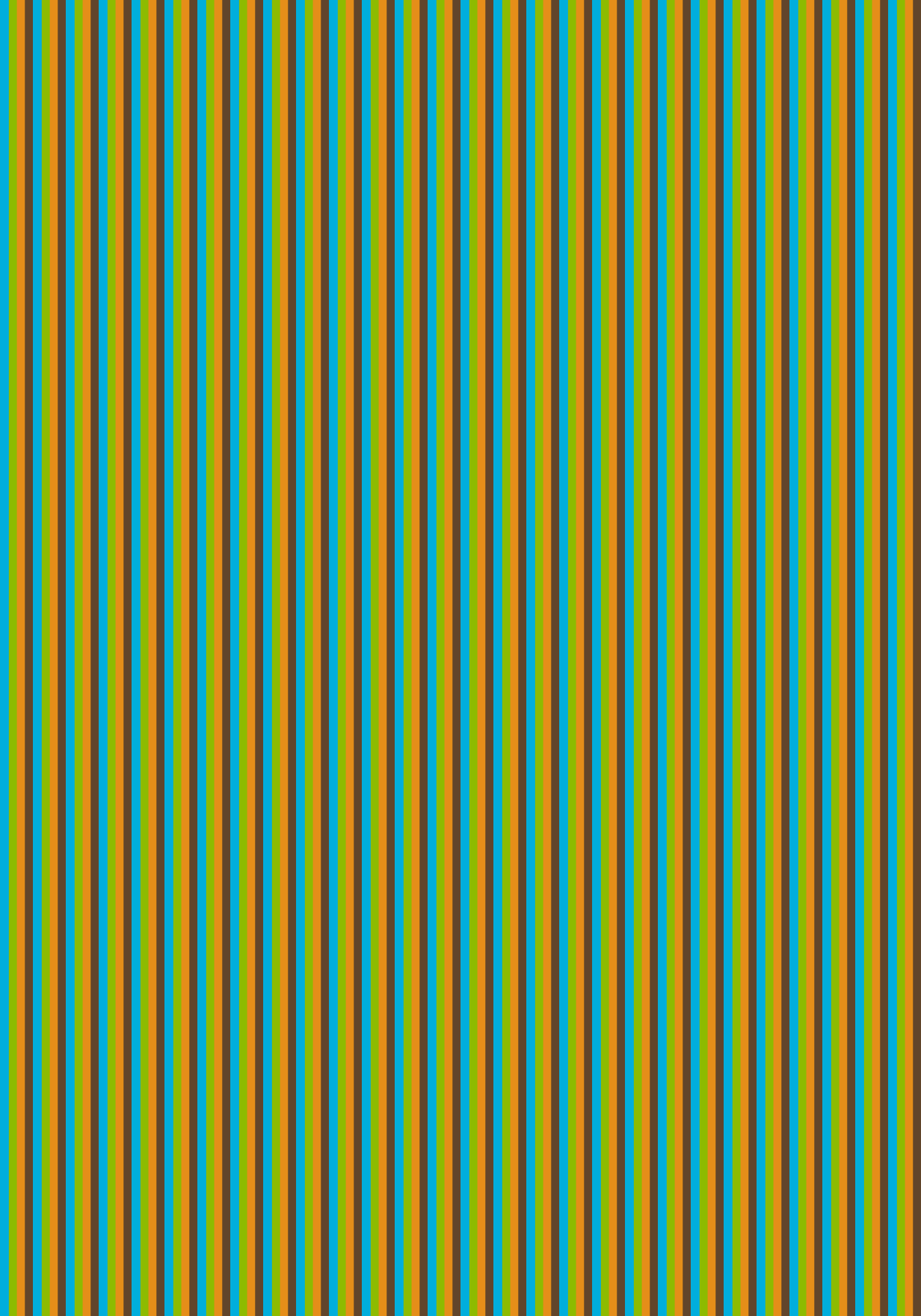
NURTURING ISE TALENT FROM WITHIN YOUR COMMUNITY

BUILDING A PROFESSIONAL DEVELOPMENT PROGRAM FOR COMMUNITY INFORMAL SCIENCE EDUCATORS

CLUES

COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE



NURTURING ISE TALENT FROM WITHIN YOUR COMMUNITY

BUILDING A PROFESSIONAL DEVELOPMENT PROGRAM FOR COMMUNITY INFORMAL SCIENCE EDUCATORS

AUTHORS
Angela Wenger and Barbara Kelly

DESIGNER
Anne Marie Kane

THE FOLLOWING INDIVIDUALS CONTRIBUTED TO THE DEVELOPMENT OF THIS BOOK
Linda Cairnes, Minda Borun, Jacquie Genovesi, Tracey Brooks, and Juan Ramirez

CLUES

COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE

CONTENTS

ACKNOWLEDGEMENTS

THE PISEC CLUES PROJECT TEAM

PROJECT DIRECTOR

Angela Wenger,
The Center for Aquatic Sciences

PISEC TEAM MEMBERS

MUSEUMS

Academy for Natural Sciences of Drexel University
Jacquie Genovesi, PhD, *Co-Project Director*
Allison Krisch
Desi Broadhurst
Sean Stallworth

The Center for Aquatic Sciences
Angela Wenger, *Project Director*
Barbara Kelly, *Co-Project Director*
Linda Cairnes, *Project Manager*
Astrid Rodriguez
Joseph Rodriguez
Susan Holmes

The Franklin Institute
Minda Borun, *Co-Project Director*

The Philadelphia Zoo
Jennifer Labows Link, *Co-Project Director*
Erin McCool, *Co-Project Director*

COMMUNITY ORGANIZATIONS

African Episcopal Church of St. Thomas
Clara Mae Daniels
Alletta Parris-Olday
Carl Collins

Camp Fire USA, Falomi Club
Anita Franks

Congreso de Latinos Unidos
Edward Garcia
Anne Harrison

Creative Kids Club
Georgette King

Folk Arts Community Treasures (FACT) Charter School
Betty Lui

Imani Circle Charter School
Adrienne Davis
Amatise Ponzo

Indo-Chinese American Council
Le-Quyen Vu
Maria Thuy

LEAP Academy Charter School
Vanessa Jones
Norma Datil
Gladys Robreno

Norris Square Neighborhood Project
Evelyn Matos

Puerto Rican Unity for Progress
Carmen Perez

Youth Services Inc.
Gwen Bailey

SPECIAL THANKS

Special Thanks to our institutional leaders who's belief in the Collaborative's vision and goals provided support in securing the resources for this endeavor, allowing the PISEC partnership to flourish and afford real impact throughout our community.

Academy for Natural Sciences of Drexel University
George Gephart Jr., *President & CEO*

Adventure Aquarium
Kevin Keppel, *Executive Director*

The Center for Aquatic Sciences
Brian DuVall, *President & CEO*

The Franklin Institute
Dennis Wint, *Past President & CEO*
Larry Dubinski, *Current President & CEO*

The Philadelphia Zoo
Vic Dewan, *President & CEO*

COMMUNITY ORGANIZATIONS

African Episcopal Church of St. Thomas
Father Martini Shaw

Camp Fire USA, Falomi Club
Anita Franks

Congreso de Latinos Unidos
Cynthia Figueroa

Creative Kids Club
Georgette King

Folk Arts Community Treasures (FACT) Charter School
Ellen Somekawa

Imani Circle Charter School
Dr. Francine Fulton

Indo-Chinese American Council
Le-Quyen Vu

LEAP Academy Charter School
Gloria Bonilla-Santiago

Norris Square Neighborhood Project
Reed McGowan, *Past Executive Director*
Justin Trezza, *Current Executive Director*

Puerto Rican Unity for Progress
Carmen Perez

Youth Services Inc.
Gwen Bailey

THE PISEC PARTNERS WOULD ALSO LIKE TO THANK

Our Advisors
Dr. Kathy Fadigan
DeAnna Banks Beane
Maddie Zeigler
Alexandra Robinson-Rogers
Michael Weilbacher
Dr. Michael Mann
Dr. Keith Dixon
Dr. Gelvin Stevenson
Roland Wall
Chris Waldron
Dr. Alejandro Vagelli
Derrick Pitts

All of the Staff & Volunteers whose support made the complex moving parts of this project possible.

Photographers
Linda Cairnes
Susan Holmes
Barbara Kelly
Judie Weinstein

Goodman Research Group
Dr. Karen Gareis
Laura Houseman
Danielle Smith
Dr. Irene Goodman

INTRODUCTION

What is PISEC?

The Philadelphia-Camden Informal Science Education Collaborative (PISEC) has worked with traditionally underserved families since 1992. It is a collaboration between the Center for Aquatic Sciences, The Franklin Institute, the Philadelphia Zoo, the Academy of Natural Sciences of Drexel University, and eleven Community Based Organizations (CBOs). The CBOs, our diverse community partners, include the African Episcopal Church of St. Thomas, LEAP Academy Charter School, the Indochinese American Council, Congreso de Latinos Unidos, Creative Kids Club, Norris Square Neighborhood Project, Folk Arts Cultural Treasures (FACTS) Charter School, Imani Education Circle Charter School, Falomi Club/Camp Fire USA, Youth Service, Inc., and Puerto Rican Unity for Progress Inc.

The PISEC institutions share a common mission to increase public understanding of science through engaging interactive exhibits and programs in informal settings. It is the philosophy of PISEC to move beyond the idea of simply supporting children's learning to that of family learning. The PISEC approach is to involve and engage all members of the family in science exploration, thereby giving them ever-increasing opportunities to deepen their exposure to areas that are interesting to them and are presented in a culturally responsive manner.

Research has shown that parent involvement in their children's learning of science concepts in out-of-school learning contexts is critically important. Many of the parents are very interested in their children's education, but typically lack the resources, information and opportunity to support their children academically. Families in the region deal with issues related to drugs, mental health, violence, low income, inadequate health care, lack of parenting skills, and poor housing. They deal with problems related to urban life such as not having safe places outside for their children to play. Many do not have complete post-secondary educations and struggle to see the importance of science in their daily lives. The families from our communities represent twelve different languages. All of this has an impact on their ability to assist their children with homework and other educational needs. How does a parent talk to a child about science if s/he is not comfortable with

the subject or language of science? Furthermore, science is often taught in a way that is decontextualized and culturally irrelevant, particularly for underrepresented populations. Research shows that community-based and informal family learning can have a significant impact on educational outcomes.

The resulting projects of PISEC have increased our understanding of how to involve diverse audiences to encourage family learning and multiple levels of science engagement.

What is CLUES?

Moving beyond building pathways to understanding and inviting family learning in museums, PISEC developed the Communities of Learning for Urban Environments and Science (CLUES) project, a 5-year program that focused on teaching science to families within their own community venues facilitated by their peers. This project built upon the previous work of PISEC's Community Ambassadors for Science Exploration (CASE) program, which introduced the component of community science ambassadors specifically in museum workshop delivery.

