

2013

Opening Minds to Science

The Saint Louis Science Center's Report to the Community





**From the President and Chief Executive Officer,
Bert Vescolani**

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Dear Friends, Partners, and Supporters,



I am pleased to introduce *Opening Minds to Science: The Saint Louis Science Center's Report to the Community, 2013*. This report presents an overview of what we have learned from and about our visitors in 2013.

At the Saint Louis Science Center, we take a visitor-first approach in all that we do. We recognize the importance of understanding our visitors - who they are, what interests them, and how they experience the Science Center. This information is vital to how we develop and deliver world-class exhibits and programs.

Opening Minds to Science provides information on our audiences' demographics and visitation patterns, gives an overview of our visitors' comments about their Science Center experiences, and highlights how evaluation helps us to shape exhibits, such as our new agriculture exhibit, currently in development, and educational programs, such as Youth Exploring Science (YES).

We hope you will find this report useful and we welcome your feedback.

Sincerely,

A handwritten signature in black ink, appearing to read "Bert Vescolani". The signature is fluid and cursive, written over a light grey horizontal line.



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The Saint Louis Science Center's Educational Philosophy

The Saint Louis Science Center is a free-choice, informal learning environment where people of all ages engage with science – directly and on their own terms. We seek to engage the broadest audience possible through experiences designed for families, school groups, educators, teens, community organizations, adults, and the general public visiting the Science Center.

Our mission is to ignite and sustain lifelong science and technology learning.

Opening Minds to Science

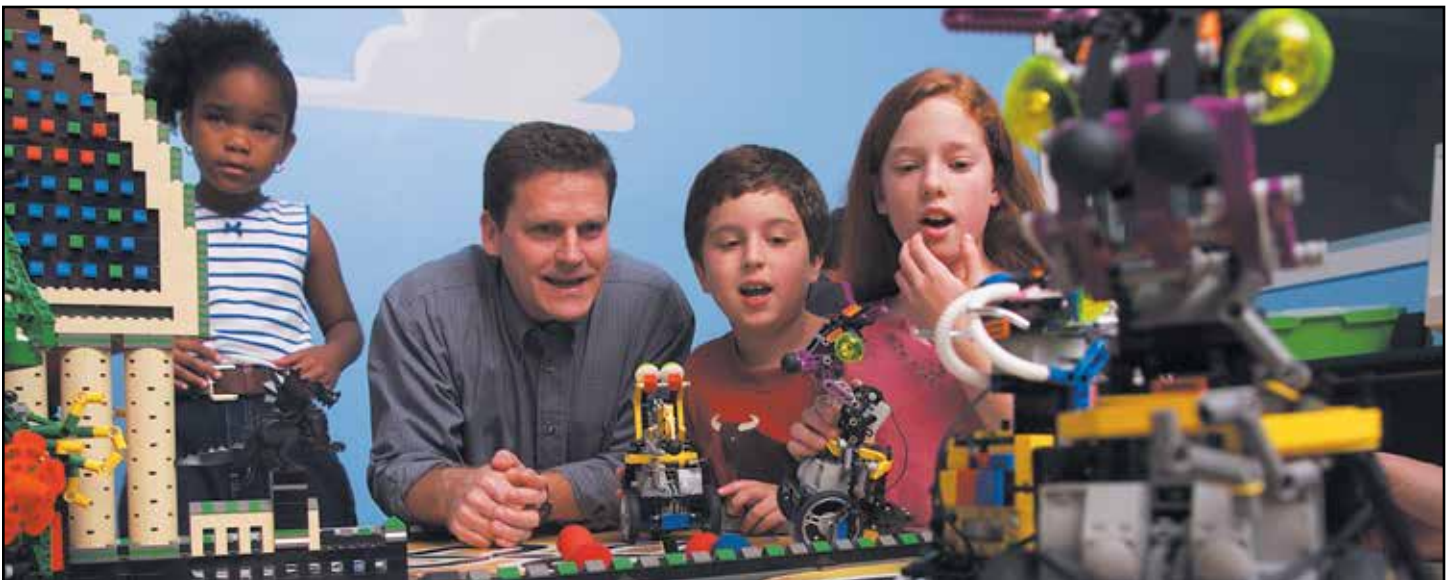
Our exhibitions and programs take into account the complete visitor environment – physical, social, and personal. We believe that learning is best fostered through programs and exhibitions that encourage visitors to:

- Make personal connections to their knowledge and experiences
- Embrace a spirit of play and discovery
- Act on their own curiosity
- Form and ask questions
- Engage in hands-on exploration and experimentation
- Cultivate science process skills
- Pursue science throughout their lives

Positive experiences with Science Center exhibitions and programs will encourage repeat visits and prompt visitors to interact with science beyond their visit. Ultimately, we hope to motivate our visitors to think differently about science and to empower them to make informed choices in their everyday lives.

