SCIENCES Evaluation Summary Report

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Component: Summative Evaluation Report
Dates included: 8/2013-8/2018

Introduction: Evaluation Questions + Expectations[1]

SCIENCES—Supporting a Community's Informal Education Needs: Confidence and Empowerment in STEM was a Full Scale Development Project with Research with the goal of creating a "STEM ecosystem" in a severely under-resourced urban community. The Chicago Zoological Society, which operates Brookfield Zoo, expanded a community partnership with Eden Place Nature Center in Chicago's Fuller Park Neighborhood and offered a full suite of environmental science learning opportunities and programming for educators, youth, families, and adults. Complementary elements in Brookfield Zoo and Eden Place program portfolios were selected to increase the engagement of this community in environmental science. Education programs were woven into an "ecosystemic" learning model, providing the community with learning resources aligned across targeted sub-audiences (early childhood through adult) and settings (in-school and out-of-school). The project goals were to:

(1) support the environmental science literacy of the Fuller Park Community, and thus capacity to engage in lifelong, life-wide, and life-deep scientific learning,
(2) broaden access to and participation in environmental science learning opportunities,
(3) strengthen existing partnerships between and among Chicago Zoological Society, Eden Place Nature Center, and University of Illinois at Chicago in support of sustainable capacity to support environmental science literacy within the Fuller Park community, and
(4) gain insights into the ways in which the ecosystemic learning model supporting scientific literacy and agency within the community may be transferable to other informal science learning / urban community partnerships.

The project offered programs for professional, student, and public audiences[2] of all ages. Programs focused on several environmental themes, including Pollinators and Native Gardens, Fuller Park Water – A shared resource for healthy people, plants, and animals, and Nutrition and Sustainability. For descriptions of program offerings, please see Appendix A.

After an RFP process, ExposeYourMuseum LLC (principal Kate Livingston, née Tinworth) was selected as the SCIENCES external evaluator. Five overarching questions guided the evaluation for this project: 1) Are the project processes and products—including implemented science learning programs and the program of research—high quality, aligned with goals, and appropriate to meet stakeholder needs?; 2) Has the project broadened access to and participation in environmental science learning opportunities?; 3) Has the project improved the community's environmental science literacy (including cognitive, affective, and behavioral/skill building learning outcomes)?; 4) What is the capacity for partnership sustainability among CZS and the Fuller Park community?; and 5) What factors have impeded or facilitated progress?

[1] Section developed in coordination with the SCIENCES core team; special thanks to Lisa-Anne DeGregoria Kelly, Ph.D., Senior Manager of Education Strategies and Research.
[2] For professional audiences, SCIENCES offered educator professional development; attendance at 10 programs was approximately 160 people. Student audiences were offered school group classes, field trips, science fair, and King Conservation Science Scholars teen volunteer program; within the 30 offered programs for this audience, attendance was approximately 950 people. Public audience programming included family programs, camp, youth programs, workshops, festivals, and conservation action events; attendance at 48 these programs was approximately 2,700. All estimated attendance counts include repeat participants.

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Front-end evaluation (August 2013 – April 2014). The front-end evaluation set a foundation for the project by engaging Fuller Park community members in a participatory dialog about their unique needs related to science literacy and education. The principal evaluator worked with project staff and the advisory board to identify key stakeholders in the community with whom she conducted a series of individual interviews and semi-structured focus groups. Interviews and focus groups provided information about the community's perspective on science and environmental education, interest in subjects to inform the themes for programming, and feasibility of implementing programs offered by CZS and Eden Place. Qualitative data from the interviews and focus groups also were used to develop a survey, available on paper and online, which further explored local resources, broader community needs, and issues such as access, interest, and motivation.

Formative evaluation (May 2014 – July 2017). The formative evaluation focused on measurement in three areas: 1) development and implementation of SCIENCES education programs, 2) interaction between education programming and research activities, and 3) sustainability of ongoing processes and partner relationships. During the development of each education program component, the evaluator worked with program staff to conduct cycles of pilot testing and prototyping. This included program observation, participant surveys, and interviews to assess the structure, function, implementation, and participant reaction to the various educational components and selected themes. To monitor the research activities, the evaluator interviewed program staff and assessed the quality of research design, development, and implementation, as well as the interaction between research activities and educational programming

Summative evaluation (August 2017 – July 2018). The summative evaluation documents and articulates what SCIENCES has improved or changed, and in what ways. The final design of the summative evaluation was based on findings from the front-end and formative evaluations, including using participatory evaluation techniques[3] to engage community members in discussing their experience with the programs and assessment of community needs and assets at the close of the project.

The goal of the summative evaluation was to address discrete program impacts in the context of the project, as well as the cross-program impact of providing a thematically aligned suite of programs within the community. The evaluator assessed whether the individual programs and the project as whole had an impact on cognitive outcomes (such as understanding, interest, and motivation related to environmental science and conservation), affective outcomes (such as attitudes toward environmental science, identity as someone who can and will use science, and concern about environmental issues), and behavioral outcomes (such as confidence, intent, and ability to use science skills in their daily lives). Using a Logic Model process, the CZS SCIENCES project team identified inputs, activities, outputs, short-term outcomes, and long-term goals for the program. This variety of learning outcomes across cognitive, affective, and skill building domains align with the CZS Learning Strategy and the Six Strands of Informal Science Learning as articulated in an NRC report (2009). Intended participant and community outcomes were as follows:

Short-term outcomes:

- Learning resource participants (individually, in small groups, and community-wide) demonstrate increases in science knowledge, interest, and identity as science literate citizens.

[3] Participatory evaluation techniques included having Community Ambassadors (Community Ambassadors, independent contractors with Fuller Park community connections, were a part of the evaluation team) act as participant observers and survey distributors, using prompt cards with youth during programs to facilitate short (>3minute) interviews, discussion-driven focus groups, and short, conversational phone interviews. Artifacts (e.g., youth participant journals) and photographs from the program were also collected as a data source.

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- Learning resource participants demonstrate increased knowledge about and interest in available science programs, as well as identity as persons whom find these programs relevant.

Long-term outcomes:

- Improve the environmental science literacy (knowledge, interest, identity) of the Fuller Park Community, and thus capacity to engage in lifelong, life-wide, and life-deep scientific learning.
- Broaden access to and participation in environmental science learning opportunities.

Methodologies were designed to match evaluation goals and, where possible, existing CZS program evaluation instruments were adapted to evaluate program impacts in the context of this project. A full description of these methodologies and is provided in Appendix B (Note: 42 programs or events related to the project were not evaluated or did not result in any collected data and are therefore not included here; 80 distinct events or programs had a form of data collection occur).

Front-End Evaluation Findings + Early Lessons Learned

Front-end evaluation indicated that Eden Place and Brookfield Zoo already had good reputations among community members, prior to the start of the SCIENCES project and associated education programs. Interview participants loved, liked, and respected both partner organizations. Those who were recruited were familiar with Eden Place and considered it important that the Nature Center was located within the community and felt welcoming and familial. Some indicated that Eden Place was constantly improving and even proof of what is possible within a blighted neighborhood. Eden Place was perceived as a gateway to nature, conservation, and learning about the environment, as well as an uncommon sight. A few participants felt that the Nature Center was underutilized, or that residents were unaware of its offerings.

Interviews honed in on the strengths of the Fuller Park neighborhood and the surrounding neighborhoods and communities. Interviewees described generations of residents and families who remained in the area. They also talked about science education having some traction within Eden Place and Hendricks Elementary School (a Chicago Public School adjacent Eden Place), as well as opportunities to develop professional skills for formal educators teaching science. Elders in the community were described as active, invested, and taking pride in their neighborhood.

Identified challenges of the neighborhood included abandoned homes, lost resources (e.g., shops), and isolated residents who neither leave the neighborhood nor see frequent visitors. Poverty and low educational attainment were noted issues, as were the lack of programs available locally for youth, teens, and families in the neighborhood. Youth—in particular young Black men—were considered a “lost generation”; their community had low expectations for them to escape the cycles of poverty and crime. Few opportunities for jobs and nearby employment were seen as additional difficulties, tied to the impoverished state of Fuller Park. Finally, those caring for children in the community were frequently parents and grandparents raising youth alone, without the support of another adult in the home. Those interviewed suggested parent and caregiver involvement in any sort of programming may be a challenge, as programs and events often were a lower priority more immediate and pressing needs (e.g., employment, school, food, etc.).

Despite these pervasive difficulties, interviews identified opportunities and key considerations for the upcoming SCIENCES project. Interviewees discussed the need for a safe, social environment which recognized participants are smart and capable. Community members of all ages—from small children to elders—were viewed as important audiences to include in programming, and Fuller Park and nearby churches were seen as strong existing assets in the neighborhood. Previous programmatic, research, and evaluation efforts have occurred in Fuller Park without

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clarity of goals, input from community members, follow-up, or sustainability planning, leaving residents skeptical of the long-term investment outsiders will commit to Fuller Park.

Front-end evaluation also revealed early potential challenges in reaching participants, whether for evaluation or program participation. Recruitment from a trusted local resource (in this case, Eden Place staff and the founding family) was vital, and word of mouth was a more effective route of communication than phone or email. Online surveys were unsuccessful. One-on-one conversations were lucrative. Flexibility with participants' schedules, weather, and organizational structures proved important as well. Those who participated were open and generous with sharing their insights.

Early Formative Evaluation Findings

Once programs were underway, formative evaluation was used to assess early iterations of programming and inform ongoing adjustments. Early formative evaluation covered programs hosted between August, 2014 through January 2015. Programs evaluated included school and teacher programs (i.e., Science Fair Prep, Connections Classes, Zoo Talks), early childhood professional development for early childhood education educators (i.e., NatureStart: Fuller Park Area Educators, NatureStart: Center for New Horizons), community-based programs (i.e., Community Action Days: Wetlands Restoration, Children's Garden, and Pumpkin Festival; Zoo Adventure Passport! (ZAP!)).

Across these programs, evaluation focused on practical insights, observed successes, and challenges. For school and teacher programs, successes included engaged participants, fears challenged and overcome (e.g., nervousness about touching a turtle, wariness of bats), and observed grasp of content (e.g., understanding/ using inquiry, content about bats worked well for younger students, teachers actively shared classroom experiences when participating in interactive science activity). Common difficulties included logistical issues, for example a hot, dimly-lit room or students being distracted by other animals at the Zoo on the way to the enclosure included in the program.

Early childhood professional development for educators resulted in moderate to high increases in understanding and confidence with science and nature play. Although the two programs were not consistent on incoming experience, 1 in 4 had previous nature play training in the Fuller Park Area Educators program and half (n=9/17) had prior training at the Center for New Horizons program. Confidence increased the most in "engaging young children as scientists," while understanding increased the most in "how young children learn through exploration of the natural world." Most educators came to the training with the hopes of getting ideas for science activities in the classroom, and almost all participants heard about the training from their principal or director. In both programs, attendees reported low current use of or visits to Eden Place Nature Center.

Community-based programs, particularly Community Action Days, resulted in positive emotional responses and a feeling of connection with fellow community members. Events like these helped attendees meet new people, feel welcomed and inspired, believe they were learning new things and having fun, and were good for families. Although most participants indicated feeling safe and smart, less felt challenged by the event they attended. Several felt more comfortable with science or more connected to the environment, and all participants indicated they would like to attend more things like the event they attended.

Zoo Adventure Passport! (ZAP!), another community program focused on families, elicited similar results. ZAP! event surveys indicated many adults believed the events were welcoming, were good for families, a good way to connect with the community, and nearly all agreed they were having fun, learning new things, meeting new people, and would like to do more things like the events. There was some discrepancy between events; at the *Bats, Bees, Birds, and Butterflies* event at Eden Place, attendees felt proud of what they were doing that day, felt safe, smart, and more comfortable with science and more connected with the environment, whereas these sentiments had less prevalence at the *Pollination Party* at Fuller Park. At ZAP! events, youth appeared engaged and interested, and some appeared

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excited to have the opportunity to take home a product of something they worked on, such as pumpkins. Challenges observed included issues with indoor facilities (e.g., small space with poor lighting, out-of-order restroom, confusing check-in location) and at times, with the activities. At some ZAP! events, youth seemed restless and distracted, and adults were involved as observers rather than as participants. A few activities were not clear (e.g., butterfly activity to explain pollination, matching photos with pollinators). ZAP! also was intended as a series of three sessions, however only around 1/3 of children attended all three offered sessions (n=12/32). Others attended one or two sessions.

Within formative evaluation, assessment of approach was also considered. Although participant response to quantitative measures were high overall, to better ascertain programmatic change and growth additional qualitative insights were requested by the SCIENCES project team. Subsequent evaluation, although still mixed-methods, incorporated more interview, focus group, and observational data to maximize effectiveness of these inquiries.