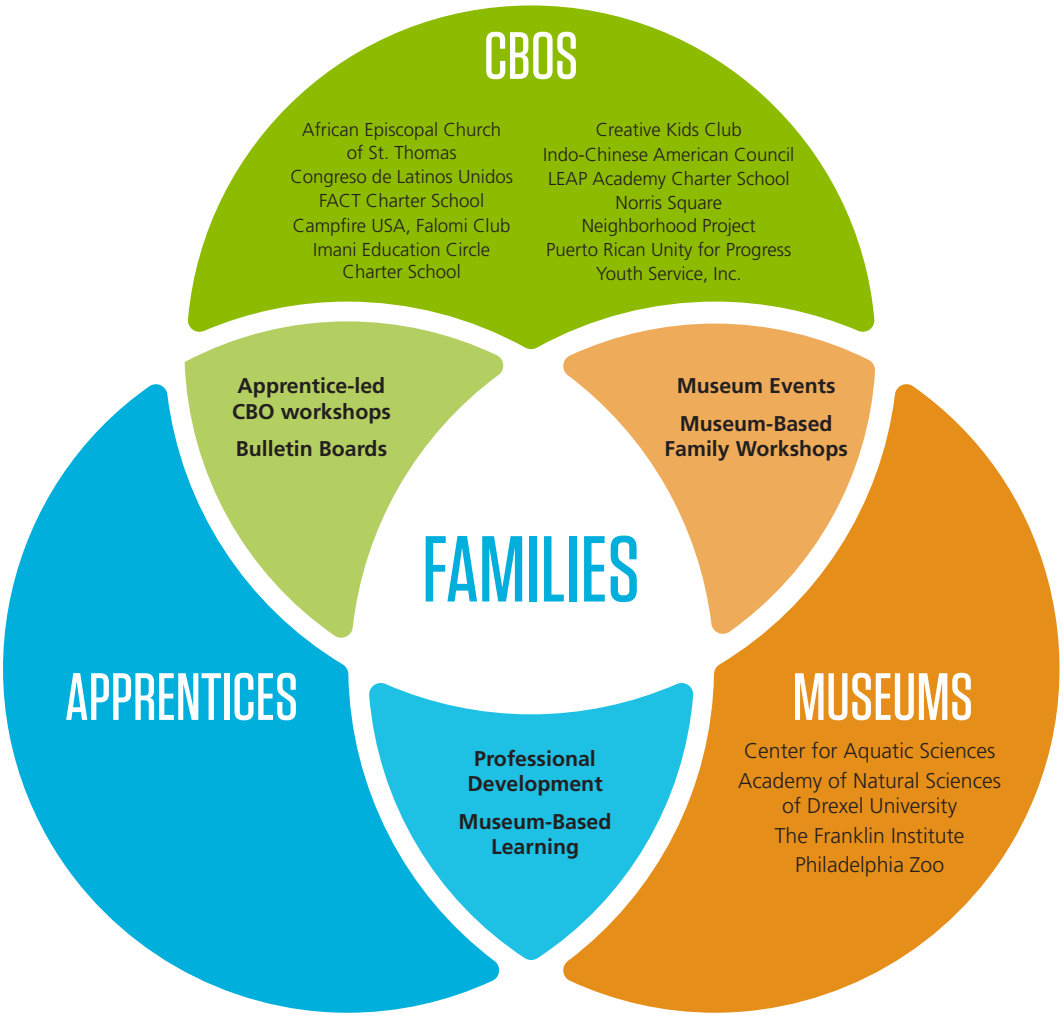
THE GOALS OF THE CLUES PROJECT INCLUDED:

1. Creating a new model for community-led science learning and environmental action for families;
2. Developing a training program to build educational leadership within the CBOs;
3. Empowering CBO-based educators to direct the focus and content of science programming; and
4. Supporting ongoing collaboration among families, community-based education leaders, and museums.

The project involved a multi-layered approach to community education by recruiting and intensively developing community Science Apprentices. These Apprentices were paired with a museum to undergo a year-long individual and group professional development plan and workshop delivery program. Apprentices were the hub of activity and communication between museums and CBOs with families as the focus of all deliverables (see Figure 1).

CLUES MODEL

FIGURE 1



Why Professional Development?

Professional development was a key element of the CLUES project as a capacity-building mechanism for individuals, community organizations and families. Museums were never intended to be the sole resource or entryway for families to engage in science experiences. In order to truly embed science and science museums into the fabric of community, the CLUES project would need to build capacity and connectivity that was formed, informed by and delivered to our community in a different way. CLUES achieved that by working together with CBOs to plan and implement every aspect of the project down to Apprentice candidate recruitment.

The training that Apprentices received was designed to expose them to new content and diverse perspectives, and prepare them to be facilitators, listeners, coaches, and leaders. Training incorporated best practices in adult learning principles including opportunities for self-direction, using funds of knowledge to enrich the learning process, and immediate application of new knowledge. This training played a critical role for the community Apprentices to facilitate and increase learning outcomes for their families in a manner that comfortably exposed them to science in multiple settings.

What is the Purpose of this Guide?

This guide is to provide staff mentors and trainers the professional development framework to recruit non-traditional informal science educators and then begin to build skills, competencies and knowledge for those individuals to serve their diverse communities as mentors, facilitators, and role models. It is also meant to illuminate lessons learned while developing the training framework for the CLUES project.

The next chapter delves into the process for recruiting and selecting viable Apprentice candidates from the community.

How Do You Choose?

The CLUES project did not utilize the typical route to find potential Apprentice candidates. The project team discussed at great length the type of individual who could be successful in this role. We began with developing position descriptions and recruitment materials (see Appendix A). The recruitment/position announcement materials were distributed by the CBOs at their site or through their stakeholders (i.e. schools, clients, church services). Any interested party could take an application, which was then mailed to the Central Project Office (CPO) after completion. The CPO then interviewed applicants and the most viable applications were forwarded to the museum in which the candidate would apprentice.

The first year yielded a wide variety of applicants, many whom were not fully prepared or committed to serve in the role of Apprentice. We came to understand that the CBOs familiarity and connection, or lack thereof, with some of the candidates played a role in their overall success in the program. Those candidates who were more woven into the fabric of the CBO came with more frontloaded "buy-in" and enthusiasm for the project than those who may have simply been looking for a job.

While there were also very successful candidates, who later informed a modification of the project by creating a Mentor level position, we decided to modify the selection process to ensure that the candidates had stronger ties to the CBO, which improved their understanding of the commitment to the position. Our selection process then became:

1. CBO partners recruited, vetted and initially interviewed their candidates first for fit, clarifying the position and community organization expectations as well as project goals.
2. Top candidates' applications were forwarded and interviewed by the Central Project Office.
   a. Applicants were provided with local media readings on current science topics for discussion during the interview.

3. The short list candidates were then sent to the appropriate Museum Project Directors for final interview.
4. Notifications of acceptance were given back to the CPO to complete the onboarding process.
   a. Acceptance and rejection letters sent.
   b. Background checks initiated.
   c. Paperwork and tax implications reviewed.
   d. Scheduling.

This modified process required additional steps, but proved to be more effective in generating successful Apprentices, although challenges always persist despite the best planning and preparation.

PREPARING FOR TRAINING

Orientation to the project was an extremely important aspect. Due to the density of the program and the enormity of information Apprentices would need, we delivered orientation in two phases: first to the project goals and the program expectations and the second to orient Apprentices to their individual museum.

Project orientation took at least 2 days consisting of icebreakers; paperwork; an introduction to the PISEC partnership and CLUES; Apprentice goals; schedules; diversity awareness and training; and tax awareness implications for their participation stipend.

Museum orientation, although varied by museum, mainly consisted of facility tours, information technology and procedural training, introduction to new coworkers, and museum specific scheduling and goal setting.

The process was overwhelming for Apprentices. While there were Project Directors at every museum site, it was critical to have a staff member serve as point of contact and supervisor for every Apprentice. We learned that it was essential for Apprentices to have a consistent place to work with proximity to other museum staff in order to assimilate into the museum culture. It was also important that all staff, from Human Resources to the front line, be aware of the Apprentice, their role and the goal of the project.

PROFESSIONAL DEVELOPMENT DISCUSSION

The professional development process was implemented on two tracks: Informal Teaching and Learning (ITL) and Science Specific Content. The ITL track provided the foundation for understanding informal education to prepare Apprentices for situational learning, diverse program development and facilitation of learning experiences. It also encompassed professional development rationale and preparation for possible work opportunities beyond CLUES.

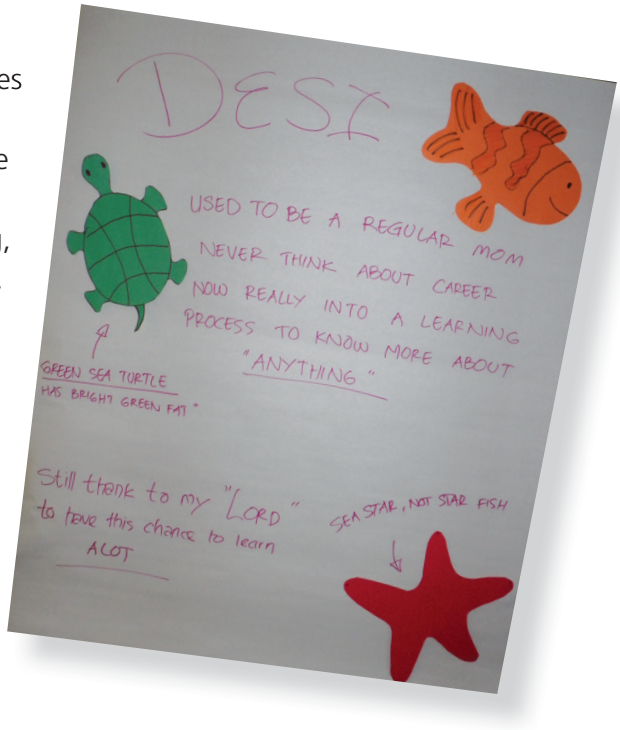
What is Professional Development?

The first training topic we tackled was the purpose of professional development. We wanted the Apprentices to first think about why they were participating in the program. The reasons for applying to the program spanned the continuum from those exploring career opportunities to fun and purposeful ways to use their time. A multitude of topics from building knowledge base to future opportunities were covered. The essentials of the discussion revolved around the goals of professional development: learning and sharing something new such as knowledge, practices, and perspectives.

PROFESSIONAL DEVELOPMENT OUTCOMES:

1. Capacity Building – Growing personally within a field, growing an organization or helping the field itself to grow
2. Skills attainment
   - **a.** Improving interpersonal or social skills
   - **b.** Creating or improving networking opportunities that support collaboration, mentoring or marketing efforts in the future
   - **c.** Supporting efforts to adapt to new work environments
   - **d.** Developing communication skills in written and oral contexts

3. Supporting growth in positive workplace behaviors
4. Professional Development sources are diverse and happen at all stages of life -School, Experience (jobs), Peer networking, Watching, Modeling, Mentoring, Media, Membership, Workshop, Conference, and Questioning
5. The value of a professional portfolio



This aspect of training is one that remained consistent throughout the project. We did, however, expand the portfolio session to appear throughout the year as a means to track and support portfolio building so that Apprentices had a tangible product to show at the end of their tenure.