Learning in an Informal Environment

Free-choice learning “tends to be non-linear and personally motivated” (Falk and Dierking, *Learning from Museums: Visitor Experiences and the Making of Meaning*, 2000). In designing our programs and exhibitions, we strive to provide multiple levels of interaction and engagement for diverse audiences. This translates into experiences that are accessible, multi-sensory, and meaningful to people with a variety of abilities, cultural backgrounds, experiences with science, learning styles, and interests. We also seek to support social learning, experimentation, and investigation. We believe visitors should have fun, engaging, relevant, and successful experiences with science, whatever their level of knowledge. Science Center staff play a key role in fostering a successful experience.



How We Develop Exhibitions and Programs

In order to develop exemplary exhibitions and programs, we ground our processes in best practices in the field, current science content, current learning theory, and audience research. Clearly-articulated educational goals and objectives drive the exhibition and program development process. As appropriate, we correlate our offerings to national and state curriculum standards. Through front-end, formative, and summative evaluation, we include our audiences and other stakeholders in the program and exhibition development and revision process.

In developing these experiences, we seek to communicate clearly how we envision visitors engaging with them, employing devices such as authentic tools and methods to personalize the experience. We take risks with cutting-edge content, ways to deliver that content, and ways of including new audiences.



Our exhibitions capitalize on the power of three-dimensional environments to engage our community with science. Our exhibitions must engage a broad spectrum of visitors. We recognize that every exhibit component cannot meet all the needs of all our audiences, but we seek to create a balance of experiences within the exhibition as a whole.

We commit to developing exhibitions that:

- Provide multiple conceptual entry points and multiple outcomes
- Present current science information and can be adapted to stay current
- Facilitate conversations and encourage visitors to engage with each other



Our programs engage our community with science via skilled, well-trained program developers and presenters. Often developed based on the needs of specific audiences, programs both expand on conversations begun in our galleries and incorporate topics and experiences beyond the scope of our galleries. Consequently, programs deepen our audiences' engagement with science and broaden the Science Center's impact. Programs also increase the size and diversity of our audience and generate revenue crucial to our ongoing work.

We commit to developing programs that are:

- Learner-centered
- Delivered by knowledgeable and well-trained presenters
- Facilitated in a manner that actively matches content and delivery to the needs of the current audience



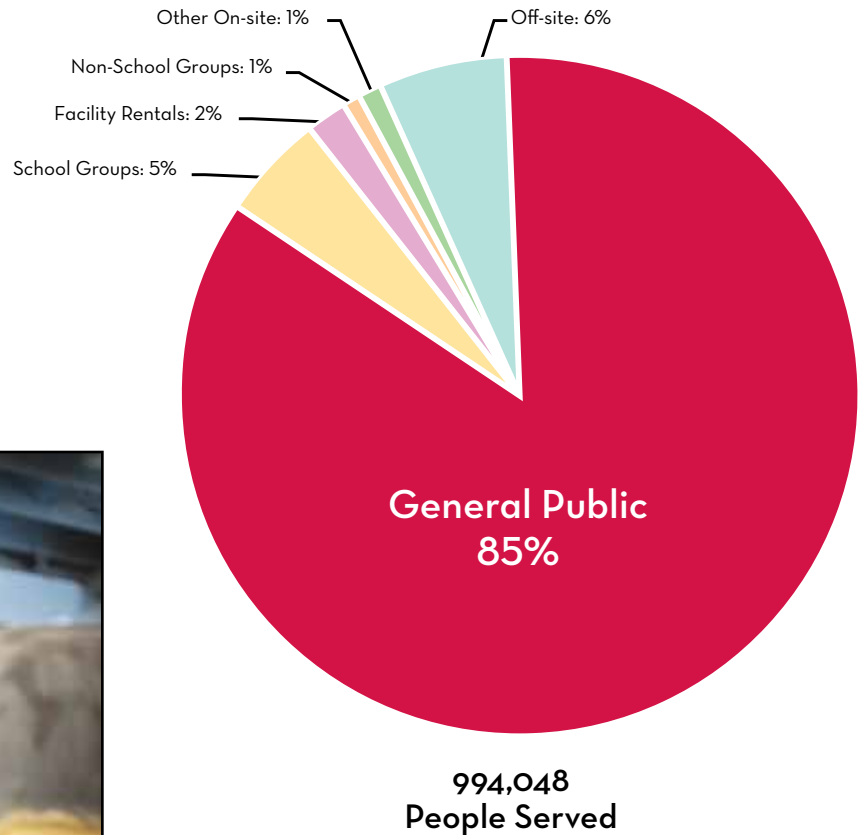
Thoughtful planning supports our exhibition and program development process. A focused and fiscally sound plan, based on this learning philosophy, addresses each of our audiences and content areas. A review process allows us to monitor our impact and track our success toward opening minds to science.