Overall, findings of the formative evaluation identified several strengths, minor adjustments, and challenges to work through during the project. Feedback from participants highlighted key strengths; SCIENCES programming was perceived as welcoming, good for families and for connecting with community, and helped participants to feel safe and smart. Likewise, participants demonstrated progress toward key program outcomes. Minor adjustments underscored a need to alleviate participant transportation barriers (since many participants were coming from outside of Fuller Park) and to tailor evaluation instruments to provide optimum insights. Formative evaluation clarified a need to alter scale data on evaluations; with routinely positive responses, it was difficult to ascertain where programmatic change was most needed. Evaluation instruments were adjusted to better decipher these needs. Finally, an ongoing challenge faced by SCIENCES programming would be the formative interviewee perception that Eden Place Nature Center is an underutilized resource, and that the surrounding Fuller Park neighborhood might not be aware of the opportunities it afforded.

Assessing Outcomes

As SCIENCES programming continued, participants across programming and content themes were observed, surveyed, and interviewed to determine the extent to which outcomes were achieved. For participants, these goals were defined as such:

Short-term outcomes:

- Learning resource participants (individually, in small groups, and community-wide) demonstrate increases in science knowledge, interest, and identity as science literate citizens.
- Learning resource participants demonstrate increased knowledge about and interest in available science programs, as well as identity as persons whom find these programs relevant.

Long-term outcomes:

- Improve the environmental science literacy (knowledge, interest, identity) of the Fuller Park Community, and thus capacity to engage in lifelong, life-wide, and life-deep scientific learning.
- Broaden access to and participation in environmental science learning opportunities.

With attention to these intended participant outcomes, data collected across programming years was synthesized and compared against these driving goals.

Short-Term Outcomes

Learning resource participants (individually, in small groups, and community-wide) demonstrate increases in science knowledge, interest, and identity as science literate citizens.

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Key themes and evidence of each segment of this short-term outcome are as follows:

Science Content Knowledge:

SCIENCES programming addressed several different topics depending on program type and programming year. In 2015, programs centered around pollinators and in 2016, content was focused on water. In the final programming year (2017), SCIENCES programs addressed nutrition and sustainability as the overarching topic. In programs where they were asked, both youth and adult participants were **able to determine the program topic and its main messages**. During the 2015 Camp, adult caregivers thought the main message or theme of the camp was **about nature and the outdoors**. One recalled, "They did a lot on butterflies, and then they did rocks." Another thought the camp was about "learning about planting flowers and the importance of taking care of the environment." Likewise, youth participants in 2017 Explorers were aware of the **food theme** of the year, relaying that the "main topic is to learn about nature and how to be more healthy" and "Nutrients. It's all about being healthy and what you're supposed to eat, and what you're supposed to and not supposed to eat because you can get really sick."

Content learning was also assessed and observed. In 2015, Explorers self-reported a high level of learning: *The activities helped me understand the topics.* (Avg[4]. 4.67); *The instructor helped answer my questions.* (Avg. 4.50); *I learned something new.* (Avg. 4.50). Likewise, teachers at school programs in 2015 reported: *The program helped the students better understand the topic.* (Avg[5]. 6.58); *The students now have a greater appreciation of nature and animals.* (Avg. 6.37); and *The students now have an expanded interest in the topic.* (Avg. 6.26).

Participants learned new information that was broad-ranging and connected to the program's theme. New information included: personal responsibility in water pollution; importance of water for health; water-borne diseases and conditions; ways to make a water filter; difference between biodegradable and non-biodegradable items; animals, insects, and plants native to wetlands; importance of pollinators like bees, bats, and butterflies; honey flavors and its antioxidant properties; nutrition and healthy eating; vitamins, minerals and their positive impact on health; which food plants can be grown at home and garden care; and how plants and food grows; exposure to new plants. Select examples of these learning experiences are as follows:

- For a water pollution demonstration, 2016 campers filled containers with a variety of materials (e.g., milk, grass, dirt) which represented various roles or entities in society (e.g., farmer, boater, fisherman, villager, factory, or ship). The facilitator related these roles or entities to water pollution, asking, "Whose fault is it that water is so dirty? Everything that goes in the water affects us." Then each child emptied the contents of their small containers into one large bucket of water. As children watched the clear water turn murky, they remarked, "Look at all that pollution," and "Eww!" The facilitator concluded the exercise asking, "Who dirtied the water and what did you learn?" Responses included: "Everybody!" "It's not good to dirty the water. Humans need to stop," "When you dirty the water, it makes animals sick," "Even little stuff dirties the water," "Everything dirties the water" and "Put trash in the trash can." The facilitator concluded, "When water is this dirty, we can't drink or bathe in it…Your mess becomes everyone's mess; everybody is responsible."
- "I like that we got to learn about vitamins and minerals and how they affect your body. How they can keep you from being sick and what illnesses they treat."- 2017 Explorer Youth
- Following 2017 Explorers, nearly all youth realized something new during the program. In short interviews at the end of the program, youth completed the sentence, *"Before Explorers, I never realized…"*:
    - "I never realized that all of the stuff we're eating has a lot of bad stuff in it."

[4] Each statement was rated on a five-point scale, with 1 meaning *not at all*, 2 meaning *slightly*, 3 meaning *moderately*, 4 meaning *very*, and 5 meaning *extremely*.

[5] Statements were rated on a seven-point scale, where *not at all* was designated with a score of 1, *somewhat* was 4, and *very much so* was 7.

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- "I never realized that they put sugar in almost everything people get."
- "How much sugar was in pop."
- "How much fat was in chips."
- "I never realized you needed vitamins. Lots of them, not like, only take one."
- "That vitamins and minerals could treat illnesses."
- "I never realized all the things that help you get well. I used to think only medicine helped! Only medicine helped your broken bones, but it's food!" Another youth agreed: "Exactly!"
- "What it'd be like to have a giant garden and have all this good nutrients here. I would know what rainbow foods helps with which illness."
- "That... there were a lot of plants that they showed me down there that I didn't realize there were. [Interviewer: Oh, there were plants you didn't know existed before this. What is one you saw the first time?] Stevia."

Further evidence of science content learning was present in journals written by Explorers in 2016. As part of the Chicago Zoological Society internal evaluation strategy, journals were analyzed under the National Research Council's (NRC) Informal Science Education Learning Strands[6] and these analyses, along with raw data, was provided to ExposeYourMuseum for incorporation within overarching SCIENCES evaluation. Almost all 2016 Explorers journals contained entries which could be categorized under Informal Science Education Learning Strand 2 and Strand 3 (89% each; n=7/9):

Strand 2: Come to generate, understand, remember, and use concepts, explanations, arguments, models, and facts related to science.

- "Yesterday we learned about how to save our water because there is only 7% of our water we are able to drink."
- "Water helps you use the bathroom and makes you smarter. Water helps your eyes."
- "Today I learned about what are the effects of water born [sic.] diseases like E. coli gastroenteritis and lead poisoning. Hepatitis A virus, Legionnaire's disease, Salmonella, and Typhoid's fever are also water-born [sic.] disease."
- "I did today was learn about cryptosporidiosis, E.coli gastroenteritis. Lead poisoning: lead-base paint and its dust, usually found in older buildings, are common sources of exposure. Young children are especially at risk."

Strand 3: Manipulate, test, explore, predict, question, observe, and make sense of the natural and physical world.

- "Today I did the water taste test some of the water taste terrible but some taste pretty good."
- "[I watched a video about] how it's importatn [sic.] to help the Earth before the Earth dies and we all be covered in trash so that is why we have to take care of it."
- "Today I learned how to make a filter. Mine didn't turn out to good. We used coffee filters, charcoal, grass, rock, and sand."
- "I am so happy because today I learned about PH in water My water was light blue. I also learned how to mak [sic.] a water filter. I was so confinted [sic.] that my filter was going to work. But come to find out my water was clear a little bit. I also go to draw my water filter. (Had fun today at camp)."
- "We learned how to create a water filtration system. My water was murky be was be able to be drunk."

[6] Bell P, Lewenstein B, Shouse A, Feder M (2009) Learning science in informal environments: People, places, and pursuits. Washington: National Academies Press. 352 p.

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In addition to learning science content directly from programs, educators who attended Teacher Professional Development sessions and Early Childhood Education offerings like NatureStart learned science content as well as instructional methods. Overall, educators appeared to make greatest gains in their confidence in teaching using informal science methods or discovery-based learning. At school programs in 2015, teachers (n=10) rated *I learned something today that I can use in my classroom* (6.8 rating average on a 7-point scale). The following tables break out the ratings educators gave to teaching and instructional methods as a result of SCIENCES programs:

NatureStart Early Childhood Education 2015 **Participants increased understanding in:**	**Average[7]**
How young children learn through exploration of the natural world.	4.71
The ways direct experiences contribute to learning about the natural world.	4.57
The ways young children link language and experiences.	4.57
The benefits of combining positive play experiences with nature.	4.57
How children's play behavior differs between natural play spaces and traditional playgrounds.	4.57
How life experiences inspire people to care about nature.	4.43
How young children can learn about nature through integrating literacy, art, science, and inquiry activities.	4.43
The elements that make a natural play space engaging.	4.29
The ways developmental stages influence how children learn.	3.86

Teacher Professional Development Workshop participants in 2015 were asked to indicate their level of agreement or disagreement with a series of statements by providing a rating on a scale of 0 to 4 (with 0 as "I completely disagree with this statement and 4 as "I completely agree with this statement"). As a way to assess change, participants rated each statement twice, once with how they felt before the workshop and again with how they felt after the workshop. The below tables are sorted with highest "after" averages at the top to lowest "after" averages at the bottom for each category. All statements reflected positive change from before to after; those with greatest change are shaded.

2015 Teacher Professional Development Workshop **Instructional Strategies**	**Average Before**	**Average After**	**Change**
Students learn best in science when they are allowed to explore real life problems and solutions	3.95	4.00	0.05
Helping students understand the scientific process will strengthen students' science ability.	3.86	3.95	0.10
Science activities should foster a connection between understanding and application.	3.86	3.95	0.10
Teachers should provide students with the opportunity to develop and build upon their own understanding of science concepts.	3.71	3.81	0.10
It is essential that students at all grade levels know and understand good scientific methodology.	3.48	3.71	0.24

[7] Each statement was rated on a five-point scale, with 1 meaning *not at all*, 2 meaning *slightly*, 3 meaning *moderately*, 4 meaning *very*, and 5 meaning *extremely*. Average ratings are sorted from highest to lowest scores.

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2015 Teacher Professional Development Workshop **Understanding and Confidence in Teaching Science**	Average Before	Average After	Change
I am confident in my understanding of inquiry.	3.19	3.52	0.33
I am confident in my ability to teach scientific concepts at my grade level.	2.95	3.43	0.48
I am confident in my understanding of science concepts.	2.86	3.38	0.52
I am confident in my ability to teach hands-on science.	2.90	3.35	0.45
I am confident when conducting inquiry-based science lessons in my classroom.	2.90	3.33	0.43
I am confident in my ability to assist students throughout the Science Fair process.	2.89	3.22	0.33

2015 Teacher Professional Development Workshop **Inquiry-Based Science**	Average Before	Average After	Change
A student's scientific ability is strengthened by developing inquiry skills.	3.76	3.90	0.14
Inquiry-based science lessons are important.	3.76	3.90	0.14
Science is practiced through active engagement and inquiry.	3.76	3.90	0.14
Inquiry can help students solve problems in science.	3.75	3.85	0.10
Students can use inquiry to help them make informed decisions.	3.62	3.81	0.19

Science Interest

Another aspect of science learning was developing and sustaining interest in science. For SCIENCES participants, this was manifested as curiosity, engagement or excitement during the program, and a desire to have continued involvement or exposure to science topics. Observations by Community Ambassador data collectors[8] provided examples of these core indicators of science interest, and are included as follows:

Curiosity

- Participants at 2016 Explorers programs were curious about connections to their daily lives. While matching symptoms to diseases, one participant asked, “E. coli were found at the Chipotle restaurant?” and another responded, “Yes, it was on the news.” One Explorer discovered, “Lead poison can lead to brain damage,” while another wondered, “All of these diseases can be in water?” and a peer chimed in, “Yes, look at Flint Michigan.” Explorers were invested in the activity; one exclaimed, “You cannot get rid of Lead Poison!” and another summarized, “All citizens deserve to have clean water and be healthy.”
- When learning about the amount of water involved in daily activities, one Explorer (2016 participant) wanted to know, “Why do you need water to build a car?” Another was concerned about the amount of water needed for keeping a lawn healthy, and wondered, “When is the best time to water grass?”
- Campers in 2016 listened to a facilitator describe what fishing in Africa was like. She explained to the group that the water was very cold. One male camper wanted to know, “What is hypothermia?” Later, another camper wondered whether there were animals in Africa, and the facilitator answered, “Yes, hippopotamus and elephants.”

[8] Community Ambassadors, independent contractors with Fuller Park community connections, were a part of the evaluation team.