INFORMAL SCIENCE EDUCATION PRINCIPLES

Our training efforts leaped into the foundational principles of informal science education. The project team trains museum staff on a regular basis, with many of them entering the workforce with basic knowledge and practice. For this project, we could not make an assumption of prior knowledge, therefore we determined that the following topics would be critical for Apprentices to understand in order to implement their work for diverse audiences. We included trainings that prepared the Apprentices for multiple modalities of learning, facilitation and reflective practice, and the nuts and bolts of workshop development. The topic list was extensive, took nearly 3 months to cover and included:

1. Learning styles
2. Developmental Stages
3. Object-based Learning
4. Formal vs. Informal
5. Novice vs. Expert
6. Reflective Practice (2 sessions)
7. Evaluation
8. Inquiry Science (2 sessions)
9. Presentation Skills
10. Types of Presentations
11. Researching for Workshops
12. Lesson Planning for Workshops
13. Selecting Materials for Workshops
14. Practice Writing for Workshops (3 sessions)
15. Workshop Practice Session
16. Portfolios

Learning Styles

There is no doubt that individuals learn through multiple modalities which are fluid, based on learning contexts and periods within a lifespan. Our intent was to introduce some of the more salient learning theories in informal science education (ISE), such as constructivism, humanism, multiple intelligences and cognitivism. Discussion of these theories were meant to inform how theory was implemented into ISE practice when serving vastly diverse audiences. The group spent part of their workshop time unpacking the theories and discussing the resource articles by Sharon Sweet (*A Lesson Learned About Multiple Intelligences*, www.ascd.org/publications/educational-leadership/nov98/vol56/num03/A-Lesson-Learned-About-Multiple-Intelligences.aspx) and Kathy Checkley (*The First Seven…and the Eighth: A Conversation with Howard Gardner*, www.ascd.org/publications/educational-leadership/sept97/vol55/num01/The-First-Seven.-.-.-and-the-Eighth@-A-Conversation-with-Howard-Gardner.aspx). The Apprentices were given a test to determine what elements of their intelligence are the strongest. Finally, they were challenged to create and present an activity which addressed at least three of the seven multiple intelligence types.

Developmental Stages

The definition of family varies greatly. One aspect that remains relatively constant in the definition is that they are multigenerational. With this in mind, we developed a 3-hour training that presented developmental stages and age appropriate activities. The bulk of the session involved observation of an area of the museum with intergenerational groups followed by a group discussion and small group work to design and present an age appropriate activity based on new knowledge. This activity was the most impactful aspect of the session.

We supplemented existing training with materials from sources such as the Responsive Classroom's Child Development Pamphlet Series (www.responsiveclassroom.org) as well as Riverbend Environmental Education Center's Developmentally Appropriate Activities for Environmental Education.

Object-based Learning

One of the largest assets that museums offer is using tangible objects that enhance learning through discussion, use of all senses and help draw conclusions via examination.

The project team wanted to explore this idea with Apprentices not only as a means to understanding learning styles, but to incorporate our strongest tools when developing science experiences.

During the 3-hour workshop, Apprentices were introduced to object-based learning, basic interpretation skills (i.e. open ended questioning, body language, and listening) and then sent out into the museum to make observations in two areas that utilize object-based learning in interpretation. The Apprentices were asked to consider and record their thoughts on the following questions:

1. List ways in which the interpreter used the object
2. List the techniques that you liked that helped the visitor learn
3. List the techniques that you thought could have been improved. How would you improve them?

The group engaged in debriefing after each observation.

Formal vs. Informal Learning

The team felt it important to unpack the idea of formal versus informal learning. Many of the Apprentices only had formal learning experiences with science and it was important for them to understand the differences. The session focused on understanding the difference between the 7 characteristics that create successful informal learning activities for families, and applying the criteria to design and evaluate programs for families.

Apprentices spent time discussing the characteristics of informal and family learning through the reading "Why Family Learning in Museums?" by Minda Borun (http://name-aam.org/uploads/downloadables/EXH.spg_08/EXH_spg08_Why_Family_Learning_in_Museums_Borun.pdf) and then were tasked with evaluating 3 exhibit components or one program to analyze them for the presence of the 7 characteristics. The session was debriefed on their findings and possible improvements to those experiences.

Novice vs. Expert

The Novice versus Expert topic was considered an important aspect of Apprentice training for a very practical, yet important reason: addressing science misconceptions and moving individuals from simple to more complex ideas.

Apprentices discussed the "constructivist" view of knowledge and the concept of novice vs. expert through readings, discussions and activities. This allowed them to distinguish between novices and experts, and apply this knowledge to improve their own practice to encourage shift in learner understanding. During training, Apprentices engaged in activities such as recognizing personal science misconceptions and interviewing visitors to discover their misconceptions. Readings included "The Constructivist Museum" by George Hein (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.461.3236&rep=rep1&type=pdf), and "Native Knowledge and the Design of Science Museum Exhibits" by Minda Borun (http://onlinelibrary.wiley.com/doi/10.1111/j.2151-6952.1993.tb00794.x/abstract).

Reflective Practice

Reflective practice is an important tool for learning in informal settings. The workshop was incorporated to support the idea that teachers/facilitators are learners as well. The project team wanted to instill reflective practice as a means of professional development through shared knowledge amongst the group that could encourage constant personal and programmatic evaluation, analysis and then modification of learning experiences for learners.

The team used various resources and methods to deliver 2 training sessions. The first was to send Apprentices working in small groups out into the museum to select an interpreted area and video tape interactions with visitors. These videos were analyzed and critiqued, then shared with the larger group. Discussions included

observed strategies and areas of improved practice. The second resource used was Lawrence Hall of Science's "Reflecting on Practice" professional development learning modules (http://www.lawrencehallofscience.org/science_out_of_school/educator_tools/reflecting_on_practice). Apprentices engaged in activities designed to help them understand what encourages learning and when learning takes place.

Evaluation

The project team felt it was important for Apprentices to have a basic understanding of the purpose of evaluation, the phases of evaluation, methodologies and measures, as well as trying instruments out on their own in the museum. After an explanation of different evaluations (interviews and observations), Apprentices chose at least two programs to attend during the day to collect data.

While Apprentices did not carry out formal evaluations on programs and exhibits for research purposes, they were responsible for delivering and collecting front-end, formative and summative evaluations for workshop participants during the project. This knowledge would also be valuable in relation to their reflective practice, and while observing behaviors and asking questions during their workshops.

Inquiry Science

The project team spent a significant amount of time presenting the pedagogical underpinnings of informal science education supported with some practical application of this new knowledge. The next step in our logic was to address concrete practice by modeling inquiry and facilitation.

This module required 2 full-day sessions for Apprentices to engage in multiple activities from physics to natural science, followed by debriefing on their shifting role from learner to facilitator.

The resource reading for the first session was G. Wiggins and J. McTighe's "Putting Understanding First" (http://www.ascd.org/publications/educational-leadership/may08/vol65/num08/Put-Understanding-First.aspx). For the second session, the workshop facilitator used readings from M.L. Martens "Productive Questions: Tools for Supporting Constructivist Learning" (http://static1.1.sqspcdn.com/static/f/1747612/24823103/1399045331033/productivequestions.pdf?token=0uZU0luyf1xQWK6el0eRNvE2mw8%3D) and J. Elstgeest "The right question at the right time." (2001, In Primary Science: Taking the Plunge, ed. W. Harlen, 25–47).

Apprentices were asked to reflect on certain questions at the end of each session. Their thoughts and answers to the questions were insightful.

SESSION 1 QUESTIONS

1. **What stands out for you about learning science in this way?**
   The Apprentices reflected quite a bit on the conversation, question generation and the ability to explore, theorize, test, analyze and modify theories. They appreciated the involving "hands-on" aspect of the activities and the opportunity for their minds to "just go."
2. **What ideas about how scientists solve problems did you experience today?**
   The Apprentices gained an appreciation of the scientific process and collaborative nature of science. They also felt that it was important to understand that there may be more than one answer.
3. **What new science content did you learn today?**
   Some Apprentices discussed science topics while a few others noted practice oriented ideas about science process or teaching methods.
4. **Share a specific learning or facilitation strategy that you noticed that seems effective for encouraging thinking.**
   Many Apprentices discussed the value of open-ended questioning and patience, and how they encourage participation. Others felt sharing experiment outcomes and conversation as effective for encouraging thinking.
5. **Please add any other thoughts, comments, questions, suggestions…**
   The Apprentices overwhelmingly felt that the inquiry learning style was impactful AND fun. They also felt that it facilitated thinking about experiments on a different level.

THE REFLECTIONS IN SESSION 2 ASKED ALL OF THE SAME QUESTIONS, BUT WITH ONE ADDITION:

1. **What stands out for you about learning science in this way? How was it different from the previous "science workshop?"**

The Apprentices' answers moved from the value of the scientific process to how broadly inquiry practice can impact learners. Answers include statements such as:

- "It's very exciting to have someone who knows what they are doing. People with passion for what they teach [and who they are teaching…] are better than those who do not like it."
- "I felt like I could answer any question and not be shot down in flames for what I think is going on. I could answer the question and then be gently pushed to think on it harder."
- "This class required extensive research, extensive thinking."
- "To be asked questions, to dig down deep and open my mind more instead of stating the obvious."

Presentation Types & Skills

With the basics of learning, learning styles, facilitation and reflection under their belts, the Apprentices then spent two sessions learning about the different delivery methods and the skills needed to present and interpret science content. The group spent time on the benefits and appropriate use of workshops, demonstrations, presentations, classroom lessons, field trips and shows for a variety of audience types and situations. Each Apprentice, having already shadowed numerous educators in their respective museums, had a good grasp of what methods engaged them personally. The basics of public speaking were covered as well as improvisation for a more theatrical approach. The project team utilized both museum educators and actors to deliver these sessions.

The Nuts and Bolts of Workshop Preparation

One of the key elements of developing workshops, once you know what the topic will be, is preparing the lesson plan. The importance of the lesson plan cannot be understated. It is the rationale and blueprint for the lesson and the communication instrument for other educators who may use it. The process of writing a lesson plan helps facilitators think about the goals and objectives, incorporate the most effective delivery method, anticipate learning environment or outcome challenges and the time it may take to achieve the goals. In some cases, it may be the prototype to test, analyze and revise methods, materials and assessments. It also serves as a tangible product of professional development.

The project team pondered the aspects that were critical to successful lesson planning by including discrete sessions in:

1. **Researching for Workshops –** The team dedicated two sessions to both library and website research.
2. **Anatomy of a Lesson Plan for Workshops –** This session discussed the standard elements of a lesson plan using a lesson plan template (see Appendix B).
3. **Selecting Materials for Workshops –** This session covered both the selection of quality materials, biofacts, and activities as well as internal purchasing processes.

The Apprentices were then given three professional development session slots to begin Workshop Planning by researching and writing their first lesson plan with the guidance of a project team member. Once the plans were completed and edited they were then instructed to purchase their materials in preparation for a Workshop Practice Session. This session allowed the Apprentices to test out their plans with the helpful feedback from their peers.

In addition to the workshops, Apprentices also created Take Home activities for their families to continue enjoying science together at home.

While all lessons plans were not 100% standardized in appearance, they were effective.

Portfolio Building

The CLUES project invested a great deal of effort in developing the Apprentices with the vision of not only building individual, community, and CBO capacity to provide science programming access, but to also support the museums' aspiration of cultivating a diverse workforce that reflected the communities in which they resided. Many of the Apprentices expressed a desire to remain in the field of community education in some form after their participation. In preparation for that potential future, we engaged the Apprentices in continuous portfolio building as a tangle product of their professional development and achievements in the program. They were also encouraged to have digital versions of their portfolio.