People Served

How many people does the Saint Louis Science Center reach?

The Saint Louis Science Center tracks daily attendance through the use of on-site door counters and by tracking attendance at off-site programs.

In 2013, the Science Center reached 994,048 people. The majority, 94% (938,368 people), were on-site visitors. The remaining 6%, (55,680 people), experienced educational programs and community outreach activities at off-site locations, such as schools, community centers, and the Challenger Center-St. Louis.



How do we learn about our visitors?

Our visitors and their experiences are central to everything we do at the Saint Louis Science Center. Therefore, we routinely conduct evaluation studies to better understand our visitors and their experiences with Science Center offerings. These studies are designed following best practices in the field of visitor studies. Data are systematically collected, analyzed, and communicated so they can inform decisions about exhibitions, programs, and operations. This is accomplished through methods such as surveys, comment cards, interviews, and observations.

Data presented in this report were collected through a variety of studies, including:

Seasonal exit interviews of adult, general public visitors that provide the Science Center with key information including visitor demographics and visitation patterns.

Comment cards that staff distribute each day to a random sample of visitors throughout the facility with the invitation to, “let us know how your visit goes today.”

Front-end exhibit evaluation studies, which are used by exhibit development teams to better understand what our audiences know, don't know, and are interested in learning about related to an exhibit topic.

The Science Center's internally developed System for Assessing Mission Impact (SAMI), which collects and summarizes key performance indicators for educational programs.

Summative evaluation studies, which assess the overall impact and successfulness of an exhibit or program. These in-depth studies provide feedback to funders as well as exhibit and program developers.

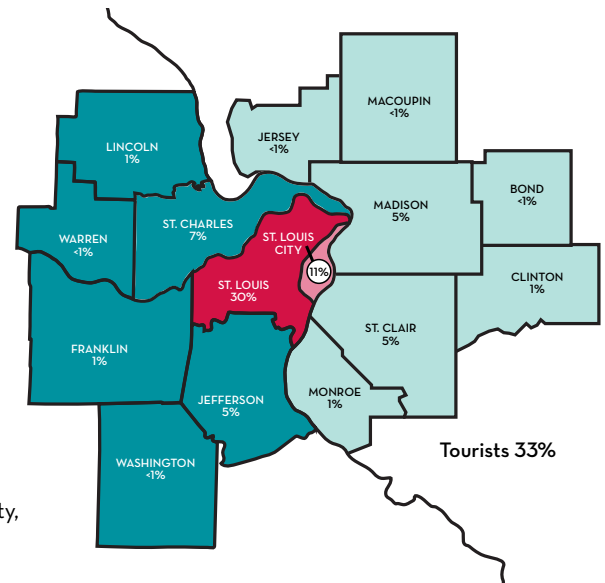
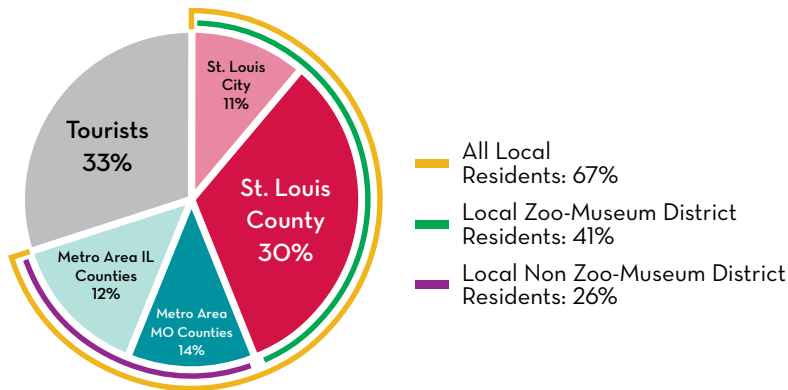


General Public Audience Profile

Who are our visitors?