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- During lunch at 2016 camp, a female camper asked, "Why is the mango good for you? Because I really like eating mango." Another female camper said, "She is going to ask her grandmother to buy her some mangos."
- After learning about honey bees at 2016 camp, a male camper was curious, "Is it true a bee will sting you and then die?" and the presenter confirmed, "That is true."

Engagement or Excitement

- In 2016, two Explorers participant journals (22%; n=2/9) showed evidence of NRC Informal Science Education Learning *Strand 1: Experience excitement, interest, and motivation to learn about phenomena in the natural and physical world.* One participant wrote, "Today I got a new water bottle and I love my water bottle…I learned what water does for my body and how it helps me live." Another was enthusiastic about an upcoming nature stewardship excursion at the beach, "…we are pick[ing] up trach [sic.]… and I think going to have fun."
- While writing in a journal, one Explorer in 2016 made connections between personal goals and learnings from the program: "I need clean water so I can be a good football player!"
- Explorers in 2016 discussed ideas when the Zoo educator prompted, "What is it to have water conservation in the home?" An Explorer said, "Not running the water while brushing your teeth," another suggested, "Take a 5-minute shower," and another contributed, "washing the dishes." The Educator asked the Explorer to explain what they meant, and another jumped in, "You could make dish water" and the Educator clarified, "Maybe fill up a tub?" to which the Explorer responded, "Yeah." The Explorers thought for a bit longer, and a male youth thought of "Washing your feet. You could wash them first, and then turn the water on." The Educator pressed further, "What about what people could do around their homes?" and one Explorer remembered, "Oh! Rain barrels," which they had painted earlier in the program. Another Explorer came up with, "I think they should stop the water hose." And another thought of "People drinking water and they leave it on."
- At a 2016 ZAP! program, one young girl watching a facilitator handle an alligator skull asked, "Can I touch it?"
- After reviewing a list of biodegradable items, 2016 campers embarked on a nature walk with instructions to pick up non-biodegradable items they found. Campers collected plastic, barrettes, potato chip bags, and bottle caps. On another day of camp, campers noticed trash on the ground. One said, "Look what we found," as they picked up the garbage.
- At a 2016 Early Childhood Education program, young children played with toy turtles and chipmunks in an aluminum pan containing sand, seashells, and small plastic pine trees. They also appeared to be engaged while running their hands through the sand and touching the pine trees.
- A Zoo educator was explaining to four young Early Childhood Education program participants that deer lose their antlers and grow new ones. One girl related, "I hope my ears don't fall off."
- At a school program held at Brookfield Zoo in 2015, students talked excitedly while gathering materials (coats, clipboards and pencils) for gibbon observations. While walking to the observation area, students were observed discussing their ideas of what they might see animals doing, taking pictures, and pointing at animals.
- ZAP! 2016 participants in a plant medicine activity were visibly excited; one young girl ran around the Nature Center lawn when she found the card that identified a cure for the ailment she was assigned, and other children shouted as they found the cards that matched their assigned ailment.
- Child participants at a 2016 ZAP! program listed necessary adaptations to live in a wetland; as each adaptation was mentioned, a volunteer from the group was dressed in a clothing item or an object (e.g., feather boa for gills, straws for antennas, pool noodles for legs/arms, etc.). Children shouted ideas, for example, "Legs and arms!" and "How will he breathe?" throughout the process of dressing the volunteer. Once the process was complete, children laughed and asked if they could take a picture of the volunteer wearing the wetland adaptation outfit.

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Desire for Involvement or Exposure

- In 2015, Explorers youth participants rated their interest in further science involvement in several domains: returning to the program, studying science in school, application to life outside of school. Generally, average ratings were relatively high, and are visible at right.

Statement	Average
I want to come back and do Explorers again.	4.50
I think it is important for me to study science.	4.33
I think about how I can use science in my life.	4.17
I would like to study science in school next year.	3.83

- At the beginning of Camp in 2016, one child shouted, "Are we going on a nature walk?" The facilitator responded, "Yes, we will begin our nature walk and observe as many insects that you can find." All children shouted in harmony, "Yea!"
- At an Early Childhood Education program in 2016, an adult female with a group of 3- and 4-year-olds were at a station to make a bird feeder using an ice cream cone, lard, and bird seeds. She asked the children how they felt about making a bird feeder. They shouted, "I want to do it!" and "I want to make a bird feeder!"

Adult attendees to Community Conservation Action Day events were contacted for phone interviews and asked about the science or nature topics they were interested in or would like to know more about. Some wanted to learn more about specific animals (e.g., beavers, geese, horses, worms), or the benefits of urban agriculture (e.g., native plants and grasses to combat flooding). However, most common were requests for local gardening tips. Participants wanted to know more about organic gardening, natural weed killers, companion planning, ways to improve flower growth, how to trim trees, what supplies to purchase for gardening, how to test soil for lead, and information about composting. One participant thought, "Even like Gardening 101 would probably be great. I think that's a great way to bring the community together." And another believed, "People might get ideas to do something around their homes that they wouldn't have done otherwise."

Beyond interest in new topics, participants demonstrated interest in carrying out activities or ideas they discovered in SCIENCES programs. Typically, they were inspired to connect with nature in a new way. For example, during a focus group, a ZAP! participant said they planned to camp in the backyard after their grandson asked to spend the night looking at the stars. A caregiver of Explorers relayed that their children wanted to recreate healthy recipes at home that they had learned in the program. "Thing that they kept talking about, was the recipes. My one daughter made zucchini bread… my daughter just went crazy. She was makin' zucchini bread for everybody," the adult recalled. A pair of adults who attended a Community Conservation Action Day were inspired to clear out a large plot of their yard and start a bee-friendly organic garden. When neighbors began asking for gardening tips, they were glad to answer questions. "It's expanding us and making us want to learn more about it just to see ... it's teaching us about indigenous plants and animals in Illinois. Yeah, it's really helped us to look more into what's going on here in the city," the participant reflected. Others were also interested in planting gardens or specific plants, composting and recycling at home.

<u>Identity as Science Literate Citizens</u>

Developing an identity as science literate citizens was another important short-term outcome component for SCIENCES participants. For youth, this was apparent in skill building, particularly in making observations and critical thinking. Comfort with nature, for example, bugs or animals, was also an indicator of openness to learning more. For adults, facilitating family involvement within science programming was a key skill to build as a scientifically literate citizen. Finally, evidence of interest in or knowledge of environmental stewardship activities was a key component to developing scientific literate identities among participants. Examples collected by Community Ambassador observers follow:

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- Child participants at 2016 ZAP! demonstrated observation skills while examining soil samples. One boy [7 years old] remarked, "It smells like poop!" another child shouted, "I found a worm!" and one girl said, "I found some green things." After smelling a soil sample that contained a high proportion of sand, one girl noticed the sample smelled like the beach.

  Example of: Observational Skills

- On a 2016 Camp nature walk, the facilitator held a flower and looked at it closely, apparently searching for bugs. Campers followed this example, examining flowers they found. One 6-year-old plucked a plant and said, "This looks like the caterpillar." A 7-year-old male said, "This smells good," as he smelled a flower, and the facilitator explained how the plant was used to make soaps and shea butter. "Look! I found a red rock," said one female camper as she dug in a mound of dirt; the group gathered to see her discovery.

  Example of: Observational Skills, Comfort with Nature

- At an Early Childhood Education Program in 2016, caregivers assisted while children made observations. A Nature Center Educator placed a live turtle on the floor. A young girl touched the turtle and an accompanying adult asked, "How does it feel?" The girl touched the turtle's legs and responded, "soft," then touched the shell and said, "it is hard."

  Example of: Observational Skills, Comfort with Nature, Facilitation Skill

- One adult Early Childhood Education program attendee helped their child look closely to find the answer to their question, "Are the turtles a family?" The adult guided, "No, look, they all look different. Look really close." The child noticed, "It's big ones and little ones," and the adult observed, "He is so small and cannot see so he climbs on top of the big ones."

  Example of: Observational Skills, Comfort with Nature, Facilitation Skill

- While hiking during the outdoor portion of the 2016 Early Childhood Education program, an adult noticed, "Look at those trees, beavers did that." A child stated, "They chewed them in half," and another pointed out, "Look it's a lot of them in the water knocked down."

  Example of: Observational Skills, Facilitation Skill

- In a 2015 school program water sample activity, students were asked to determine if a fish could survive in water with a particular set of environmental conditions (e.g., pH, nitrates, etc.). Students gathered samples of water and tested it; each student pair explained the data from their sample to the rest of the group, and described phosphorus, pH, and nitrates based on what they found in their water samples.

  Example of: Observational Skills, Critical Thinking

- The facilitator instructed students in a 2015 school program held at Brookfield Zoo to conduct their own observational study with gibbons. Students presented their hypothesis for where gibbons would be located (i.e., on the ground, in the middle of the trees, or at the top of the trees), made comparisons with the observational data they collected, and presented their conclusions. Three boys observed gibbons in the middle branches of the trees, and shared that they were surprised since they expected to find them in the tree tops instead.

  Example of: Observational Skills, Critical Thinking

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- While searching for trash on the Nature Center grounds, a 9-year-old female camper picked up an insect and announced, "Look what I found!" A male camper identified, "It's a roly poly bug!" The facilitator took photos, then instructed the girl to release the bug back into nature. The girl followed the facilitator's instructions.
  Example of: Observational Skills, Comfort with Nature

- Campers were led on a nature observation walk through the Nature Center and instructed to identify insects and bugs seen on the trail. Most appeared confident as they encountered and identified ladybugs and butterflies, but one camper screamed and shouted, "Oh, it's a spider!" After the walk, the facilitator explained to children that every insect has a job in nature, including bees.
  Example of: Observational Skills, Comfort with Nature

- Bees appeared to incite largely negative reactions from campers. After a presentation about honey bees, a female camper said, "I don't like bees. I got stung before." Likewise, during a nature walk, an 8-year-old camper warned their peers, "Look out there's a queen bee!" which sent other children running. Although some peacefully coexisted with bees on the grounds, other children were uncomfortable when they encountered bees on the property. For example, during breakfast, bees gathered near apple sauce campers were eating. A 6-year-old male swung his arms and shouted, "Get away from me, you old bees!" An older female advised, "Just let them be. They are not bothering you." The facilitator interceded and explained that, as pollinators, bees are necessary to produce most of the fruits and vegetables that people eat.
  Example of: Existing/Persisting Discomfort with Nature

An identity as a science learner was also evident for adults. During a phone interview, one adult at the 2015 Family Nature Play Trip said felt they held a mix of roles because "walking around with my daughter, telling her about the different animals would definitely be the teacher part. When the presenters came out with the animals, learning some of the things about the owl and the snake was the learning part for myself." Another adult thought they held a learner role, "because there is a lot of stuff I didn't know that they were teaching us and telling us. I was definitely the learner there." At Pumpkin Fest in 2015 and 2016, adult attendees who participated in phone interviews felt predominantly like learners, along with their children. One explained that, although their work is similar to the content of the event and they saw many people they knew, they felt low responsibility for educating others and "I was just able to sit back and relax, and enjoy the event." Another took on a learner role "when talking to other people that had been there before, that had volunteered before, the owners themselves, them telling me about what goes on and what they do." Another respondent, who attended with a 5-year-old grandson, felt a mixture of roles, "because I actually been to quite a few Pumpkin Fests before…. But my grand baby, just looking through his eyes, is different."

Participation in environmental stewardship activities at home were addressed in a follow-up survey following Explorers in 2015. About half[9] of responding youth practiced environmental stewardship activities *all the time*. Most common was recycling, with all participants recycling either *all the time* or *most of the time.* Less common were talking to friends and family about the environment, encouraging family to eat healthy food, and encouraging family to conserve water. The next year, the Explorers program increased familiarity with environmental stewardship activities, as well as revealed the impact of humans on their surroundings. Often, they were able to name actions they could take to reduce their own negative impacts and seemed eager to spread this awareness with others via informational brochures they created.

[9] In all cases, proportion was 50% or n=3/6 except *encourage my family to conserve water* (n=2/6).