THE PORTFOLIO INCLUDED:

1. A current resume
2. All lesson plans
3. All family Take Home Activities
4. Photos of their CBO communication bulletin boards
5. Workshop and event fliers
6. Relevant certificates of training (i.e. Project Wild, CLUES program, Master Naturalist)
7. Relevant artwork or music developed for the program
8. Letters of Recommendation from the Central Project Office and their specific Museum Project Director

The CLUES project trained 22 Apprentices over the program period. Many of the Apprentices have changed jobs in the years following CLUES, but several have held positions in related fields. Eight Apprentices became museum staff, four work in CBO or school-based afterschool programs, three work supporting community members through social services, and two are working in formal education.

SCIENCE CONTENT

The CLUES project was extremely dense and complex. Not only did the Apprentices have to learn a new job with an enormous amount of information, they also had to turn all of that knowledge around in a short time to deliver numerous science workshop experiences to families in their communities. The project team had to carefully plan professional development that provided Apprentices with essential facilitation practices, as well as the science they needed to complete the picture. Science content ran in parallel with teaching content in the first three months and then continued throughout the rest of their tenure as an Apprentice. The science content focused primarily on environmental science, with emphasis on topics relevant to their community. The project team worked diligently to research and provide the most salient content to supplement their existing content training. A dozen or more sessions were dedicated to specific science training.

The Apprentices were given a background in Sustainability (i.e. energy and food) and Global Climate Change (i.e. sea level rise, weather, carbon foot print). They were also introduced to topics in pollution, waste water management, environmental justice and participated in the Pennsylvania Master Naturalist certification program. The Apprentices then developed workshops on topics such as recycling, pollution, urban gardening and carbon footprints. Apprentices were also trained in the specific science content of the museum to which they were assigned.

Apprentices at the Franklin Institute received training on the human body and physics topics. Their Apprentices developed workshops in health, nutrition, exercise and the heart. Zoo Apprentices learned more about wildlife conservation, animal adaptations and behavior. These Apprentices developed workshops on topics such as urban wildlife and bird migration. Academy of Natural Sciences Apprentices engaged in topics around dinosaurs and ecology to create workshops focused on topics like insects and archeology. Center Apprentices at the aquarium focused on marine biology and oceanography to develop workshops around shark conservation, sustainable seafood and sea turtles. The content trainings were delivered through a variety of methods including classroom, exhibit-related, symposium, field work, field trips and conferences.

Some of the best field trip experiences included visits to museums outside the collaboration, local municipal plants, and locations for experiential activities related to workshop topics. Museum visits included larger science museums, such as the Connecticut Science Museum to observe new exhibits and floor staff presentations, as well as smaller institutions, like Briar Bush Nature Center where Apprentices could observe exhibits on a smaller scale as well as discover additional opportunities for families. With a workshop emphasis on local conservation, Apprentices toured waste water treatment plants and recycling centers. Having toured these local sites, the Apprentices used these experiences to make real-world ties to recycling and water use for the families in their community. Lastly, many of the field trips were designed to encourage the Apprentices to delve deeper into their workshop topics. Trips to urban gardens, food trusts, and a green roof in the city were designed to expand the Apprentices scientific and local knowledge on these subjects. For instance, by taking a birding tour through the city and experiencing the variety and number of local birds, the Apprentices were then able to convey that information to their families.

Who Needs Support?

Being a CLUES Apprentices was not going to be an easy job and would be overwhelming with the flurry of new knowledge, people, cultures and expectations. The professional development activities required the group to be together 1-2 times per week to accomplish the over 30 sessions it would take to train them. The project team also used this time to allow Apprentices to get to know each other and themselves better; to help them to appreciate each other's perspectives, employ team self-regulation and professional behavior; encourage collaboration, communication and productivity; set common goals; make the workplace motivating and enjoyable; and identify leadership qualities within the group. Identifying leadership would prove to be important in the second year of the project.

The frequent training and field trips served double duty with team building. Two experiences, in particular, would prove to be transformational in the group dynamic.

The project took two multi-day residential training experiences during the year, one to the Center for Environmental Transformation in Camden, New Jersey and the other to Sedge Island in Barnegat Bay, New Jersey.

The weekend program at the Center for Environmental Transformation was dedicated to teaching the Apprentices about urban farming, food deserts, heirloom seeds and food sustainability. They also discussed rain gardens and healthy cooking

and eating. This learning experience allowed for collaborative activities like harvest and cooking as well as ample time to reflect upon personal experiences with food and culture. The time spent after programming often lead to deeper personal discussions where team members could listen or offer perspective and advice on troubling personal or professional matters. It also afforded the group access to a museum staff member in an informal, non-work setting to express themselves freely. This opportunity not only brought the group closer together, but in some cases changed the process of how activities were accomplished within the program. For instance, in one year, it was suggested that weekly, non-training meetings were not productive for Apprentices who felt their time could be better spent developing workshops or being more involved at their community centers interacting with families. We changed this practice immediately.

The Sedge Island trip focused on beach and bay ecology, outdoor education, water conservation and fishing. The Apprentices had to kayak out to reside in a cabin on an island in the middle of the bay. Prior to the trip there was enormous amount of anxiety about being in nature over the weekend, including fear of drowning and boating, as well as access to showers and modern electronics. This trip was also a little more physically demanding than other experiences. A few Apprentices complained loudly and some almost refused to attend. One of the best team building outcomes of this trip was the outpouring of leadership taken by some Apprentices to support and encourage those who had trepidation to attend throughout the trip. It took a lot of conversation and compromise to get everyone on board. What we found was an overwhelmingly positive reaction to the experience, a sense of adventure and willingness to try something new, and tighter bonds of trust and friendship between Apprentices.

Overall, Apprentices identify this as the most impactful experience of the program.

Throughout the training sessions, workshops and museum events, it became evident that a few individuals engendered the trust and respect of their peers. They were sought for their advice and example of how to accomplish certain activities or navigate the museum culture. As a result, the project team decided to experiment in creating a Mentor level position in the program to further build the capacity of highly motivated and promising individuals and to also create another level of support for the incoming novice Apprentice cohort.

MENTORING

At some point in everyone's life a mentor was there to lend experience, sage advice or open doorways. While the CLUES project had many project and museum staff who could and did serve in a mentoring role, no one would be able to offer the unique perspective and experience of the role of Apprentice better than another Apprentice. During the formative years of the project, emerging leaders were always present within the cohort. The project team felt it would further support the success of the novice Apprentices to have a touchstone, or two in this program, to refer to when they needed to navigate new or challenging waters. We decided to create this new position and recruit (see Appendix A) from within the current year 2 cohort. Not only were we looking for candidates that had the trust and respect of their peers, but an exemplary grasp of the program and processes as well.

In order to grow different skills and responsibilities, the Mentors received additional training on topics such as supervision and grant writing, and they participated in the professional development delivery for the new Apprentices. The Mentors were also able to attend a national professional conference, the Association of Science-Technology Centers (ASTC), at which they practiced their networking and attended topical sessions.

FROM THEIR PERSPECTIVE

The Apprentices were asked throughout the program to share their perspectives through a multitude of ways, including weekly reporting to CPO staff, focus groups and surveys with evaluators, and informal conversations with museum staff. Additionally, museum staff, community liaisons and families were asked to reflect on their experiences with the Apprentices. These multiple perspectives build a complete view of the Apprentices work and impact.

The Apprentices had a short training period in which they were asked to learn about both informal science education and key science concepts, before being required to incorporate it all into cohesive lesson plans. Upon reflection of the trainings, one Apprentice shared:

> *"While I was at the [museum], I received a lot of helpful information from the education staff. I was scheduled to observe [museum] staff conduct workshops and, as time went on, I gradually started to work on those same workshops. Through that experience, learning the science of the museum coupled with the professional development I received offsite, I was able to confidently create and host my own workshops."* ***— CLUES Apprentice***

The intense, holistic training approach resulted in changes that were noticeable, not only to the Apprentices, but also to the community partners that worked with them:

> *"I had a young lady as an Apprentice that is just the most amazing person I've ever seen. It's like she lived CLUES. She lived to make a workshop an event, just come alive. She put so much heart and soul into it…Everything she did was so well thought-out that we had no problem ever with our families coming out to the workshops because they always knew it would be fun, and that they would leave feeling like, "wow."… She was great without training; anything you ask her to do, she can do it. [But] I know she was enriched and empowered by every step of her training in CLUES. She took that and made herself a better person. You cannot come to CLUES and not become better, unless you just do not take and understand all that is offered to you."*
> ***— CBO Partner***

The Apprentices valued the time spent at the museums and in training and saw it as a way to begin to formulate their workshops:

> *I came up with topics that were relevant to my intentions for the CBO and what would be in their best interest and most palatable to families. [I] took advice and borrowed activities from all the various people I interacted with at the museums and elsewhere to put together something that would be appealing to families and kids of all ages. Maybe half of my work was original and half from modified activities I had seen or experienced.* ***— CLUES Apprentice***

> *My workshops were inspired by a number of different things. Some were my own invention to find ways for the [families] at my CBO to interact with science in new ways. Some were directed at reaching out to new members of the community, and inspired by activities I learned at the [museum] and at training workshops. Some were tied directly into the resources available at the CBO like gardening.*
> ***— CLUES Apprentice***

The Apprentice's goal in developing workshops was to provide an enjoyable and educational science experience for families in their community. Many of the Apprentices were known to these families prior to their apprenticeship and while families recognized that they were not science experts, they did come to rely on their science knowledge and have an expectation for high quality programming.

> *They know everything, and if they don't, they come back and then they know. The fathers will ask questions that we didn't think of. We have adults, fathers who ask all kinds of questions, hard questions!* ***— CLUES Family***

One of the goals of the CLUES project was to create diversified informal science educators that would empower the CBOs to expand science offerings and to create a museum staff population that more accurately reflects its surroundings. As one CLUES museum partner stated:

> *"We couldn't do it alone; the collaborative has been key, the museums and the CBOs. It's like Dr. Jolly was talking about 10 or 15 years ago in Dialogues on Diversity: You're not really truly going to have the representation you want unless you include the communities in every aspect, not just as front-line staff or the occasional exhibit on cultural things, but really integrating them at every point. The community organizations tell us what to do; we're not the be-all and end-all or the experts, no matter what anybody else tells you!"* ***— Museum Partner***

The Apprentices, eight of which became museum staff and four of whom work at a CBO or similar after-school program, also valued the experiences. Upon reflection during the CLUES program they stated:

> *"After finishing my CLUES Apprenticeship, I hope to continue to develop my love for science into a career in a science related environment."* ***— CLUES Apprentice***

> *"A whole new direction of where I want to take my life."* ***— CLUES Apprentice***

Perhaps one of the greatest successes of the CLUES project was that the Apprentices were able to see beyond the impact of the program in their own life and value the impact that CLUES could make on their community. As one Apprentice explained, upon reflection:

> *"It's always great for CLUES folks to talk about the CLUES program as much as they can, how it serves people from urban communities. People from urban communities, when they see someone they know, or from their neighborhood, or who looks very similar to how they look, that opens them up to, 'Maybe I could do that.'"*
> ***— Former Apprentice***

ASSESSMENT

The CLUES professional development experience could only be described as intensive. Nearly 80% of both the science and informal education content presented to the Apprentices was new. We began including formal workshop session reflections so we could gauge their grasp of the big ideas for that session, how they would apply the knowledge or practice in their workshops, what workshop topics they would pursue and general thoughts and opinions on the workshops or trips. If any discrepancies or misconceptions were obvious, the trainer could then provide follow-up and clarification on any particular subject.