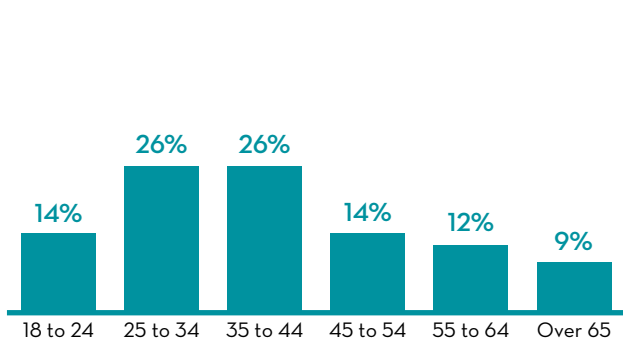
Seasonal exit interviews in the spring, summer, and fall/winter, in which a randomized sample of adult, general public visitors are invited to participate in an interview at the end of their visit, provide key information on demographics and visitation patterns. In 2013, a statistically valid sample of 1,009 visitors were interviewed.

General Public Visitors' Residence



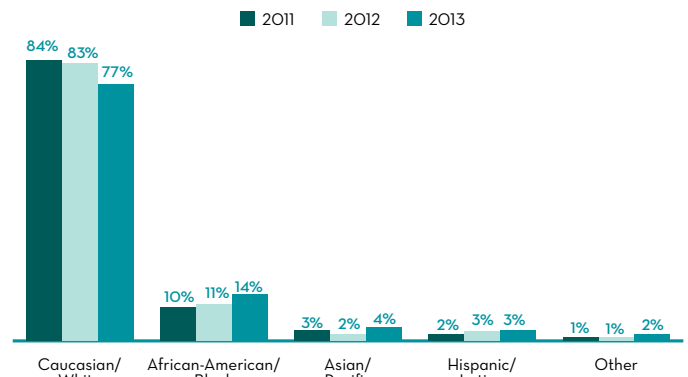
The majority of visitors (67%) reside in the Metro St. Louis area, including St. Louis City, St. Louis County, and the surrounding Metro areas counties in Missouri and Illinois.

Age Ranges of Adult, General Public Visitors



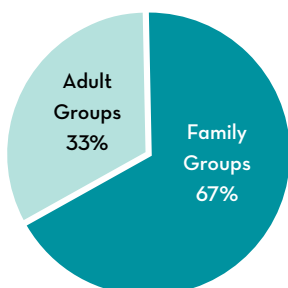
The majority of adult visitors are between the ages of 25 and 44.

General Public Audience Ethnicity



Over the past three years, African-American/Black visitors represent a growing portion of general public visitors.

Group Type

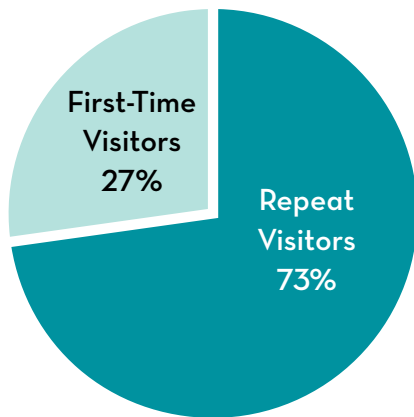


Two-thirds of adult visitors come in a family group. The typical family group includes two adults and two children. The median age of the oldest child is 8. The median age of the youngest child is 5.

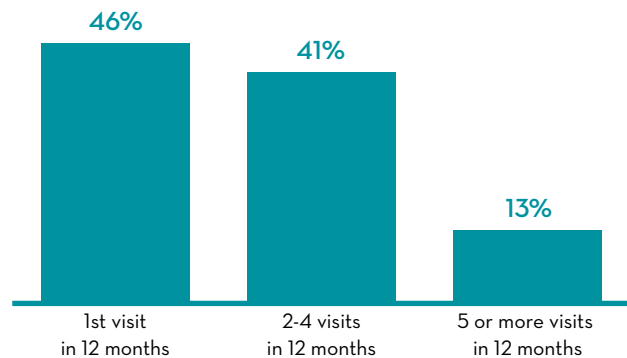


What do visitors do during a typical visit?