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- Ideas for making a positive change in their daily routine came readily to several Explorers. When the Zoo Educator asked, "What can we do to eliminate some of our trash at lunch time?" an Explorer responded, "Eat just fruit!" A peer added, "Eat some tomatoes too." "Yes, we need some veggies," agreed the Explorer.
- At the Canaryville Library[10], some Explorers worked on designing brochures to include in a Geocache box while others conducted research to include as brochure content. At a computer, one girl had written numbers on a sheet of paper. She explained to the observer, "This is how many cans have been recycled. I'm looking up how many have not been recycled. I'm taking notes, and then I'll bring it back to the group to put on the brochure." She then spent the entire library visit working on her contribution, visiting websites with titles including "22 Facts About Plastic Pollution" and "10 Ways to Improve Your Recycling" and searching "plastic statistics", "how can you help your community?" "how can recycling help your community?" and "what can not recycling cause?" She used information from these sites and searches to add to her list of notes on plastic and recycling. Another girl at the computers said, "I'm just looking for ways to conserve water," and scrolled through an article titled, "7 Ways to Conserve Drinking Water." She then searched "people killed of water" and then adjusted to, "people killed of water borne diseases." After a while, she changed her search to "Cholera" and then "Cholera definition for kids" and copied the definition onto her paper. The Zoo Educator came to coach the girls at the computers, explaining that keeping the message positive is important in changing behavior. The girl searching for diseases navigated to a site with a banner at the top, which read "Water: use it wisely. 100+ ways to conserve." and began copying notes from this page onto her note sheet.
- The Zoo Educator lead a discussion on improving recycling processes. With wide open eyes, smiles and lots of focused chatter on the topic, Explorers seemed thoroughly engaged. They worked together to identify problems and recommend solutions for recycling waste. Comments and suggestions included: "They should stop using plastic," "We can make a recycling bin," "We can have a recycling contest," We can collect bottles and cans and get money for it," "Yea, and we can collect money and help the Zoo," and "We should donate the Foster Care."
- Using a matching activity, Explorers discovered the amount of water necessary for everyday activities (e.g., brushing teeth, taking a shower, flushing the toilet, drinking water, washing dishes, etc.). Afterward, the Zoo Educator prompted, "In what way do you think you could reduce these amounts of water consumed personally?" Explorers responded, "You take less time brushing teeth if you do it the right way," and "Take 5 minutes to shower."

Learning resource participants demonstrate increased knowledge about and interest in available science programs, as well as identity as persons whom find these programs relevant.

In an effort to build attendance at SCIENCES programming and encourage participation in other science opportunities, awareness of resources and seeing their relevance were of vital importance.

Science Resource Awareness

Although attendance to SCIENCES programs were not lacking, there is not strong evidence for broad participant awareness of SCIENCES programs, their connection to the Brookfield Zoo, or other available opportunities. No data was collected about the neighborhood's awareness of SCIENCES programs nor their awareness of how SCIENCES programming connected to the Brookfield Zoo.

However, several core community members attended multiple SCIENCES offerings (e.g., ZAP! and Community Conservation Action Days (CCADs)) or had their children attend multiple years; these individuals developed strong

[10] The Canaryville Library is the Chicago Public Library closest to Eden Place. Due to its proximity, it was at times a location for programming and/or a destination and resource for Explorers participants.

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relationships with EPNC and Brookfield Zoo personnel and were not indicative of the Fuller Park neighborhood as a whole. Individuals who participated, but had less perceived strong interpersonal connections to EPNC and Brookfield Zoo personnel, often came from other neighborhoods (see more on this topic in section called "Reach Beyond Fuller Park" in *Unanticipated Findings*, on page 21).

Some participants acted as advocates among friends and family, actively promoting SCIENCES programs; one Family Nature Play Trip attendee said, "I would encourage [friends and family] to, if they ever could get the chance, to take advantage of it so the children are able to see different animals, and have a chance that they may not have been aware of. I would encourage any family members and friends to take children to learn something that they may not know." Another attendee live-streamed her experience with members of her online community. She said, "I was Periscoping like, 'You all have to be here to see this.' They were nice though. I was letting everybody in the world that do follow me, 'Do you see this?' You know, telling them a few things about it while I walk this nature walk." Finally, a 2015 Pumpkin Fest attendee felt attending the event had helped them reconsider the local assets available, explaining, "I think being at Eden Place and being in the city makes you think differently about things that aren't there, the use of space." The event brought to mind resource availability on the southside of Chicago, as well as "what we produce or what more could happen here, or about the food we eat and what we do. It's just overall an exposure to something that's a learning opportunity."

Science Program Relevance

Despite inconclusive findings on program and resource awareness, participants appeared eager for programming and activities provided by SCIENCES and found them to be relevant.

"I would just like to attend more sessions because I'm into gardening myself. I have let my grandson help me plant stuff… I planted tomatoes, cilantro, onions. I seen a lot of the same things at Eden's Place."- 2016 CCAD attendee

Opportunities for children were top on one interviewee's list of favorite offerings at Pumpkin Fest; she said, "My daughter likes the animals, and she stays in the animals area for [a] long time" and liked that children were able to paint pumpkins and participate in a planting activity. Another agreed that the science and craft projects for kids were good learning opportunities for his children. "I thought it was something for everybody, because the kids [12 and 11 years old]… they just went off on their own. They found other kids, and I was walking around looking at the gardens, and talking to the other people here about the animals and stuff. Yeah, it was something for everybody." One adult recalled about the Community Conservation Action Day (CCAD) event they had attended. Indeed, a teen at 2015 Pumpkin Fest was overheard sharing, "I never realized that I enjoyed gardening."

Two participants described why they valued programs and opportunities like those offered through SCIENCES. One adult felt what the 2015 camp was valuable for children because "They're our future. We need to instill those values in them, how to take care of the earth and live off of the earth instead of all of this genetically modified kind of stuff. Just learning this is about them living better." Likewise, an adult in 2017 Explorers program felt the opportunity to learn about nature and the outdoors was important "just to have the exposure, 'cause you never know what you'll need to do in life. What job you have, where you'll be stranded at..."

Across programs, participants of all age ranges enjoyed active involvement within existing programming. Explorers in 2015 rated statements high: *I had fun during Explorers.* (Avg[11]. 4.83); *The instructor was easy to talk to.* (Avg. 4.83); *I was encouraged to participate.* (Avg. 4.67). In 2017, an Explorer youth said they had really enjoyed "Gardening. I like being with all these plants. and there's also animals down there. But it's fun to plant your own stuff, and pick it." Another was satisfied with the ability to build and paint to contribute to SCIENCES projects, and had helped construct

[11] Statements were rated on a five-point scale, where strongly disagree was designated with a score of 1, slightly disagree was 2, neither agree nor disagree was 3, slightly agree was 4, and strongly agree was 5.

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a table. An adult explained that SCIENCES programs were an opportunity for their children, who lived in different homes, to spend time together. "Yeah my kids got mad at me this morning because I told them I was going to Eden's Place [for a focus group]. 'We can't go?'" an adult relayed to the evaluators.

Beyond youth and adults, programs also were relevant for educators; at a teacher professional development program in 2015, teachers rated application statements highly: *I learned something new that I will use with my students* (Avg.4.90); *Overall, I am satisfied with my learning experience in this workshop* (Avg.4.86); *I would recommend this workshop to my colleagues* (Avg.4.86); *The workshop fit into my curriculum* (Avg.4.67); *The workshop activities centered on me as a learner* (Avg.4.60).

Long-Term Outcomes

As a long-term project, evidence of further-reaching outcomes were anticipated within the Fuller Park community. Across programs and iterations, early indicators of social change were recorded.

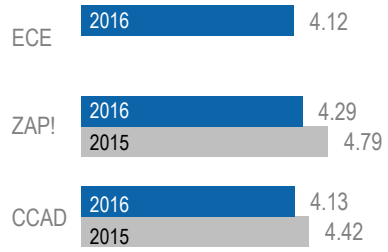
Improve the environmental science literacy (knowledge, interest, identity) of the Fuller Park Community, and thus capacity to engage in lifelong, life-wide, and life-deep scientific learning.

As with participating individuals, SCIENCES programs intended to increase environmental science literacy of Fuller Park residents and thereby improve science learning throughout the life of community members.

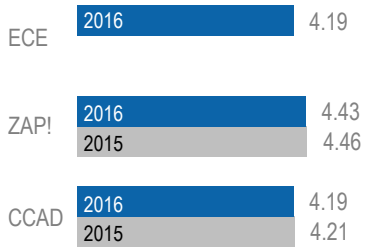
Fuller Park Environmental Science Literacy

Consistent measurement of several key statements at a range of community provide markers of participant science learning and confidence at a variety of SCIENCES programs, including Early Childhood Education (ECE) programs which were offered in the 2016 program year[12], Zoo Adventure Passport! (ZAP!) programs offered in the 2015[13] and 2016[14] program years[15], and Community Conservation Action Day (CCAD) programs offered in the 2015[16] and 2016[17] program years[18]. Although participation was fluid (i.e., participants may choose whether to return for additional years or programs) making comparisons between each program year allows the evaluation to examine participation

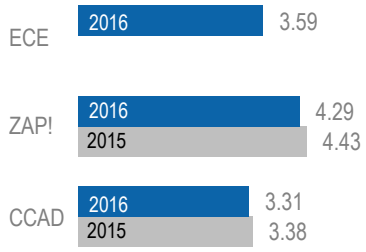
Average ratings for ***I am learning new things today*** were slightly higher in **2015** programs than **2016** programs.



Average ratings for ***I feel smart here today*** were nearly the same in **2015** programs and **2016** programs.



Average ratings for ***I feel challenged by what I'm doing today*** were slightly higher in **2015** programs than in **2016**.



[12] Programs reported were offered in January and March, 2017
[13] Programs reported were offered April-October, 2015
[14] Programs reported were offered May 2016- March 2017
[15] This survey instrument was used at two ZAP! events in May 2017, with a total of 5 respondents (n=2 and n=3). The averages from this subset are not reported here due to their disproportional sample size compared to other programming years.
[16] Programs reported were offered April 2015- April 2016
[17] Programs reported were offered October 2016
[18] This survey instrument was not used at the two Community Conservation Action Day events in April and May 2017.

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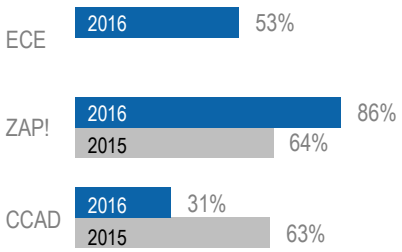
as a whole. Using consistent tools enabled the SCIENCES team to trace whether global participant trends were recorded over the course of the project. Overall, responses to these statements demonstrated slight dips in 2016 when compared to 2015 data, although dips for *I feel smart here today* were minimal.

Of note, the prompt *I feel challenged today* could have been interpreted by participants in multiple ways; while some may have understood the prompt to mean the content was too difficult, others may have interpreted it to imply their assumptions or thinking were pushed to grow or expand.

There was no clear trend in the proportions of participants who **increased science comfort** at **2015** programs and **2016** programs.



In addition to consistent measures of learning, perception of feeling smart, and feeling challenged, participants reported their comfort with science before and after the programs they attended. Responses varied and did not indicate any clear trends in science comfort over time. Attending the event increased gardening confidence for one Community Conservation Action Day participant: "I've been excited to see what they've done throughout the city as far as growing gardens. Then, I think this class helped me to see how easy it really is, because... I was always frightened of doing it."

Examined in greater detail, educators at NatureStart ECE programs in 2015 were asked "As a result of today's training, to what extent did you increase your confidence in the following areas?" Each statement (shown below) was rated on a five-point scale, with 1 meaning *not at all*, 2 meaning *slightly*, 3 meaning *moderately*, 4 meaning *very*, and 5 meaning *extremely*. Average ratings are provided and sorted from highest to lowest scores.

Participants at NatureStart Early Childhood Education Programs increased confidence in:	Average
Creating multi-sensory learning experiences using natural materials.	4.71
Helping young children connect with nature.	4.71
Developing learner-centered activities for young children's nature play	4.57
Designing engaging nature play opportunities using my outdoor landscape.	4.57
Helping young children care more about living things.	4.57
Engaging young children as scientists.	4.57
Designing indoor spaces that help children develop a sense of their local environment.	4.14

All statements received an average rating of at least 4.14, meaning participants on average felt a *very* or *extreme* increase in confidence in those areas.

Fuller Park Capacity for Scientific Learning

Again, SCIENCES strove to build capacity for science education, and consistent measures were used across several programs to record these shifts in attitude. Despite these consistent measures, no clear trends emerged; however, ratings remained relatively constant between programming years for *I am having fun today.*

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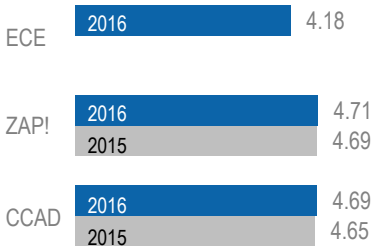
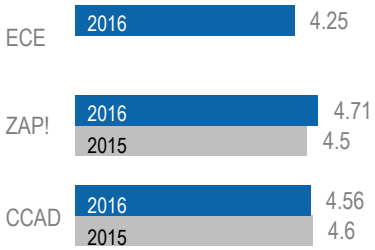
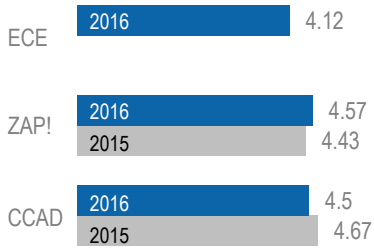
Average ratings for ***I am having fun today*** were nearly the same in **2015** programs and **2016** programs.