During the course of the project, we worked closely with our external evaluators to ensure that the professional development goals were being met. Our feedback was consistent throughout the years. When interviewed by the evaluation team:

- Apprentices were satisfied with most aspects of CLUES, including the work, the training, and the support they receive.
- Apprentices were satisfied with most aspects of CLUES training. They were even more satisfied by their work with families and museums.
- Apprentices agreed CLUES training prepared and supported them well in their leadership roles and in developing and running workshops, supporting museum staff at events, and training, coaching, and mentoring others.
- Apprentices received support to solve problems and fulfill their duties and found the CLUES program valuable and driven by a well-defined image of effective ISE.
- There was a significant increase in Apprentices' agreement that they had adequate information about the Apprenticeship and their role to do a good job.
- The majority of Apprentices agreed CLUES met their top goals for the training. In subsequent years, they were more likely to report CLUES helped build their resumes.

- Most Apprentices agreed that their CLUES participation increased their understanding of and confidence in their ability to succeed in ISE and led to a fuller exploration of their career goals.
- Almost two-thirds say they *probably* or *definitely* will continue in ISE.

One Apprentice expressed their feelings on their professional development experience as one that is holistic in approach.

> *"There's a lot of information that they discuss with all the workshops and PDs, and I think that what's really cool about it is the fact that they make it a point to connect it to your community."* ***— CLUES Apprentice***

The CBOs also provided perspective on their Mentors' and Apprentices' development over the course of their year of CLUES training in terms of science content knowledge, presentation and interpersonal skills, and connecting with their own communities in a deeper way:

> *"This was fascinating. Our Apprentice…did not know which museum or partner she would go to. She ended up at the [museum]. She came back and said, quite frankly, I hate [that museum]. However, interestingly, 2-3 weeks later, she changed her attitude. She changed and had greater appreciation for what goes on there; she said "I'm not afraid or nervous or anxious about it." That, to me, was, she, she learned an awful lot. Also, the workshops. If you've never done it before, hosting a workshop is a very new experience. It's a combination of speaking abilities and ability to communicate information in an engaging way and outside your comfort level. Our Apprentice, because of support and coaching from museum staff as well as her growth with CLUES and the education there, helped her go from being really frightened to getting a level of comfort and being able to do it in a way that kids were excited and got a lot of information out of it."* ***— CBO Partner***

The professional development process evolved each year, not only to meet the needs of the Apprentices, but to improve effectiveness and efficiency. We essentially started with formal professional development activities that required six to eight months to complete and compressed the most critical elements down into three to four months by doubling up on workshops weekly.

The investment in professional development required many man-hours by staff. In sum, it was well worth the time and money, but we realized that while one year was adequate, two years truly prepared Apprentices for Community Education. In addition, one of the most crucial ingredients beyond training remains to be passion for the work.

APPENDIX A

POSTION ANNOUNCEMENTS AND DESCRIPTIONS

CLUES
COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE

November 2011

TITLE: Science Apprentice
Communities of Learning for Urban Environments and Science (CLUES) project

DESCRIPTION:
Science Apprentices are people who will be trained as informal science educators to develop and lead workshops for families. The workshops will deal with environmental issues that affect their neighborhoods. Apprentices will also train and assist Presenters in conducting hands-on science workshops for family groups at their community centers. Apprentices will serve as interns in the four PISEC museums (The Franklin Institute, Academy of Natural Sciences, Philadelphia Zoo, New Jersey Academy for Aquatic Sciences) and working 32 hours per week for 1 year. Each Apprentice will receive in-depth training in science content and presentation skills at one of the four museums.

MAJOR RESPONSIBILITIES FOR APPRENTICES:

1. Create and present hands-on workshops at museums and community centers.
2. Invite visitor participation; help visitors make their own discoveries, present information in a friendly, engaging manner.
3. Attend training sessions on time and as scheduled by museum staff.
4. Participate in professional development trainings and museum programs such as school lessons, outreach and exhibit explanation as assigned.
5. Distribute and collect attendance and evaluation forms (provided) at community center workshops.
6. Assist in the development of one CLUES family event at the assigned museum.
7. Maintain a helpful and friendly attitude toward other Apprentices, Presenters and museum instructors.
8. Perform other duties and assist with other museum events as assigned.
9. Maintain communication, as required, to the CLUES project coordinator at the museum and with community organization.
10. Submit required paperwork and reports in a timely manner.

KNOWLEDGE AND ABILITY REQUIRED:
An apprentice must be:

1. An adult with at least a high school diploma.
2. Able to commit 32 hours/per week for 1 year to this position.
3. Able to work a flexible schedule that will include some weekends and holidays.
4. Willing to learn and help others learn.
5. Willing to speak in front of audiences of all ages.
6. Willing to work as part of a team with other Apprentices and Presenters.
7. Able to follow written and verbal instructions.
8. Able to communicate with poise, tact, and confidence.
9. Fluent in English and in the language spoken by the majority of families associated with their CBO.
10. Able to present a professional appearance and manner.
11. Able to arrange own transportation to and from museums and CBO.

PHYSICAL AND MEDICAL REQUIREMENTS:
Must be physically able to do the work of a Science Apprentice.

STIPEND
Apprentices will receive a stipend based on hours of service. Rate is $512 per week, approximately $320 after taxes.

November 2009

Application for Science Apprentice Position
Communities of Learning for Urban Environments and Science (CLUES) Program

Date _____ Community-Based Organization (CBO) *_____

Name _____
Last First Middle Jr. etc.

Prefer to be Called (Nickname) _____ Gender M/F (circle)

Address: _____

City _____ State _____ Zip Code _____

Date of Birth_____ Email Address _____
mm/dd/yyyy

Day Phone _____ Evening Phone _____ Cell Phone _____

Do you have US Citizenship/Green Card/Student Visa? Yes ❑ No ❑

Languages you speak _____

Apprentices will have to be available 40 hours a week, occasionally on weekday nights and weekends.
Please verify you are available on: ❑ Weekday Nights ❑ Saturdays ❑ Sundays

Do you have a high school diploma/GED? Yes ❑ No ❑

What was the highest level completed in school? _____

What science courses did you take in High School and College?

How often do you use a computer? Daily ____ Weekly____ Once a month _____ Seldom/I avoid it ____

Do you use Word/Excel? Daily ____ Weekly____ Once a month _____ Seldom/I avoid it ____

Do you perform Internet Searches? Daily ____ Weekly____ Once a month _____ Seldom/I avoid it ____

How much experience do you have doing library research?
❑ None ❑ A Little ❑ A Lot

How much experience do you have speaking in front of groups?
❑ None ❑ A Little ❑ A Lot

If you have some experience, what age groups did you work with? ❑ Children ❑ Adults
Please describe your experience:

*CBO's = LEAP Academy Charter School, Campfire/Falomi Club, Imani Education Circle Charter School, Norris Square Neighborhood Project, St. Thomas Church, Indochinese American Council, FACT Charter School, Congreso de Latinos Unidos.

November 2009

Application for Apprentice Position
Communities of Learning for Urban Environments and Science (CLUES) Program

In the space below, please explain why you want to be an Apprentice?

I have read the Apprentice Job Description and I will carry out the duties described.

Signed _____ Date _____

CLUES
COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE

APPRENTICE IN-PERSON INTERVIEW

Interview Date: _____

Name: _____ CBO: _____

Did applicant bring additional materials? YES NO If yes, what? _____

1. Tell me about yourself.
2. What is your relationship with your CBO?
3. Expand on why you want to be an Apprentice – Tell me a little bit more about what appealed to you about this opportunity.
4. What is your interest in science? Comfort with science?
5. What do you do to "feed" your interest in science? Any specific subjects you like?
6. What are your thoughts on learning science as a family?
7. What are your Personal and Professional growth goals?
8. Tell me about your experience and comfort with exercising your leadership and mentoring skills.
9. Describe a situation where teamwork was essential.
10. Describe a situation where you had to control a situation that had the potential of going badly.
11. You were asked to read the article "Up on the Roof" in National Geographic. Tell me what you thought.

February 2012

CLUES
COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE

TITLE: Science Apprentice Mentor (SAM)
Communities of Learning for Urban Environments and Science (CLUES) project

DESCRIPTION:
The Science Apprentice Mentor (SAM) will take an active leadership role in training and assisting novice Apprentices in developing and delivering hands-on science workshops for family groups at their community centers. The workshops will deal with environmental issues that affect their neighborhoods. Each SAM will receive in-depth training in science content and additional content specific to their role as a mentor.

MAJOR RESPONSIBILITIES FOR APPRENTICE MENTORS:
1. All of the duties of a Science Apprentice.
2. Participate in SAM professional development sessions.
3. Assist in the facilitation and supervision of professional development trainings for novice Apprentices.
4. Serve as positive role model for and monitor novice Apprentices in the daily duties and responsibilities expected of a Science Apprentice.
5. Maintain consistent communication with the Central Project Office, museum, community organizations, and Science Apprentices.
6. Perform other duties and assist with other museum events as assigned.

KNOWLEDGE AND ABILITY REQUIRED:
A SAM must be:
1. Able to commit 32 hours/per week for 1 year to this position.
2. Able to work a flexible schedule that will include some weekends and holidays.
3. Willing to learn and help others learn.
4. Willing to speak in front of audiences of all ages.
5. Willing to work as part of a team with Apprentices and Presenters.
6. Able to follow written and verbal instructions.
7. Able to communicate with poise, tact, and confidence.
8. Able to present a professional appearance and manner.
9. Have at least 1 year of experience as a Science Apprentice.
10. Demonstrate ability to develop and present a workshop outline.
11. Demonstrate leadership and initiative in the work environment and supervision of others.
12. Demonstrate technology skills for writing, creating flyers, data gathering and tracking purposes.

PHYSICAL AND MEDICAL REQUIREMENTS:
Must be physically able to do the work of a Science Apprentice Mentor.

STIPEND
Apprentices will receive a stipend based on hours of service. The stipend will be based on demonstrated experience and merit.

January 2012

Application for Science Apprentice Mentor Position (SAM)
Communities of Learning for Urban Environments and Science (CLUES) Program

Date _____ Community-Based Organization (CBO) *_____

Name _____
Last First Middle

Address: _____

City _____ State _____ Zip Code _____

Date of Birth_____ Email Address _____
mm/dd/yyyy

Day Phone _____ Evening Phone _____ Cell Phone _____

Languages you speak _____

Apprentices will have to be available up to 40 hours a week, occasionally on weekday nights and weekends. Please verify you are available on: **Weekday Nights** __ **Saturdays** __ **Sundays**__

Do you have a high school diploma/GED? **Yes** __ **No** __

What was the highest level completed in school? _____

How would you rate your ability with the following computer skills?

	High	Average	Fair	No Experience
1. Microsoft Word	____	_____	___	_____
2. Microsoft Excel	____	_____	___	_____
3. Microsoft Access	____	_____	___	_____
4. Internet Searches	____	_____	___	_____
5. _____	____	_____	___	_____
6. _____	____	_____	___	_____
7. _____	____	_____	___	_____
8. _____	____	_____	___	_____

In the space below, please explain why you want to be a Science Apprentice Mentor. Consider the following points and describe a situation where you employed these leadership or technical skills. (you may use additional pages as needed).

1. Positive and consistent communications with your:
    - Museum Liaison
    - Community Liaison
    - Apprentice Peers

2. Mentoring other Apprentices or Presenters
    - Being a good listener with the individual's best interests in mind and at heart.
    - Challenging individuals to go beyond where they would go themselves.
    - Sharing tips and best practices. Offering suggestions to help the individual advance by sharing experiences, or personal or professional skills.