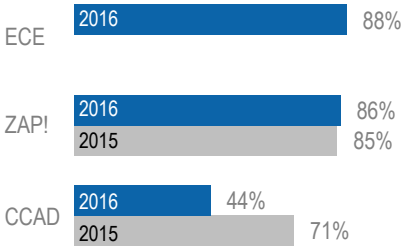
No trends were present for ***I would like to do more things like this*** between **2015** and **2016** programs.



No trends were present for ***I feel proud of what I'm doing today*** between **2015** and **2016** programs.



Overall, many individuals **increased connection to the environment** at both **2015** and **2016** programs.



"Being at a community garden, I see how much those gardens do bring people together and how open people are with one another at the garden."
- CCAD Attendee 2016

Likewise, participant connection to the environment was tracked before and after SCIENCES programs to record increases. Across programs, many participants reported increased connections to the environment after the program.

Demonstrating what is possible also appeared to influence the way SCIENCES participants saw the area's capacity for science learning and programs. Pumpkin Fest 2016 attendees saw connections **between science and the community**, with two of the three interviewees feeling the event incorporated both. Respondents were especially aware of the community aspects, including "the fact that they did have those outside organizations come in and get the community involved." A 2015 Pumpkin Fest participant **appreciated the Brookfield Zoo's presence and involvement** and thought, "the impact of **Eden Place as an alternative location** on the Southside of Chicago" was an especially positive aspect of the event. One respondent believed "Pumpkin Fest wouldn't be Pumpkin Fest without people coming and enjoying, especially community." The contribution of Eden Place Nature Center as a primary host site for programming and events expanded awareness of local resources for participants, as well. For example, teens were overheard discussing Eden Place Nature Center at a 2015 CCAD program. One teen stated, "I cannot believe this was once a dump site" and another, "I would have never guessed that something like this existed in the community." In a follow-up interview, a CCAD attendee in 2016 also found the **history of the space** remarkable, sharing that "lot of people, including myself, were just calling it just a gem because it was hidden in the neighborhood," and continued, "I know [the land] had a bunch of lead from the city being an industrial city, so just knowing what the history behind it and how they turned that land and how they turned that space into something neighborhood friendly, community friendly rather. That was impressive too." In observations, one Community Ambassador heard one woman say to another, "This is amazing. I never knew this was back here on 43rd."

Broaden access to and participation in environmental science learning opportunities.

Access to Environmental Science Learning Opportunities

In expanding access, it is crucial to understand first what attendance and access looks like early on. In 2015, participation in science activities in Fuller Park was low; all interviewed caregivers indicated their children were

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attending EPNC Summer Camp for the first time. Likewise, 2015 teachers who attended professional development were more frequent visitors to Zoos and Aquariums than Eden Place Nature Center. Most participants visited zoos or aquariums 3-4 times each year (52%; n=11/21), and ¾ of respondents rarely or never participated in Eden Place Nature Center (EPNC) activities or events (76%; n=16/21). About a quarter of participants visited zoos or aquariums five or more times per year or 1-2 times each year (24% each; n=5/21). About a quarter of participants indicated they took part in EPNC offerings to some degree of frequency throughout the year (24% total; n=5/21); both respondents who attended five or more times each year reside in areas outside of the Fuller Park neighborhood. Finally, only one participant indicated they had had professional development on the topic presented before, while the rest had no prior professional development experience in that subject matter (95%; n=20/21).

Transportation has been a considerable perceived barrier for science education for the Fuller Park neighborhood and SCIENCES programs attempted to overcome this hurdle. Although most events and programs were hosted at Eden Place Nature Center, when programs were offered at another location, often a bus or van would be supplied. Transportation to **Little Red Schoolhouse**, a nature center of the Forest Preserves of Cook County located about 25 miles from Eden Place, was important for 2015 Family Nature Play Trip attendees. One appreciated the transportation offered, saying, "The location was great, because we were offered a ride on the school bus, so the transportation, we just had to get to the bus and everything else was provided for us." Similarly, camp 2015 participants walked to **Canaryville Library**, where EPNC camp staff read a book to the group and campers were allowed to check out books. One caregiver appreciated this trip, saying "I think that it was nice that instead of them just going to the pool that day or just playing games or something, they actually set aside time to take them [to the library]."

Beyond access, discussions with participants highlighted the importance of **checking with the community about their needs**. One adult whose multiple children were able to attend Explorers due to it being offered for free shared, "Once I knew they were doing the program, I was happy...I'm so appreciative that my kids got to go... They're very happy…when you have so many kids, you're like, 'Who's going? One person is going to camp this year. That's it.'" Another adult who attended ZAP! programs with youth shared their view during a focus group:

> "I think that sometimes in a community program, we sit down and decide what we think the community needs as opposed to surveying-- assessing the community to find out what they feel like their needs are. You know, and what you may want to offer, maybe a debate, but it's not a good thing to [assume] what they want, because if we have had some program that no one have shown up to it, and then we have programs where we're overflowing. So I think it's a good idea to kind of see how you can see what is the heartbeat of the community. And it changes constantly, because people move in and out."

Throughout the project, participants offered their ideas for how SCIENCES could enable better access for a broader base of residents in Fuller Park. One thought that Eden Place Nature Center could **offer community garden plots to residents** to promote greater engagement: "If you start them off with a small area, then if they like it maybe they will be more inclined in the future to purchase a bigger plot in a community garden or maybe be more involved in it once they get their hands dirty, so to speak. That could be a way that you can get the community involved." Two anticipated **greater attendance with more regular programming**. One said, "Have more events. Not just one every two months or three months." And another echoed, "I think just having like more big events like this, too. That's one way to get them …show them how to grow some things or offer seeds. You know, just simple workshops let you get people involved. I mean food, a party, is just really the best way." Observations reiterated this idea; one participant was heard saying to another attendee, "I wish they did something in the winter so it can keep us busy."

Additionally, respondents thought that **increased outreach** would help, and **focusing on opportunities for children** would especially grow audiences. One thought simply, "more flyers out," would be a good approach, and "If

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something can grab the kids more, then adults going to have to come because I have to escort my grandchild." When asked how this respondent heard of the event, they replied, "I live in a community. I've been here all my life. It wasn't that I heard about it. I just know that every year they have it." Another respondent felt a targeted approach was key, starting with promoting the event to schools and children:

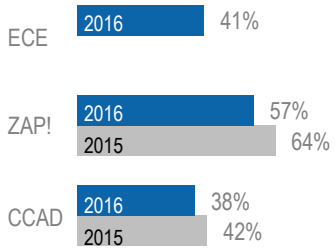
> "I think, you start at the grass roots. I think it would be a good idea to start reaching out to some of the schools in the neighborhood. The more people in the neighborhood would know, but if you get kids interested, get them excited, then I think you'll be able to get more kids in the neighborhood interested, then they'll bring their parent. Or they'll have their parents bring them, also parents are there and then you can hook them in."

Another had a variety of ideas to promote Pumpkin Fest **through schools**, including emailing school administrators, going to the front desk at schools and asking to make an announcement over the PA system about the event, or setting up a booth or table at school events like report card pickup or a literacy night. This respondent also suggested collaborating with local community centers, saying, "It just makes sense to work with them since the same purpose is there."

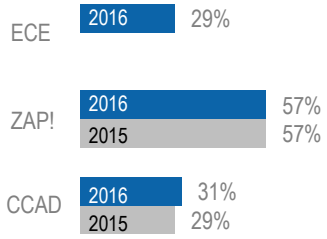
Participation in Environmental Science Learning Opportunities

Across events and programs, participants rated a series of statements which indicated that their participation in SCIENCES programming was a **key point of access to environmental science learning opportunities**. Overall, ZAP! appeared to have the greatest impact as an inspiring, unique program for participants.

Proportions of participants who thought programs were ***Inspiring; I have new ideas or thoughts*** was slightly higher in **2015** than **2016**.



Proportions of participants who felt programs were ***Special/unique; unlike most things I do*** were consistent between **2015** and **2016** programs.



Interviews and focus groups in 2017 brought to light that for adults, **personal connections to nature were often based on being outside** (e.g., walking dogs, taking youth/elderly outdoors) and **others connected through gardening** (at home or with a community garden). One adult mentioned, "We have a lot next to our house where we do garden every year, and then recycle too and I'm starting composting just this year." And another described using a home garden as a core feature of their family's homeschool science lessons. Yet another saw SCIENCES programs as an opportunity for the local populations she worked with, and explained, "That was kind of how I got interested…we were looking for another option for the kids though the Children's Hospital. I'm on the board of a charter school as well, so we were looking to create a garden."

Despite the enthusiasm for programming and ideas for expansion on science or nature topics in other contexts, some adults did not feel a connection with nature, the outdoors, or the environment: "I really don't do too much outdoors at home. I'm more of an indoors person, I stay inside the house a lot," said one ZAP! participant. For participants like these, programs at EPNC pushed their boundaries, and at times, made them more open to time outdoors. One shared, "I must confess that… I was dragging my heels. I didn't want to come because I don't like bugs… But God

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has been good. Every day I've come, I've never gotten bitten. I love it. I'm so glad [my friend] encouraged me to come."

Unanticipated Findings

Despite planned outcomes, some unexpected results emerged as common themes over the course of programming. Firstly, SCIENCES programs did not always reach residents within Fuller Park to the degree expected, and drew participants from a broader Chicago radius than anticipated. Next, participation was strongly tied to interpersonal relationships, and finally, SCIENCES built community investment.

Reach Beyond Fuller Park

With programming intended to fill a local need in the Fuller Park neighborhood, the project team was surprised to learn that many participants did not live as close to the Eden Place Nature Center as anticipated; often, participants drove in from other neighborhoods to make use of the high quality, free programming. This may indicate a greater need and potential for Chicago's southside to become involved in similar programs.

"I thought [Eden Place] was something that was really needed, especially in this area… it's really needed because you have kids that are just like ... they probably live across the street. Some of them still might not even know where their vegetables come from and the different types of animals and things like that, and that is so needed."
- CCAD Adult

Opportunities to provide access to science programming to an even greater audience had the potential for greater social change as well. A 2015 CCAD attendee thought the Eden Place Nature Center could appeal to people who live outside of Fuller Park: "I think that Fuller Park is its own neighborhood but it also is connected to some surrounding areas." This respondent lived in the nearby Oakland neighborhood, and explained the landscape with an insider's lens:

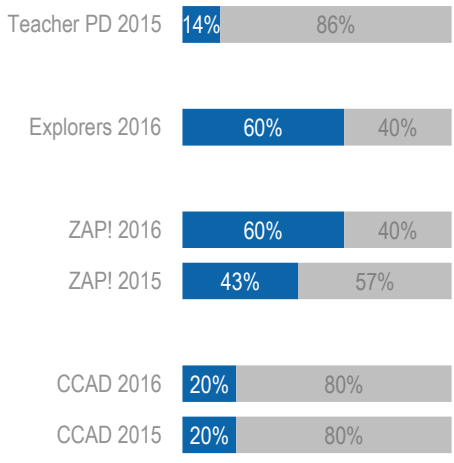
> "Historically, Canaryville and Bridgeport have had tensions between the Fuller Park neighborhood and them, unfortunately along racial lines, and they're the immediate neighbors. I know that some ministries in the past have tried to bridge some of that, which doesn't always work but I think there's some possibilities that are there. I think the Grand Boulevard neighborhood doesn't have a lot going on, and [is different from] a place like Eden Place where it's sort of a vibrant cultural anomaly on the southside of Chicago."

The respondent saw Pumpkin Fest as an event that could serve to introduce neighbors and help heal challenges of the past, as well as offer space for another needed cultural resource in the area. An adult who had accompanied youth to Explorers echoed this sentiment:

> "I do like the idea that we don't live in the neighborhood, even though they kind of focus on the Fuller Park, and I think that's important, but sometimes, integrating kids from outside of the neighborhood, and open it up. Like, having a certain amount for kids in the neighborhood, and then, some that are not in the neighborhood, and kind of exposing the kids to different neighborhoods, is very important."

Zip codes were collected on surveys at several SCIENCES events and programs. Overall, shifts indicate greater proportions of Fuller Park

Under ¾ of program participants who completed surveys were from **Fuller Park zip codes**.
Typically, over half traveled from **elsewhere**.



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Residents made up 2016 audiences than 2015, and some programs, like youth-focused Explorers and ZAP!, had higher local pull. However, 40% or more of participants were from elsewhere at each of these programs.

Although involvement was not always directly from the Fuller Park neighborhood, members of neighboring communities benefited from the programming. Adults saw programming at Eden Place as a positive sign of care, pride, and involvement within Fuller Park, but did not necessarily associate the resource with the local neighborhood boundary lines. Examples of discussions with participants during focus groups regarding the reach of SCIENCES programs are as follow:

Value for others

- "So [connection to Fuller Park] it's not the point… [Our group is from] 52nd and Halsted. So saying this neighborhood, we talking about children and children are really the same everywhere you go… everybody in all of these communities, there is some good in everybody."
- One ZAP! adult participant said a police officer and partners at a school "always look out for us, because they know we have young people. They know we have no money, and they know that we all are volunteers and working to make it better for our young people." These key informants mentioned SCIENCES programming, which helped them get involved, despite not living near Fuller Park.
- "You all invited us out to the zoo, the Brookfield Zoo and see things that some of us cannot afford, and I appreciate it. Go for ... During Christmas time, see all the beautiful Christmas trees and I feel very connected."
- "I believe that it inspired people like myself that don't live in this area to create something similar. There has been something created near where I live that is similar because there's a lot of open space. I think it did ... I mean, as far as the high school students, they said that it would be something that they would be willing to do in their communities as well."

Pride in local community

- "I think the children in this city really need a place like this, because it's like living in a state of PTSD, truly, because the only thing they see or hear about is the bad stuff. They're bombarded with it, and there's so much good stuff, and they need to see that, 'Yeah. You can be a part of the good stuff, too. You can create good stuff. Not just see it, you can create it.' I think that this area could really be a shining example for what could happen when people care and when somebody just cares enough to say, 'Hey. Let's spruce this up,' or 'Let's make this something that people can enjoy,' kids and adults, because it really does take a whole community to change things. Places like this are necessary."
- "It seems to me that the people that do live here very much care about the neighborhood. …there's new houses, and then you have people that have stayed in the neighborhood. I think that the people that remain in the neighborhood very much appreciate what this has to offer, because if you're someone new coming in, you're kind of just seeing the change or being a part of the change, but when you've been here throughout the years, then you really do see the benefits of it, especially if they're involved in the change."
- "It helped connect with the community…Because, it helps me with cleaning up around the community, trying to help keep it clean."
- "When I was trying to figure out how to get in [to EPNC], you saw the men out, and they were doing their lawns, and they were brightening up what they could on the street, and that's a beautiful thing to see. I think that this place needs to flourish, because this place would solve problems for a lot of the kids in our city, I believe. This place could create like a safe haven. Just something because Chicago is crazy at times."

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Participation Relied on Relationships

"I would [recommend Explorers]. I did it to my other friend, because I told him to come. I told him that it's really, really fun. You get to learn about nature, or a different topic that she had-- I mean, it's [Zoo Educator]! And I like her, so I come every year."
- Explorers youth

A key participation driver were the relationships forged through SCIENCES programming and social networks that already existed. Participants relied on word of mouth to learn about available opportunities. **Invitations from Eden Place Nature Center and Brookfield Zoo** staff were especially effective for helping community members know when programs were being offered. For example, a caregiver heard about the 2015 summer camp through EPNC's co-founder, because "I live across the street from her so we're always talking from time to time." An Explorers adult also shared that the grassroots efforts of Brookfield Zoo staff had raised their awareness: "We heard through [CZS/Brookfield Zoo staff member] … She did tell us about the programs, and asked if the kids would be interested in doing it." Yet another adult who had attended CCAD stayed aware of SCIECNES programs by talking with "people like [CZS/Brookfield Zoo staff member, EPNC co-founder, and Community Ambassador]… I just have a lot of people that inform me on stuff." Embedded personnel within the community were key relationships; their invitations were effective because of their persistence and investment. "[CZS/Brookfield Zoo staff member] calls me all the time, [I know] [EPNC staff], because I'm from the community and my kids go to Hendricks," an adult participant described their interpersonal relationships with project partners.

Past participants also **encouraged friends and family to come**. Two ZAP! participants indicated a friend told them about the program, and another adult who attended multiple programs echoed, "I was invited by…a friend of a friend…She was trying to convince me to signing my sons up for it." Word of mouth worked for bringing active participants from outside of the Fuller Park community, as one resident from outside the neighborhood shared:

> "[My neighborhood has] a really good community kind of thing, I mean we even have a house where we have meetings every month and one of the people knew about Eden Place and she knew that I was interested in stuff like that and she asked me if I would come and help with the planting, so I said I will come and that is the reason I came. That is the only reason I know about it, I'm not on Facebook and all of that stuff."

One adult participant was eager to get friends and family involved, not only because of the program's value as a way to spend time together, but for the mutual benefits for the environment as well:

> "I actually want more people to get involved. That is why the people that I talk to and try to bring with me to get more involved and bring their kids. Like I said, I have a cousin that I brought a couple of times. She is also going with us tomorrow and I want to get her son involved. He is only about two now, but I mean you start at early age, he'll be more involved and she will get more involved. We all have a great time.
>
> The more we do for nature it helps the environment, period. The more flowers we plant, the more trees we plant. Everybody will be ... Breathe clearer, instead of all of this pollution and stuff that they've got going on from trucks and buildings from smoke and stuff. Even cigarettes and whatever."

Many participants shared ideas for ways to reach more Fuller Park residents and further encourage participation. They suggested working with other community partners, like the park district, schools, community groups, and churches. Others spoke of the value of hosting more events, sharing information at Farmer's Markets, or even hosting a Farmer's Market at Eden Place to draw new participants. However, many agreed with one Community Conservation Action Day participant, who recommended "Just the word of mouth thing and fliers. I mean you might only get two or three people at a time, but two or three people at a time will make more the next time and the next time and we can build a group."

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Relationships and Community Investment

Although explicit community-building was not a key long-term outcome for the project, at its core, SCIENCES worked to support connections between program participants, science and nature, and EPNC and Brookfield Zoo. Evidence of building relationships, within participants, with their communities, and with CZS staff, was apparent.

Relationship with fellow participants or peers
Team-building exercises were incorporated within youth programming to establish positive relations between participants; often, these exercises resulted in positive interactions. Participants demonstrated positive relationships with peers during other activities as well.

- "Today in camp, I met a lot of new people," – Explorer's journal entry
- Explorers were split into teams to assemble animal puzzles; one member from each team was blindfolded and assembled the puzzle by following the verbal directions of their teammates. Explorers laughed, shouted instructions, including "No, not there, over here," and "Place it on the left side in the corner." Their team pride was evident; teams cheered once they assembled the puzzle successfully and one Explorer exclaimed, "Yea, we did it!" To conclude the activity, the Zoo Educator asked, "Why do you think your team won?" Explorers on the team that completed the puzzle first answered, "Patience," Listening," "Worked as a team," and "Didn't get frustrated." She followed up, and asked the team that took longer to complete the puzzle, "What challenges did you face while trying to direct your teammate?" One Explorer said, "Everybody was loud," and their teammates agreed that poor communication was a challenge.
- Explorers split into groups to paint rain barrels. Each group had one youth designated as a team leader. In one group, the team leader stated, "We need to discuss what we are doing, before painting the barrels." Another Explorer suggested, "Make a little bit of what everyone wants." The team began to paint colorful shapes on their barrel, and at the end of the activity, they continued to work together to clean up the materials they used. The next day, Explorers again worked with their teams to complete their rain barrel beautification project, but some disagreements arose. One Explorer instructed another, "Don't paint over tear drops," and one was heard requesting, "Can we all just compromise?" The Zoo Educator guided the group on strategies to work more cooperatively. Afterwards, Explorers appeared to be more supportive of each other, asking, "Do you want to do spots or flowers?" One asked their teammate, "I am not sure about this water drop, what do you think?" who responded, "It's beautiful." After completing the rain barrels, one Explorer expressed pride in their collaborative effort, saying, "We made a masterpiece." One Explorer briefly recalled this collaborative experience in their journal, writing, "We decorated water barrels with our groups."
- At the Library, two Explorers at a computer worked together to find images of rain barrels they could include on a brochure. They gave each other input on which images to select and took turns using the mouse to copy images from websites and paste them onto a word document to print.
- As an icebreaker, Explorers were instructed to get a signature from a peer who answered yes to a series of questions (e.g., Who has a pet? Who is a vegetarian? Who drinks bottled water?). One Explorer asked another, "Have you ever found a bird nest?" The other Explorer responded, "I found one and it had blue eggs in it!" The Zoo Educator also participated in the activity, and asked an Explorer, "Have you ever gone fishing?" He laughed and replied, "Of course! Remember, you took us last year!"
- "I didn't know [Explorer] want to be a NFL player like me." – Explorer's journal entry
- "Then we all said things about us that no one know. I am so happy that I came in today I had a good time." – Explorer's journal entry

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- The Zoo Educator had several slips of paper with positive adjectives written on them. She asked the Explorers to gather in a circle and explained that each person would choose an adjective to describe the person sitting to their right, and after reviewing which adjectives they could choose from, she asked one girl to start. She looked to her right, and chose "Generous. She keeps offering to do my hair." The next youth said of the girl to her right, "Intelligent. She almost knows it all." The next Explorer thought the boy to her right was, "Resourceful. When we were painting, he used a sponge brush for the flowers." He then said the girl to his right was "Respectful. She respects her elders." The next girl thought the girl to her right was "Very creative. They thought of a way to use the paintbrush to make a circle." This camper was sitting with the camp Educator to her right. The Educator said she could skip over her, but the girl decided she would prefer to talk about the Educator, saying, "[Zoo Educator] is creative. She designed--[observer did not hear the rest of the quote]." The Educator considered the Explorer to her right and said, "Entertaining. You had boisterous, outlandish outbursts." She then mimicked the girl shouting "Water conservation!!" The girl laughed, as did the surrounding Explorers. The Educator told the evaluators, "She's come out of her shell this year," implying that the girl had attended the year before and was growing more comfortable. Once the group settled down again, the girl said, "I think [Explorer] is generous. Sometimes she thinks of others." Other Explorers teased the girl who was being complimented, and emphasized, "*Sometimes*!" She laughed, appearing to enjoy their jokes and attention. This was the same girl who had started the circle, so the activity was finished. As the conversation was winding down, the male camper asked, "Can we go to the left?"
- One female Explorer was using markers to color and fill in the letters on her brochure. Another walked by and said, "That's ugly." The Zoo Educator overheard and came over to talk to the girls. She asked, "Why did we compliment each other yesterday?" referring to a warm-up activity where each person picked from a set of positive adjectives and explained why it described the person sitting next to them. The girls replied, "To be kind." and "To be respectful." The Educator agreed, "Sometimes when you spend a lot of time around people, you can get grouchy," and asked the Explorers to focus on uplifting each other rather than tearing down teach other's work.
- Explorers worked cooperatively on team building exercises. The Zoo Educator introduced a new activity abruptly by saying, "We need a stick!" Five Explorers jumped up and ran in various directions to find an appropriate stick to use, while three remained sitting under the pavilion. Those searching the grounds quickly found a long, fallen branch, about 6 feet long, to use in the activity. The remaining Explorers joined in and the Zoo Educator led the group in using one finger each to hold the stick, lower it to the ground, and raise it up above their heads. The group cheered as they completed the activity and the Zoo Educator congratulated them saying, "That takes adults 10 minutes!" Students appeared proud of the accomplishment, with comments like, "We're smaller," "We're fit!" and "We did it slowly." One Explorer even rolled up her sleeve to show her bicep, saying, "Look at these muscles!"
- Marking the start of each day in Summer Camp, the facilitator led the group in an "I am" statement circle. Campers held hands and declared something that described themselves to the group; statements were typically proclaimed with enthusiasm and included, "I am happy," "I am strong," "I am brave," "I am healthy," "I am balanced," "I am beautiful," and "I am black and proud." On other days, campers listed more than one adjective about themselves, and on two observations, the full group concluded the exercise in unison, shouting, "I am black and proud!" Examples of additional "I am" statements include: "I am positive, strong, kind, nice, and talented;" "I am strong, kind, and friendly;" "I am beautiful. I am wealthy. I am smart;" "I am balanced. I am healthy. I am confident. I am happy."