3. Presenting exciting workshops
    - Choosing an interesting topic and doing research to turn it into a workshop
    - Creating an engaging hands-on activity for families
    - Involving people of all ages
    - Giving people something to take home

In the space below, please explain more about your experiences as an Apprentice and how the Mentor position would align with your future goals. Use additional space if necessary.

4. What did you gain from your experience as an Apprentice?

5. How does the Mentor position support your future career goals?

Applicants:
If your application is selected for interview, please bring your COMPLETED PORTFOLIO (including resume, list of references, two letters of recommendation, writing samples, certifications, etc.) with you.

APPENDIX B

EXAMPLES OF LESSON PLANS AND TAKE HOME ACTIVITIES

Defeat the Yummy Treats

2

Workshop: Defeat the Yummy Treats

Length: 45 minutes to 1 hour

OBJECTIVE

1. Families will learn to limit added sugar as much as possible.
2. Read it before you eat it!
3. Families will learn how sugar is an often unnecessary additive.

OUTLINE/SCRIPT

- What's in Your Food?
    - It's about the food sources your body needs to be healthy. Good nutrition is about eating healthy snacks and balanced meals. Food with lots of sugar, salt, and fats make an overweight, unhealthy body.

ACTIVITY #1 - Definitions

- **Carbohydrates**
    - Carbohydrates are a big source of energy for you.
    - What is a carbohydrate?
        - Its starch and sugar. This kind of sugar is called **empty calories** because it has energy but doesn't provide you with anything else. Better health will benefit you if you eat plenty of fruit, vegetables and grains.
- **Fats (You need a little)**
    - Having too much can clog the veins and arteries that carry blood around your body and overwork your heart to pump blood.
- **Proteins**
    - Proteins help you to repair yourself when you get cuts.
    - Proteins come from foods like fish, meat, chicken, eggs, soybean, and many others.
- **Water**
    - You can get a lot of water by drinking it by itself, or from food. Water helps you to carry other nutrients around your body, controls the temperature of your body, and moves food down along your system and eventually come out of your body.
- **Calories**
    - The number of servings you consume determines the number of calories you actually eat.
- **Sodium**
    - Limit your intake to less than 20%

ACTIVITY #2 - Definitions

- YOU CAN'T FIX YOUR HEALTH UNTIL YOU FIX YOUR DIET
    - The best foods for you are on the outer sides of the market.
    - The fresh fruits, veggies, lettuce products, fresh grass-fed meats and organic eggs, dairy products and whole grain.
    - If you want minerals or iron, there are so many healthy foods to choose from to get those things: kale, spinach, broccoli and cauliflower have many necessary minerals in them.

- Whole Foods
    - Healthy foods don't have all the additives, fat and sugar added. They also don't have their nutrients taken away.

- Processed Food
    - These processed foods should be avoided, or at least eaten sparingly:
        - Canned foods with large amounts of sodium or fat.
        - Pasta meals made with refined white flour instead of whole grains.
        - Packaged high-calorie snack foods such as chips and candies.
        - Frozen fish sticks and frozen dinners that are high in sodium.
        - Packaged cakes and cookies.
        - Boxed meal mixes that are high in fat and sodium.
        - Sugary breakfast cereals.
        - Processed meats - hot dogs, bologna, sausage, ham and packaged lunch meats.

- Junk Food
    - Junk food is food that has been processed with additives
    - It's low in fiber.
    - It tastes good due to salt and/or sugar content
    - It offers a high number of calories in a small volume.
    - It's high in fat
    - It's high in sugar in liquid form
    - Eating too much junk food can lead to health concerns, tooth decay, and obesity.

- Code Words for Sugar
    - **High-fructose corn syrup**
    - Agave Nectar
    - Barley Malt Syrup
    - Beet Sugar
    - Brown Rice Syrup
    - Brown Sugar
    - Cane Crystals (or, even better, "cane juice crystals")
    - Cane Sugar
    - Coconut Sugar, or Coconut Palm Sugar
    - Corn sweetener
    - Corn syrup, or corn syrup solids
    - Dehydrated Cane Juice
    - Dextrin
    - Dextrose
    - Evaporated Cane Juice
    - Fructose
    - Fruit juice concentrate
    - Glucose
    - Honey
    - Invert sugar
    - Lactose
    - Maltodextrin
    - Malt syrup
    - Maltose

- Maple syrup
- Molasses
- Palm Sugar
- Raw sugar
- Rice Syrup
- Saccharose
- Sorghum or sorghum syrup
- Sucrose
- Syrup
- Treacle
- Turbinado Sugar
- Xylose

ACTIVITY #1: SODA

- How much sugar is in soda?
  - Ask participants to guess how many teaspoons are in a 12-ounce can of soda. Ask a volunteer to help you with this demonstration. Ask the volunteer to spoon out 10 teaspoons of sugar onto a plate in front of a can of regular soda.
  - (Display the three size cups – small, medium, X- large)
  - Presenters will ask another volunteer to spoon out sugar into the cup size selected.
  - Each table will cooperate to read the label and count out how much sugar is on their label. Each person from the group will calculate the teaspoon of sugar added into a cup or plate.
  - You can order the "Sugar Shockers" handout from www.learningzonexpress.com that lists beverages and the amount of sugar in each.
- Calculations
  - How much teaspoons of sugar are in the bottle?
  - 4 grams of sugar equals one teaspoon.
  - EXAMPLE: If you divide 68 grams by 4, you get about 17 teaspoons. Ask volunteer to count out 17 teaspoons onto the plate.
- Questions for facilitators:
  - Look around at the other tables? What do you see?
  - What does this make you think about sugary drinks?
  - Let me ask you a question…would you eat this much sugar?
  - What other drinks could you substitute for soda?

ACTIVITY #2: APPLESAUCE

- Presenters will assist with providing the families with a small cup of three different types of applesauce.
- The tray and cups will be labeled A, B, & C. Each person will select one cup and describe what they observe: see, and smell in their cups.
- Open ended questions
  - What do you notice in each cup?
  - Tell me what you see…smell
  - What other things do you observe?
  - What are some of the similarities/differences?
  - Why do you think it might be that makes these different from each other?
  - What else might be in there?
  - How is the texture same/different?
  - Which sample do you think you would like/dislike to eat? Why?
- Presenters will hand out the spoons and ask participants to taste the applesauce.

- Ask:
    - So which sample did you like/dislike the most? Why?
    - Can you guess what's inside the cup?
    - Can you guess which one is the most healthy for you
    - Why do you think so?
    - What would you need in order to know what's inside?
        - Right! The label!

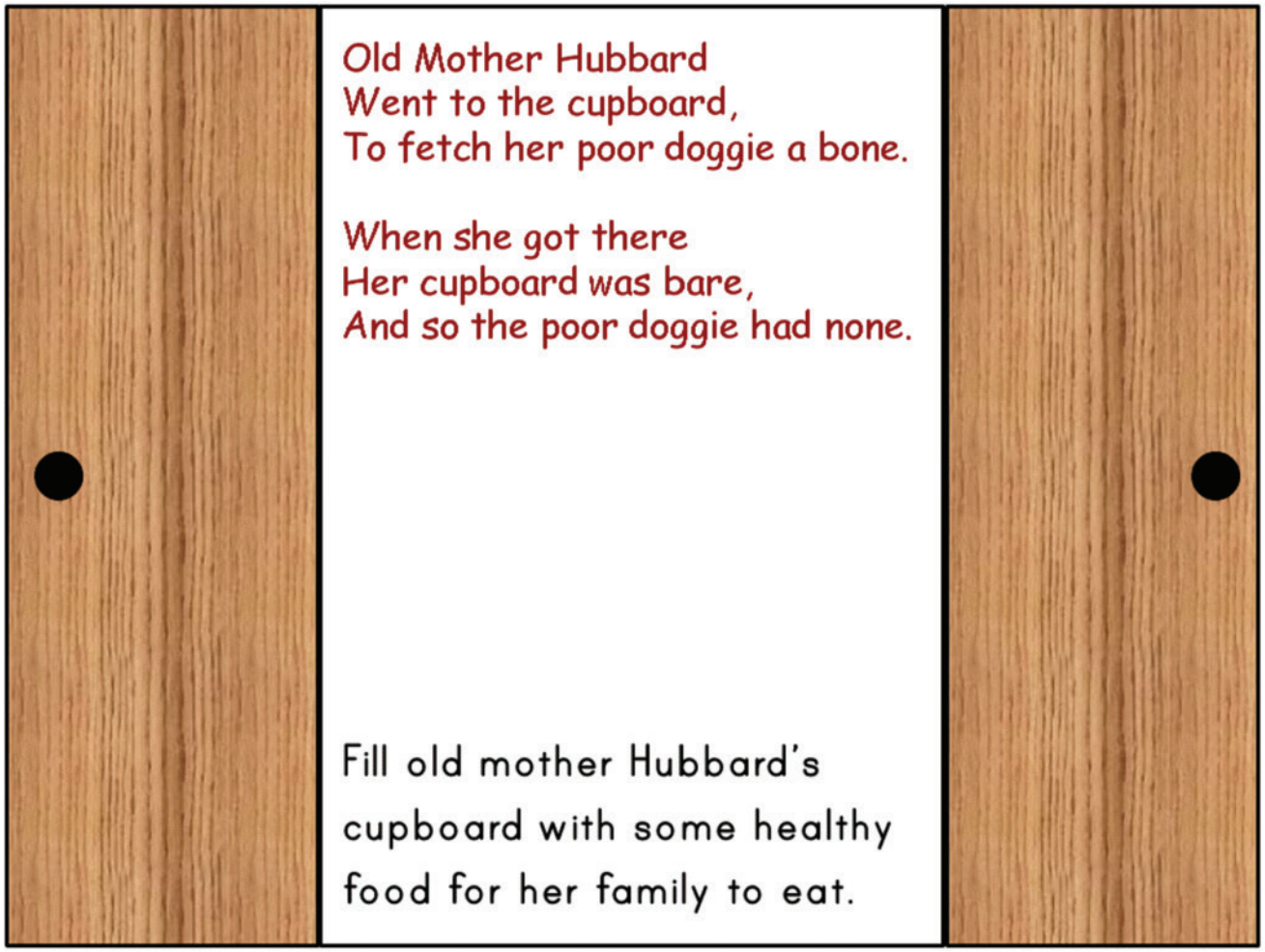
TAKE HOME ACTIVITY - OLD MOTHER HUBBARD'S CUPBOARD

Materials:

- Cupboard Printout
- Scissors
- Glue
- Newspaper (need the advertisements for the Grocery Stores)

Instructions:

- Print – out the template
    - Give to families as they leave the Workshop
- Cut along the outside of the large rectangle (cut out the entire cupboard in one go).
- Fold the cupboard so that the doors meet in the middle
- Cut out images of healthy foods and glue them into Mother Hubbard's Cupboard (the big part in the middle).


Old Mother Hubbard
Went to the cupboard,
To fetch her poor doggie a bone.
When she got there
Her cupboard was bare,
And so the poor doggie had none.
Fill old mother Hubbard's
cupboard with some healthy
food for her family to eat.