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- Campers and the facilitator were supportive as they exerted themselves physically during exercise portions of Summer Camp. Each camper did 10 jumping jacks and took a brief break. As they got ready to begin another set of 10, one female camper expressed, “Really? My body can’t handle this!” Another camper encouraged, “You can do it.” On another occasion, during exercises, a female camper said, “I can’t do it” and the facilitator pushed, “You can do whatever you put your mind to.” Likewise, as campers ascended a hill, one female camper said “Oh, I can’t climb this hill. I am going to fall.” The facilitator responded, “Yes, you can. Let me show you.” She ran up the hill and the female camper followed. She celebrated at the top, saying, “I did it! I did it!” Another camper sang, “She can do anything!”
- At the Clean and Green event, participants worked together to complete clean-up efforts; several teens made suggestions for ways their group could work more effectively and complete each task.
- During a plant medicine scavenger hunt, children at a ZAP! program were observed assisting each other to find cures to assigned ailments. Children shouted encouragement to their peers, such as, “Go! Go!” “Find your cure!” and “Let me help you!”
- During an activity regarding medicinal plants, two adult ZAP! attendees discussed memories of mothers and grandmothers using home remedies for sickness.
- A family with an 8-year-old girl arrived to a ZAP! program. As they approached, a girl already at the event [also 8 years old] ran to greet her peer, saying, “I am so glad you came this week! I missed you last time.”
- “I would tell [a friend] that it's a nice program for little kids and teenagers, we learn different things about the society and our environment. It's fun, there's fun things to do and the instructors are very nice and patient with us. It's a good company.” -ZAP! Youth

Relationship with Local Community

Programming positions participants as champions for science and nature within their local communities. Indicators suggest ways this role impacts relationships outside of the program:

- To help Explorers understand how their Geocache would appear to other members of the community and the public, the Zoo Educator showed the group the Geocache app on her phone. She said, “We’re the flashing dot. The green dots are Geocashes.” One Explorer seemed surprised by how many Geocache locations surrounded them, and gasped, “Oh my gosh!”
- Explorers were watching a video which taught the basics of building a Geocache and associated rules. The video explained that if a person wants to take something from inside a Geocache, they should be sure to replace the item. The Zoo Educator paused the video and emphasized, “You should always trade equal or up.” The tip seemed to excite two Explorers; one said, “Oh! I’ve got magnets and plastic bracelets,” and another chimed in, “I’ll bring a book.” One Explorer questioned, “What if you don’t have something to trade?”
- Filtered water bottles were provided during the program to use and take home. Water bottles were important not only to the Explorers, but also were assets for their families as well. One Explorer recounted, “My sister lost hers already,” and another said, “I love my new bottle, it saves my mom some money.”
- “I think it would be a great way to integrate the community too, because if you do have new people that are coming in, and then you have the people that have lived here for a number of years, that's a way to integrate those families so that they do get to know each other, and continue to care about what is happening here.”—CCAD Adult
- A Pumpkin Fest attendee was pleased to find “It was very community oriented.” This participant continued, “I was pleasantly surprised. Like I said, it was my first time being there, so I didn't really know what to expect. Just my overall impression was everybody there was very kind. Welcoming, I think that is my word to select one word. It was very welcoming.” The **opportunity to gather with neighbors** was a favorite

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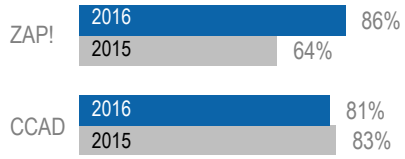
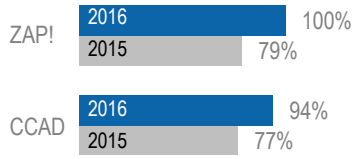
aspect of the event. A participant explained, "I think what I enjoyed the most was just, not any of the activities per se, but just the general atmosphere. Seeing so many families in the city, enjoying that type of an atmosphere. That was pretty [expletive] impressive, and it was pretty unique situation to see what's in the city, you know?... Because I can't think of any other facility like that within the city of Chicago proper, so that's something that I really enjoyed."

- Although they are looking for connections with neighbors, at times, adults did not feel they had found familiar faces. One CCAD attendee mentioned, "The kids always make friends but I haven't seen any of my neighbors from my block here."
- Consistent measures of feelings of community were often selected or rated highly at events and programs.

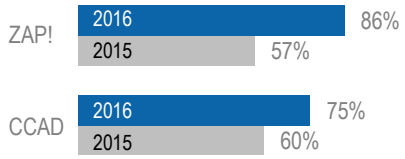
Proportions for ***Good way to connect with community*** were high in 2015 programs and 2016 programs.



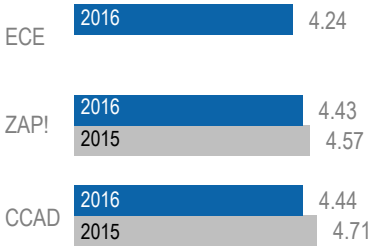
Proportions of participants who thought programs were ***Good for families; something for all ages*** grew from 2015 to 2016 programs.



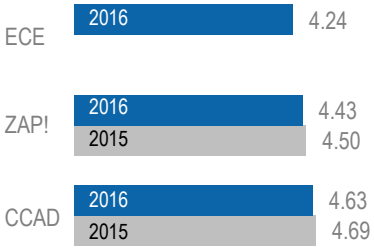
Proportions of participants who thought programs were ***Welcoming; I feel like I belong*** grew from 2015 to 2016 programs.



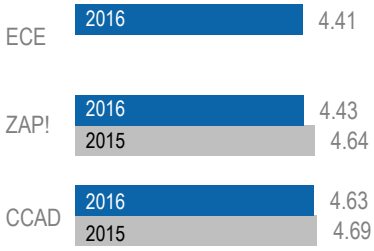
Average ratings for ***I am meeting new people today*** were slightly higher in 2015 than 2016 programs.



Average ratings for ***I feel safe here today*** were relatively consistent between 2015 and 2016 programs.



Average ratings for ***I will tell others about what I'm doing today*** were similar for 2015 and 2016 programs.



Relationship with CZS

Participants appeared comfortable and connected to Eden Place Nature Center and Brookfield Zoo staff. Youth grew highly connected to the educators who offered programming in the space, and the rapport established helped develop a close-knit community within SCIENCES programs. Evidence participants trusted, were comfortable with, and were connected to Brookfield Zoo includes:

- "Today I fell [sic.] happy because I got to plant and play with [a Brookfield Zoo staff member] because he helped me paint." – Explorer's journal entry
- One male Explorer was heard saying, "[a Brookfield Zoo staff member] is my best friend."
- "I thought the [Zoo Educator] did a great good today. P.S. She is the best!" – Explorer's journal entry

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- "Today I loved that I got to paint and [Zoo Educator] is the best and she let us have fun" – Explorer's journal entry
- "I didn't know that [Zoo Educator] was with Brookfeild [sic.]" – Explorer's journal entry
- One Explorer commented to the observer, "[Zoo Educator] has known me forever."
- "I like the people here, [Zoo Educator], we've known her for a couple years. And we have very fun. We do a lot of stuff together."- Explorers Youth
- [Zoo Educator] Bucks were a type of reward currency invented by an Explorer, named in honor of the Zoo Educator. The Explorer drafted the design of a dollar bill, complete with a drawing of the Zoo Educator where a president's profile usually appears on US currency. One of the following days of the program, the Zoo Educator made copies of the [Zoo Educator] Bucks, passed them out to Explorers, and set up a "store" at the end of the day where Explorers could use their [Zoo Educator] Bucks to purchase items like water filters, books, and Brookfield Zoo hats. Explorers appeared excited to make their purchases, and smiled and pointed as they chose and "bought" items.
- While taking attendance, the Zoo Educator asked one girl, "Your sister doesn't want to come?" apparently wondering why she had arrived without her sister that day. The girl responded, shaking her head, "She's sick. She said she'll come tomorrow." The Zoo Educator also showed concern with another Explorer who had not come with their sibling. Upon hearing they too were sick, she asked, "What kind of sick?"
- As ENPC founders drove up to the Nature Center, they rolled down the window of their truck. The Explorers appeared excited and began waving to the couple. One of the founders later came in through the gate and began walking toward the group. As she approached, several Explorers called, "Hello, [EPNC Founder]!" to greet her.
- "I was actually a parent that worked with, as a child, I actually worked with Eden's Place. And then, I was volunteering, and my kids were helping with Eden's place. So that is how we wind up getting connected with it…Yeah, we have been, kind of, with them for years, on and off, with different activities. Just volunteering. Last summer, we did some planting. We had a project through my kids' school. Then we did it down there, so ..." -Adult who accompanied youth to Explorers
- "I love this setting because it's so personal and intimate for the children. They… want hands on. In a bigger group, like at the zoo, it's huge, so you got to kind of travel around. But here, it's like a family. It's just so cozy, and just you get to really ... I mean the kids love [Zoo staff member]. They know the workers, and they love that, and the consistency. It's just wonderful. It's personal and intimate."—Zap! Adult Participant
- A family with an adult female, and two youth were standing near the Community Ambassador Observer. The male [12 years old] smiled at the Ambassador and said, "I remember you from last time," and then informed the Ambassador that his mom and sister were attending for the first time.
- A Community Ambassador from the program's evaluation team was observing a ZAP! Program. They recognized participants from the West Englewood after school program. Likewise, participants recalled their connections to the Community Ambassador; a teenager assisting small children said, "I know you from somewhere else," and the Ambassador agreed that the teen looked familiar. Later during the program, the teen recognized the Ambassador. They exchanged hugs, and the Ambassador said she was proud of how the teen had grown since they last saw each other.

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Synthesis and Key Takeaways

With the intent to reach and bolster the Fuller Park community through opportunities for informal science education, the SCIENCES project achieved many successes. By beginning with a strengths-based approach to front-end evaluation, community advisors described a neighborhood with generations who remain in the area and active elders who take pride in their community. However, these conversations also exposed challenges the group faced: abandoned homes, lost resources, poverty and a dearth of programs for youth, teens, and families in the neighborhood. Low educational attainment, few employment opportunities, and often the challenge of raising children alone made family and caregiver involvement a particularly difficult hurdle facing the adoption and success of SCIENCES programs for families and adults alike.

Knowing difficulties from a community perspective enabled early iterations to more focus on most effective and impactful programming. Measures of cognitive outcomes (such as understanding, interest, and motivation related to environmental science and conservation), affective outcomes (such as attitudes toward environmental science, identity as someone who can and will use science, and concern about environmental issues), and behavioral outcomes (such as confidence, intent, and ability to use science skills in their daily lives) all displayed positive results. Some key logistical issues, for example, transportation barriers and challenges with repurposed evaluation tools which did not reveal much, were alleviated before moving into continued years of programming.

Short-term outcomes focused on increases in participant science knowledge, interest, and identity as science-literate citizens. Participants in a variety of programs were easily able to identify program topics and essential messages; new knowledge was broad-ranging but often focused on animals and their importance to the environment, plants, gardening, and nutrition, pollution and water's connection to health, and practical ways individuals can keep themselves and the environment at their best. Educators attending professional-development focused programs indicated high ratings in key teaching points, for example, confidence in teaching using informal science methods or discovery-based learning.

Science interest was manifest as curiosity, engagement or excitement during the program, and a desire to have continued involvement or exposure to science topics. Youth often brought up questions, such as "Can we drink rain water?" and "Why is the mango good for you?" during activities. They also demonstrated excitement by eagerly participating in activities (e.g., touching animal skulls), continuing environmental stewardship action modeled earlier in programs (e.g., picking up non-biodegradable trash) and close listening and behavioral indicators of focused attention (e.g., laughing at appropriate times, adding to the conversation with their own input). Caregivers with young children demonstrated engagement by facilitating or answering questions for their youth, joining in on activities, and interacting with fellow participants. For adults, interest was most evident in the form of a desire to participate in future programming or to apply tips or concepts they had learned at home. Several mentioned the benefits of gardening workshops. Still other adults described ways youth had helped them connect with nature in a new way; youth also showed interest in carrying out activities or ideas they discovered in SCINCES programs, for example, cooking healthy foods or spending time outdoors.

Establishing participant identity as science literate citizens was another short-term outcome of SCIENCES. Often, this was most apparent in skill building, particularly in building observation skills and critical thinking. Participants also overcame fears about bugs and being in nature; many demonstrated their openness to learning more by actively participating—touching, getting close, and spending time outdoors. Adults, in particular, built facilitation skills in engaging in science with their children. Finally, many participants indicated they were aware of and had interest in executing environmental stewardship activities, like eliminating waste.

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Also a component of the intended short-term outcomes for SCIENCES was for participants to be more aware of science resources and identify as people who might find these resources or programs relevant to their own lives. Although some participants were actively involved throughout years of program offerings, there is not clear evidence of neighborhood awareness of all programs, connection to the Brookfield Zoo, or other available opportunities. Despite this lack of evidence, many participants acted as advocates within their own families and social networks, and promoted SCIENCES programs. Personal relevance of science-based programs and resources, however, was clear. Many participants hoped for more opportunities to learn about gardening, events and occasions to connect with neighbors, friends, and family, and opportunities for children to gain exposure to the outdoors. One participant, in particular, felt reaching children through programming was crucial for the longevity of and care for the Earth. Likewise, participants of all ages appeared to enjoy active engagement within SCIENCES programs, suggesting that additional opportunities would continue to meet participant needs and interests. Finally, teachers who participated in professional development indicated they found the workshop highly applicable to their work and would be using techniques they learned in their own classrooms.

Long-term outcomes were similarly concerned with science literacy (knowledge, interest, and identity), however, with greater aim for adoption within the Fuller Park Community. Environmental literacy of community members was monitored in terms of science learning and confidence at a variety of programs. Generally, respondents consistently gave high ratings of having *learned new things¸* and *I feel smart here today*. Participants appeared to feel less *challenged* by what they did in the programs, though this may have been interpreted as either "too difficult" or "provided an opportunity for growth" by respondents. Although their comfort with science was measured consistently, no clear trends emerged regarding increases; ZAP! programs in 2016 reported highest increases (86% of participants grew more comfortable with science) and Pumpkin Fest (a CCAD program) in 2016 showed lowest gains in science comfort (31% indicated they were more comfortable after the event). Again, Fuller Park capacity for science learning was measured via several opinions regarding programming. Consistently, programs showed high average ratings for statements like, *I am having fun today, I would like to do more things like this,* and *I feel proud of what I'm doing today.* Increases were recorded across programs for the connection between participants and their environment; three of the five programs demonstrated 85% or more of participants had gained greater connection to their environment. Participants likewise appreciated the presence and involvement from the Brookfield Zoo, believed Eden Place Nature Center was a valuable asset to the community, and reflected on how far the neighborhood had come with the opening of the Nature Center for the public.

Broadening access to and participation in environmental science learning opportunities was a final long-term outcome addressed by SCIENCS. Early attendance reflected low participation in programs hosted at Eden Place Nature Center, and transportation was identified as a key way SCIENCES had expanded the availability of making trips to use other environmental science resources, like the Little Red Schoolhouse, Brookfield Zoo, and the Canaryville Library. Participants reminded the project team to create programs and offerings centered around community needs, rather than their own ideas. Some ideas elicited from community members included: community garden plots, more frequent programming, increased outreach to local partners, and opportunities for children promoted via schools. For participants, programs offered through SCIENCES appeared to be a key point of access to environmental science learning opportunities. Participants indicated that ZAP!, in particular, was *inspiring* and *special/unique.* Most participants who indicated they had a personal connection to nature found these through being outside (e.g., walking dogs, taking youth/elderly outdoors) or through gardening (at home or with a community garden), and some indicated that they had new ideas for their connection to the outdoors via SCIENCES programming.

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Beyond planned outcomes, SCIENCES programs made some key achievements outside of their intended scope. An extensive reach was one such unexpected outcome. Consistently, over half of participants completing surveys indicated zip codes outside of Fuller Park. Youth-focused programs had an apparent greater local pull. Members of these neighboring communities saw the value in SCIENCES programs for their own neighborhoods. Sharing resources enabled participants to cross historically instilled boundaries, as well as take pride in and showcase the positive efforts made in Fuller Park.

Another key finding was that participation in programming was heavily dependent on interpersonal relationships and social networks. Many participants shared that they had been invited to programs by Eden Place Nature Center founders or a Brookfield Zoo educator. Others came at the encouragement of peers, friends, and family. Likewise, relationships that were established developed investment into the programs and fostered a sense of community. Within programs, the relationships forged between participants were often based around points of connection (e.g., shared experiences) or learning to build up others with interpersonal skill practice for youth (e.g., complimenting others and conflict resolution). Other participants negotiated their relationships with the community in their roles as a contributor to and champion for science and nature; some saw events as a good way to connect with new people and gave them a sense of belonging, while others used what they learned from SCIENCES programs to educate and inspire friends and neighbors to approach projects like a home garden. Finally, genuine exhibited care for participants from Eden Place Nature Center and Brookfield Zoo staff greatly contributed to community and individual investment in the programs.

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The **Chicago Zoological Society** is a private nonprofit organization that operates Brookfield Zoo on land owned by the Forest Preserves of Cook County. The Chicago Zoological Society is Association of Zoos and Aquariums (AZA) Accredited. (www.czs.org)

Eden Place Nature Center is an urban oasis in Chicago's south side Fuller Park neighborhood encompassing an area of one city block. Eden Place was founded by a local family in 2003 following the discovery that the neighborhood had the highest lead level in Chicago. The nature center was created through community action, clearing an illegal dump site and establishing a public natural habitat. (www.edenplacenaturecenter.org)

Fuller Park is a less than one square mile residential and industrial region bounded by two rail lines and an express way. 90% of Fuller Park's approximately 2,500 residents are African American. 50% are below poverty level, 30% are unemployed, and over 25% of adults do not have a high school diploma. Fuller Park has long been one of Chicago's severely geographically isolated, under-resourced neighborhoods.

Zoo Explorers Club (Explorers) is a free STEM program designed for youth ages 11-13. It included hands-on, nutrition, and garden based science at the Eden Place Nature Center Children's Garden and ran in summer months.

Zoo Adventure Passport (ZAP!) is a free after school program for families with children ages 3-12, which met for several sessions in the spring months. ZAP! povided hands-on science activities designed to be fun and family oriented.

Nature Play early childhood programs provided play settings for nature-based early learning, and engaged young children and their families to foster lifelong connections with nature.

Events at Eden Place Nature Center such as the Earth Day Celebration and the Pumpkin Patch Festival were **Community Conservation Action Day** opportunities for all ages to come together to enjoy the outdoors.

According to the Brookfield Zoo website**, NatureStart™** is a professional development program that trains informal educators in museums, zoos, aquariums, and nature centers, along with other professionals who interact with young children and families, to develop and facilitate early childhood nature play programs, create play settings for nature-based early learning, and engage and interact with young children and their families to foster lifelong connections with nature. NatureStart™ ideals are incorporated in Brookfield Zoo exhibits, community outreach initiatives, and professional development programs. (https://www.czs.org/naturestart)

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Front-End Evaluation

Date	Description	Data Sources
1/16-20/2014	Fuller Park stakeholder interviews (community members, science teacher, police officer)	Interviews: n= 9

Formative + Summative Evaluation

Date	Type of Program	Program Name	Data Sources
8/22/2014	Early Childhood Educator Professional Development (NatureStart)	NatureStart Fuller Park Schools	Surveys: n= 4
8/23/2014	Community Action Day	Community Action Day	Surveys: n= 8
8/28/2014	Early Childhood Educator Professional Development (NatureStart)	NatureStart Fuller Park Schools	Surveys: n= 17
9/10/2014	Teacher Professional Development	Science Fair Preparation Teacher Workshop	Surveys: n= 6; Observations: n= 2
9/20/2014	Community Action Day	Community Action Day	Surveys: n= 1
10/11/2014	Community Action Day	Pumpkin Fest	Surveys: n= 5
10/21/2014	Connections Class	Science Inquiry	Surveys: n= 2; Observations: n= 2
10/22/2014	Connections Class	Learn to Observe	Surveys: n= 2; Observations: n= 1
10/30/2014	ZAP! (Zoo Adventure Passport!)	ZAP! Nature's Partner	Observations: n= 2
11/20/2014	ZAP! (Zoo Adventure Passport!)	ZAP! Bats, Bees, and Butterflies	Surveys: n= 13; Observations: n= 2
12/3/2014	Connections Class	Science Inquiry	Surveys: n= 3; Observations: n= 2
12/18/2014	ZAP! (Zoo Adventure Passport!)	ZAP!	Surveys: n= 6; Observations: n= 1
1/20/2015	Connections Class	Bats	Surveys: n= 4; Observations: n= 2
1/20/2015	Connections Class	Bats	Surveys: n= 5; Observations: n= 2
1/28/2015	Zoo Talks	Local Habitats	Surveys: n= 1
3/4/2015	Early Childhood Educator Professional Development (NatureStart)	NatureStart Fuller Park Schools	Surveys: n= 7
4/25/2015	Community Action Day	Sensory Garden Work	Surveys: n= 6; Observations: n= 1
4/30/2015	ZAP! (Zoo Adventure Passport!)	ZAP! Pollinator's Journey	Surveys: n= 1

5/28/2015	ZAP! (Zoo Adventure Passport!)	ZAP! Growing with Pollinators!	Surveys: n= 6
7/30/2015	Summer Camp		Photographs (of camp artifacts): n= 18
7/31/2015	Summer Camp		Phone Interviews: n= 3; Photographs: n= 20
8/3/2015	Explorers	Flowers, Seeds, Birds, and Bees	Observations: n= 1
8/11/2015	Teacher Professional Development	Teaching & Learning with Monarch Butterflies Teacher Workshop	Surveys: n= 17
8/13/2015	Explorers	Conservation Science Explorers	Surveys: n= 6
8/15/2015	Community Action Day	Fuller Park District Back to School Event	Photographs: n= 5; Observations: n= 1
8/22/2015	Teacher Professional Development	Professional Development Day	Surveys: n= 6
9/3/2015	ZAP! (Zoo Adventure Passport!)	ZAP! Break Down H2O	Surveys: n= 6
9/24/2015	ZAP! (Zoo Adventure Passport!)	ZAP! Hydrologic Cycle	Surveys: n= 1
10/8/2015	Teacher Professional Development	Science Fair Preparation Teacher Workshop, SCIENCES & ISTE	Surveys: n= 4
10/17/2015	Community Action Day	Pumpkin Fest	Surveys: n= 17; Phone Interviews: n= 2; Observations: n= 1
11/7/2015	Community Action Day	Clean and Green Day + Rain Barrel Workshop	Surveys: n= 5; Observations: n= 1
1/14/2016	Connections Class	Science Inquiry	Surveys: n= 4; Observations: n= 1
2/11/2016	Other	Science Fair 2016	Surveys: n= 3
2/20/2016	Community Action Day	Family Nature Play Trip	Surveys: n= 6; Phone Interviews: n= 3; Observations: n= 1
3/23/2016	Connections Class	Nature Hike	Surveys: n= 2; Observations: n= 1
4/7/2016	Connections Class	Nature Hike	Surveys: n= 4
4/7/2016	Connections Class	Nature Hike	Surveys: n= 4
4/22/2016	Community Action Day	Earth Day Block Club Party	Surveys: n= 14; Observations: n= 1
4/26/2016	Connections Class	Water Quality	Surveys: n= 4; Observations: n= 1
5/12/2016	ZAP! (Zoo Adventure Passport!)	ZAP! Let's Get Dirty!	Surveys: n= 4; Observations: n= 1
5/19/2016	ZAP! (Zoo Adventure Passport!)	ZAP! Eatable Edibles & The Clean Machine	Surveys: n= 1; Observations: n= 1
5/26/2016	ZAP! (Zoo Adventure Passport!)	ZAP! Wetlands	Surveys: n= 2; Observations: n= 1
6/2/2016	ZAP! (Zoo Adventure Passport!)	ZAP! Bugs Everywhere	Observations: n= 1
7/26/2016	Summer Camp		Photographs: n= 21; Observations: n= 1

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7/28/2016	Summer Camp		Photographs: n= 21; Observations: n= 1
7/29/2016	Summer Camp		Observations: n= 1
8/1/2016	Summer Camp		Observations: n= 1
8/2/2016	Summer Camp		Observations: n= 1
8/4/2016	Summer Camp		Observations: n= 1
8/5/2016	Summer Camp		Observations: n= 1
8/8/2016	Explorers		Journal Entries: n= 6
8/9/2016	Explorers		Journal Entries: n= 9; Observations: n= 1
8/10/2016	Explorers		Observations: n= 1
8/11/2016	Explorers		Journal Entries: n= 7; Observations: n= 1
8/15/2016	Explorers		Journal Entries: n= 7; Observations: n= 1
8/16/2016	Explorers		Journal Entries: n= 7
8/16/2016	King Conservation Science Scholars (Teen volunteer program)		Focus Groups: n= 7
8/17/2016	Explorers		Journal Entries: n= 2; Observations: n= 1
8/18/2016	Explorers		Journal Entries: n= 5; Observations: n= 1
10/15/2016	Community Action Day	Pumpkin Fest	Surveys: n= 16; Phone Interviews: n= 3; Photographs: n= 5; Observations: n= 1
1/19/2017	ZAP! (Zoo Adventure Passport!)	Canaryville Library Event: Nature Play Program	Surveys: n= 9; Observations: n= 2
3/11/2017	ZAP! (Zoo Adventure Passport!)	NatureStart visit at Sand Ridge Nature Center	Surveys: n= 8; Observations: n= 2
4/21/2017	Community Action Day	Earth Day 2017	Observations: n= 2
5/4/2017	ZAP! (Zoo Adventure Passport!)	Food Effects	Surveys: n= 3; Observations: n= 1
5/11/2017	ZAP! (Zoo Adventure Passport!)	We Are What We Eat	Surveys: n= 2; Observations: n= 1
5/25/2017	ZAP! (Zoo Adventure Passport!)	The Children's Garden Project	Adult Focus Groups: n= 10; Youth Interviews: n= 3; Observations: n= 1
5/27/2017	Community Action Day	ZAP! Conservation Action Day	Observations: n= 2
6/23/2017	ZAP! (Zoo Adventure Passport!)	Nature Play Day	Observations: n= 1
8/7/2017	Explorers		Observations: n= 1
8/8/2017	Explorers		Observations: n= 1

8/10/2017	Explorers		Observations: n= 1
8/14/2017	Explorers		Observations: n= 1
8/15/2017	Explorers		Youth Interviews: n= 10; Observations: n= 1
8/16/2017	King Conservation Science Scholars	Scholars + Staffs	Staff Focus Group: n=6; Scholar Interviews: n= 2
8/17/2017	Explorers		Observations: n= 1
8/22/2017	Explorers		Observations: n= 1
8/25/2017	Explorers		Observations: n= 1
8/28/2017	Explorers		Observations: n= 1
8/29/2017	Explorers		Phone Interviews: n= 1; Journal Entries: n= 11; Observations: n= 1