7

Sustainable Seafood

8

Workshop: Sustainable Seafood

Length: 45 minutes – 1hour

OBJECTIVES

1. Families will understand the importance of choosing sustainable seafood
2. Families will learn the difference between sustainable vs. unsustainable seafood

VOCABULARY TERMS

- Sustainable Seafood – seafood that is either caught or farm raised in ways that consider the long term vitality of harvested species and the well-being of the oceans.
- Farm Raised – animals are raised on a farm and are not caught in the wild.
- Wild – caught – animals are caught in the wild.

OUTLINE / SCRIPT

- Our oceans are increasingly affected by various human activities; one of these activities is how we catch and farm seafood. Today, fish and other wildlife populations in the ocean are being put at risk due to the fishing methods that we utilized. Nearly ~85% of the world's fisheries are fished to capacity or overfished (Monterey Bay Aquarium, 2012).
- Did you know that fish are running out? Fishing is an important global industry and the livelihoods of millions of people around the world depend upon this vital food resource. But there can be some negative impacts associated with fishing – especially how fishing affects the marine environment and the problem of overfishing.
- Around 25% of the world's fish stocks are overexploited or depleted.
- 200 million jobs depend on the fishing industry worldwide.
- A staggering 8% of everything caught in the oceans is wasted by being thrown back into the water, dead or dying.
    - Every year, this bycatch is over 7.3 million tons
- So how we as average citizens help? We can help protect these important resources by educating ourselves. What is sustainable seafood? Sustainable seafood can be defined as a fish and shellfish that are harvested in a manner that protects the target seafood but also its ecosystem. According to NOAA's National Marine Fisheries Service, "in 2010 Americans consumed 15.8 pounds of seafood per person". In essence everyone in America consumed some type of seafood within their daily consumption. However, as consumers we rarely understand the impact of what it takes to get seafood that we enjoy onto our dinner table.
- How can you HELP?
    - Actions you can take:
        - Conserving energy
        - Educating ourselves
        - using energy efficient appliances

- using public transportations,
- driving less,
- buy LOCALLY grown foods as much as possible

ACTIVITY #1: END OF SEAFOOD VIDEO

http://faircompanies.com/videos/view/the-end-fish-a-guide-to-help-turn-tide/

ACTIVITY #2: PLASTIC POLLUTION MATCHING GAME / FOOD WEB

Materials:

- Aluminum Can
- Cardboard Box
- Plastic Soda Bottle
- Paper

Instructions:

- Instructor will write the on the board – 200 to 500 years, 4 weeks, forever, and 2 to 5 months.
- Families will be given time to discuss how long they think it takes for each item to break down, decompose, naturally.
    - Aluminum Can – 200 to 500 years
    - Cardboard Box – 4 weeks
    - Plastic Soda Bottle – Forever
    - Paper – 2 to 5 months
- Through this activity, families can be asked questions on how they think all this trash is harmful to fish. They can also be asked what they think happens to an animal when they accidentally eat all this bad trash.
- From there, presenters can gather some volunteers to make a food web.
    - Individuals can represent certain groups of animal.
    - Through this activity, it can be shown what happens to one animal group when something goes missing.
        - Example: Have someone represent all the algae in the world. If all the algae goes missing, how does that affect the food web – certain fish won't have any food, therefore bigger fish won't have any food, and in the long run, there will be no more fish available for anyone – humans included.

TAKE HOME MESSAGE

1. Families will understand what the difference is between sustainable and unsustainable food.
2. Families will learn how their decisions, especially in regards to trash and recycling, can affect their food supply.

TAKE HOME ACTIVITY - SEAFOOD MARKET – FISH WATCH

http://www.fishwatch.gov/docs/FishWatch_postcard_2up_the%20one.pdf

Trash Trash Trash!

Why so much Trash?

Workshop: Trash Trash Trash! Why so much Trash?

Length: 45 minutes – 1hour

OBJECTIVES

1. Families will gain a better understanding of recycle, reduce, reuse.
2. Families will recognize their impact on their environment.
3. Families will learn how to be a part of the solution.
4. Families learn to repurpose (reuse) things/objects in our environment.

OUTLINE / SCRIPT

- Ask Families, "What are the 3 R's?"
    - They are reduce, reuse, and recycle
- Why the 3R's important?
    - There are many different answers.
        - We depend on the earth's resources
        - We can play a role in taking care of the Earth.
- How can you help eliminate the waste/trash problems? We are running out of landfill space and storm drains are clogging.
    - There will be many answers – feel free to write them all on the board
- RECYCLE
    - What does it mean to "recycle"?
        - Responses may vary
        - To recycle means to reuse something used before.
        - Recycling is the reprocessing of old materials into something new.
    - What things can you recycle?
        - Responses may vary
        - Some cool examples are:
            - Take your reusable shopping bag to the market when you shop.
            - Plastic bottles and jugs are recycled and made into carpets, pathway benches and fences.
            - Jewelry can be made from recycled plastic.
            - You can recycle glass by melting it down then, the making new glass products.
            - In South Africa plastic bags that we get from the market are been made into handbags. See pictures.

- Recycling companies convert the original item into something new and then sell the materials that it can used to produce into new items.
- Materials to be recycled are either brought to a collection center or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials bound for manufacturing.

    - What is happening in our cities today because we are recycling?
        - Responses may vary
        - There are more trees and parks.
        - In some places, you have to buy a shopping bag. This encourages people to reuse the bag.

- REUSE
    - What do you mean when you say reuse?
        - Take something to use over again.
    - What they know about reusing things?
        - Use the following questions as prompts:
            - What item do you reuse?
            - Did you ever go to a yard sale? What is a yard sale?
            - Did you ever donate your old toys or clothes to a charity?
            - Did you ever use an old glass jar to hold your pencils, pens or paintbrushes?
            - Did you ever use an old glass jar to drink from?
- REDUCING
    - How do we reduce waste? The term "reduce" clearly applies to lifestyle
        - Responses may vary.
        - Keep purchases to a minimum.
    - Lowering consumption is the key to the concept of reducing. {What is the meaning for consumption?}
    - Avoid making trash in the first place.
    - Reducing can apply to physical objects as well as natural resources, such as gas, electricity and water.
    - Not to be confused with reusing or recycling, reducing means lowering or get rid of something completely.
    - Cutting back on unnecessary purchases lowers the rate at which materials are used but also effectively lowers the energy, gas and transportation costs incurred when produced and sold.
- Other reducing ideas:
    - Write on both sides of paper.
    - Buy one big bottle instead of small ones.
    - Use a reusable lunch box or bag instead of paper.
    - Use dishes instead of paper plates.
    - Use a reusable mug instead of a paper or plastic cup.
- PUTTING IT ALL TOGETHER

- By combining reduce, reuse and recycle a complete circle is formed that can preserve natural resources; reduce waste, energy consumption and pollutants; and protect the planet.
    - Composting offers an example of all three resource conservation elements. With composting, natural materials are recycled into a form in which gardeners and landowners reuse. When composting, the need for artificial fertilizers is reduced.

ACTIVITY #1: TIME IT TAKES TO DECOMPOSE MATCHING GAME

Materials:

- Classroom Blackboard
- Fact sheets with decomposing info

Instructions:

- Write the name of all our "trash" items on the board and the times (they are going to be mixed up)– feel free to add more items to the list
    - Glass bottles 1 million years
    - Disposable diapers 450 years
    - Aluminum cans 80-200 years
    - Styrofoam cups 50 years
    - Plastic bags 10-20 years
    - Plywood 1-3 years
    - Milk carton 3 months
    - Newspaper 6 weeks
    - Paper towel 2-4 weeks
- Have the families discuss among themselves how long they think it takes for each item to decompose naturally.
- After thinking for a while, go around the room and ask them to match up the item with its decomposing time.

ACTIVITY #2: REUSING ITEMS

Materials:

- Gift wrapping paper
- Paper lunch bags
- A toy
- An empty peanut butter jar
- A plastic milk jug
- A detergent bottle
- An empty plastic soda bottle
- Margarine container

Instructions:

- Introduce all these materials to the families
- Ask them – How might these items be reused?
- Have them list some ideas and have a discussion about it.

ACTIVITY #3: DUCT TAPE LUNCH BAG

Materials:

- Piece of Cardboard (for the bottom of the bag)
- Duct tape (In any pattern – be creative!)
- Scissors
- Markers and other decorations

Instructions:

- Cover your piece of cardboard with the duct tape – this will be the bottom of the bag.
- Make a duct tape sheet long enough to become the sides of the tote.
- Connect the bottom of the sheet – lay the sheet horizontally. Place the bottom right below the sheet at the center. Connect the sides touching with duct tape.
- Connect the rest of the sheet to close the sides of the bag.
- Add the strap – Fold a long piece of duct tape in half lengthwise and connect the ends to the inside of the bag.
- Use sharpies and any other decorations you have to make your bag AMAZING!

TAKE HOME MESSAGE

1. Families are introduced to the concept of recycling and the 3 parts of it.
2. Families have ideas of how they can help the planet by recycling.
3. Families understand where their trash goes after they throw it away.

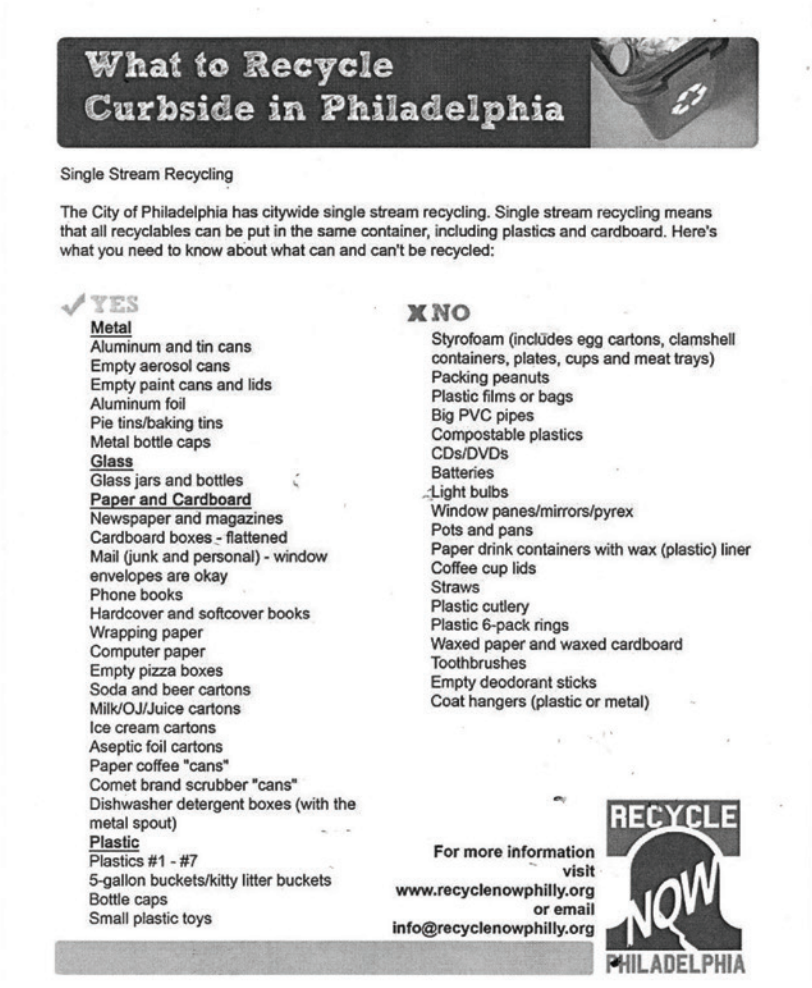
TAKE HOME ACTIVITY - RECYCLED PAPER BRACELET

Materials:

- Magazine
- Scissors
- Toothpicks
- Glue
- String
- Clear nail polish (optional)

Instructions:

- Rip out a page in the magazine
- Use scissors to cut the page into 1 – inch stripes
- Wrap one strip around a toothpick and glue the end down
- Once the glue dries, paint with clear nail polish. (optional)
- Once the glue dries, slide off the bead and place on a piece of string
- Continue until you have a bracelet and knot the end.



What to Recycle Curbside in Philadelphia

Single Stream Recycling

The City of Philadelphia has citywide single stream recycling. Single stream recycling means that all recyclables can be put in the same container, including plastics and cardboard. Here's what you need to know about what can and can't be recycled:

✓ YES

Metal
Aluminum and tin cans
Empty aerosol cans
Empty paint cans and lids
Aluminum foil
Pie tins/baking tins
Metal bottle caps

Glass
Glass jars and bottles

Paper and Cardboard
Newspaper and magazines
Cardboard boxes - flattened
Mail (junk and personal) - window envelopes are okay
Phone books
Hardcover and softcover books
Wrapping paper
Computer paper
Empty pizza boxes
Soda and beer cartons
Milk/OJ/Juice cartons
Ice cream cartons
Aseptic foil cartons
Paper coffee "cans"
Comet brand scrubber "cans"
Dishwasher detergent boxes (with the metal spout)

Plastic
Plastics #1 - #7
5-gallon buckets/kitty litter buckets
Bottle caps
Small plastic toys

X NO

Styrofoam (includes egg cartons, clamshell containers, plates, cups and meat trays)
Packing peanuts
Plastic films or bags
Big PVC pipes
Compostable plastics
CDs/DVDs
Batteries
Light bulbs
Window panes/mirrors/pyrex
Pots and pans
Paper drink containers with wax (plastic) liner
Coffee cup lids
Straws
Plastic cutlery
Plastic 6-pack rings
Waxed paper and waxed cardboard
Toothbrushes
Empty deodorant sticks
Coat hangers (plastic or metal)

For more information visit www.recyclenowphilly.org or email info@recyclenowphilly.org

RECYCLE NOW PHILADELPHIA

APPENDIX C

ASSESSMENT EXAMPLES

CLUES
COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE

June 2013 Apprentice Assessment

Name: _____

What is your first topic?

My first topic will be on habitats and culture of various immigrant communities that my CBO serve. The immigrant communities includes Africans, Cambodians, Vietnamese, and Hispanics.

What topics are you considering for your second and third workshop topics?

The second and third workshop topics will concentrate on animals that are native to the immigrant communities of my CBO.

What was your favorite section of the Philadelphia Free Library tour?

My favorite section would have to be the Children's section because it offer varieties of books in other languages that target different cultures. It will be a great resource to utilize as my CBO comprise of various ethnic groups.

Name one book that will help you with your first topic?

Rank the following websites in order of reliability for accurate information, with 1 most reliable and 5 least reliable.

2 _____ www.fi.edu

3 _____ www.nrdc.org

1 _____ www.fws.gov

5 _____ http://en.wikipedia.org

4 _____ www.earthsendangered.com

List 2 websites you have bookmarked to help you with your first topic.

List 3 benefits to having a “green roof”.
-reduced the amount of energy that are used
-help enhanced storm water management and water quality
-enhance quality of life

What is a watershed?
A watershed is an area of land where rainwater or snow drains into a body of water (i.e. rivers, lakes, creeks, marsh, or ocean).

Name one new thing you learned about watersheds.
If your water shed is polluted, the water downstream will be polluted also; so it is vital that we protect our watersheds. I also learn that drinking tap water is not "hazardous" for your health.

What is your watershed? Schuylkill River (part of Delaware River basin)

What is the watershed of your CBO? Tacony & Frankword Creeks Watersheds

Try http://www.phillywatersheds.org/what_were_doing/maps/pwd-water-systems-map

Or http://cfpub.epa.gov/surf/county.cfm?fips_code=34007

How can you connect your watershed and the affect you have on your watershed to your first topic?

A watershed is critical to every habitat. If we pollute our habitat this will cause massive pollution to our watersheds thus causing an imbalance within that ecological system of that particular habitat. Many of the immigrant communities that my CBO serve will understand the importance of having a balance ecological system as they come from countries that are seeing tremendous ecological system destruction.

CLUES
COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE

July 2013 Apprentice Assessment

Name:

We had 5 trips this month. Name your favorite thing about each and say why.

1. Project WILD / WILD Aquatic Training
   -I like the nature observation workshop where we went outside and made several observations and documented it. The workshop was simple and easy to put together; this particular workshop can be utilized for my families at the CBO.

2. EcoComplex
   -The greenhouse was my favorite part of the tour. It highlights the idea of hydroponic which is an easy alternative to growing vegetables and plants without using dirt. This technique can be easily transferred to my workshops for my families to use.

3. Bartram 's Garden
   -The community garden would have to be my favorite one because it is something that I will be utilizing with my families in the spring. I am currently working with the CBO to build a community garden for the surrounding community.

4. Belmont Water Treatment Plant
   -My favorite part would have to be the pumping station; the station does a tremendous amount of work to pump water from the river. Before the tour I did not know where Philadelphia gets their water from so this was definitely informative.

5. Southeast Sewage Treatment Plant

-The entire tour was my favorite because it highlights the hard work of cleaning our waste so that it can be safely returned back to the river and starts the cycle again. It is a job that often does not get the credit that it deserved; so I commend the water department for the tremendous work that they do.

What new thing did your learn that might be useful for your workshop? I learn several things that can be useful for my workshop but one thing that I firmly believe should be highlighted in my workshop is our drinking water. I want to do a workshop incorporating drinking water for the family to see where their water comes from and the tremendous tasks it takes to keep it clean.

September Assessment

1. Name one thing that is causing global warming.

My first topic will be on habitats and culture of various immigrant communities that my CBO serve. The immigrant communities includes Africans, Cambodians, Vietnamese, and Hispanics.

2. Name two things you and your families can do in your everyday life that might help slow down global warming.

The second and third workshop topics will concentrate on animals that are native to the immigrant communities of my CBO.

3. At the Wild Outdoor Expo, name one activity you participated in

My favorite section would have to be the Children's section because it offer varieties of books in other languages that target different cultures. It will be a great resource to utilize as my CBO comprise of various ethnic groups.

and two new things you learned.

4. What two new things did you learn about autism at the workshop on September 16?

5. Name 2 things that might be an issue for people on the autism spectrum, especially at a museum/aquarium/zoo and your workshop.

-reduced the amount of energy that are used
-help enhanced storm water management and water quality
-enhance quality of life

6. If you attended the program on how air pollution is affecting children - name one thing that could result from air pollution.

-reduced the amount of energy that are used
-help enhanced storm water management and water quality
-enhance quality of life

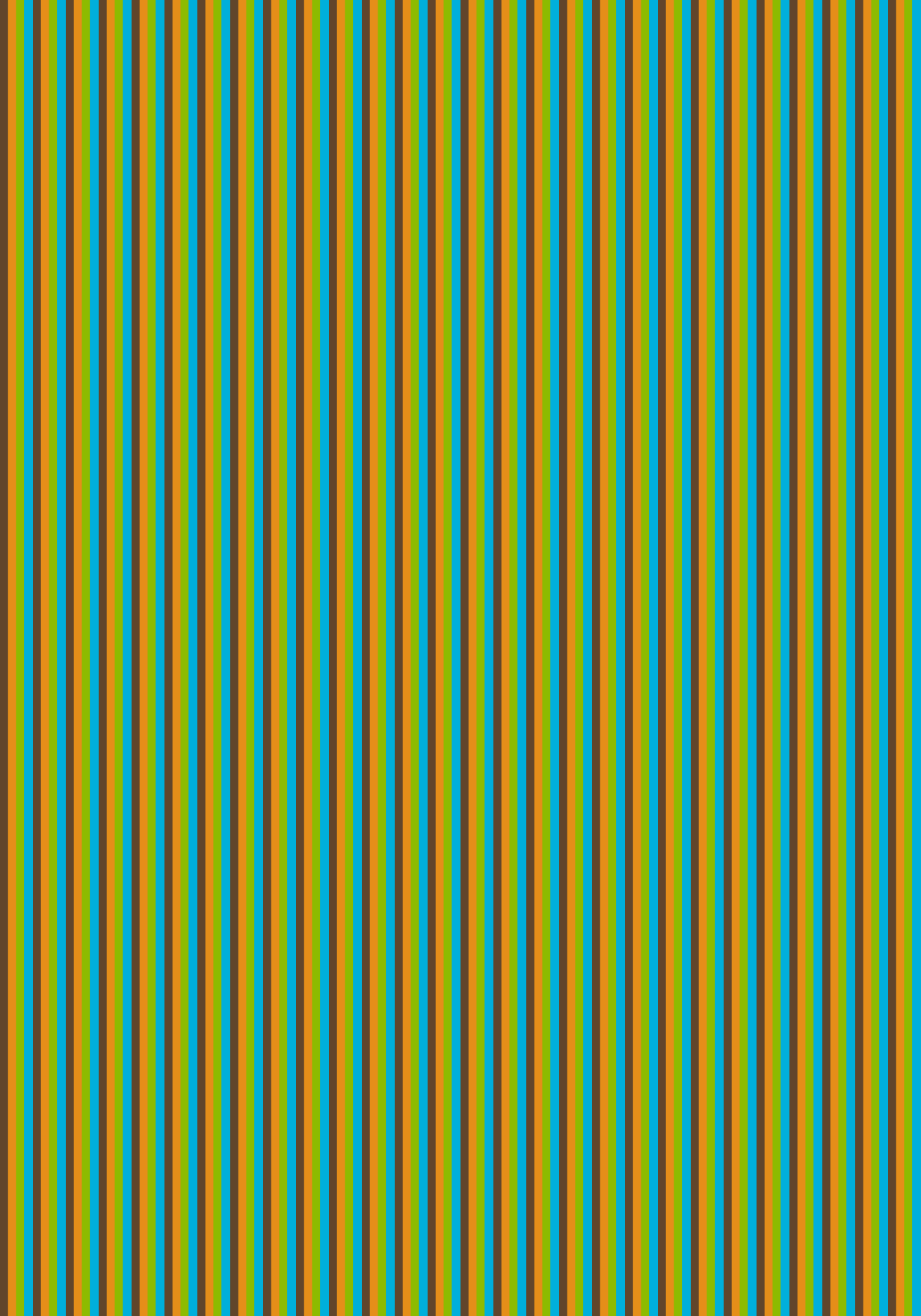
Also name two things in the air (one each- indoors or outdoors) that can affect our health.

A watershed is an area of land where rainwater or snow drains into a body of water (i.e. rivers, lakes, creeks, marsh, or ocean).

7. If you have delivered your first workshop, name 2 things that you feel worked really well. Also name one thing that could have gone better and what you can do to change it.

If your water shed is polluted, the water downstream will be polluted also; so it is vital that we protect our watersheds. I also learn that drinking tap water is not "hazardous" for your health.


EXIT



CLUES

COMMUNITIES OF LEARNING FOR URBAN ENVIRONMENTS & SCIENCE