First-Time vs. Repeat Visitors

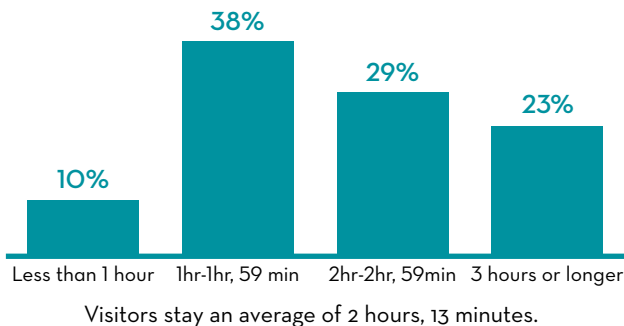


How often do repeat visitors come to the Science Center?

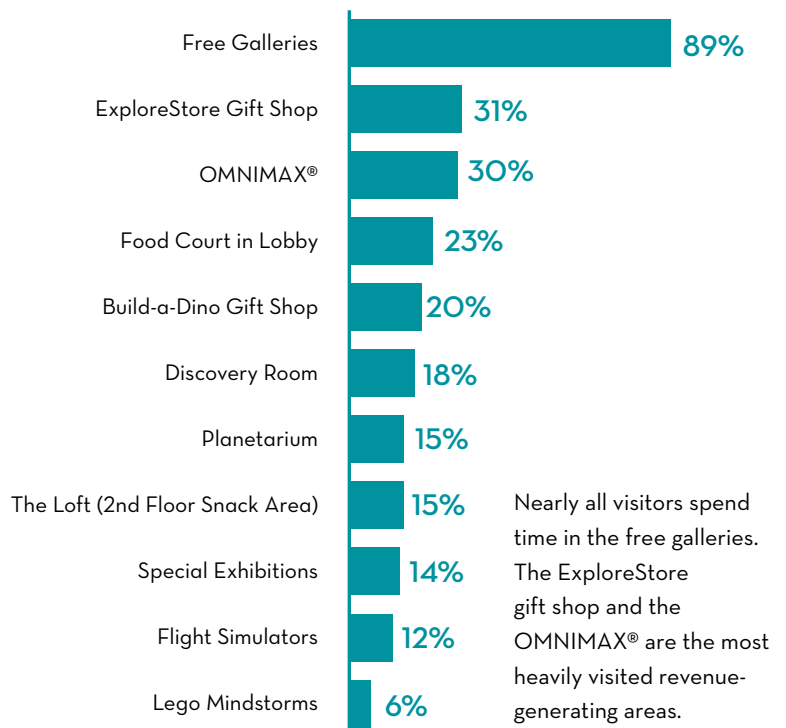


Nearly three-quarters of general public visitors are repeat visitors. On average, these repeat visitors came to the Science Center 2.8 times in the previous year.

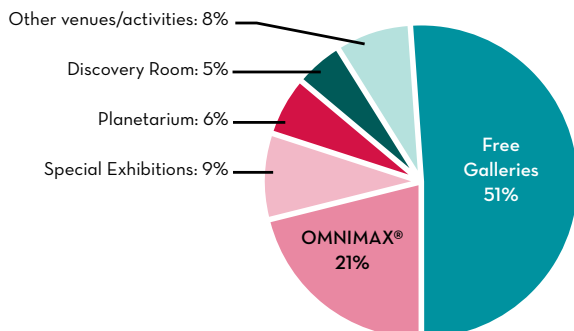
How long do visitors stay at the Science Center?



Areas Visited (Multiple responses possible. Total exceeds 100%.)



Primary Reason for Visiting



The majority of visitors came for the free galleries. Another one-fifth came specifically for the OMNIMAX®.

Visitors' comments are coded into 23 different categories based on the topic addressed. The comments are also identified as either a "Positive/General" comment, which expresses either satisfaction or no problem, or an "Opportunity for Improvement", which expresses either dissatisfaction or offers a suggestion.

Of the 1,346 cards visitors completed in 2013, 85% included at least one comment. A total of 1,716 individual comments were collected from all the cards. A sampling of comments is presented below.

Positive/General Comments:

OMNIMAX®:

"Thank you for keeping the IMAX shows around for several months so we can bring our friends & family."

"Butterfly Migration was just beautiful. The Omnimax theatre was so great, we felt like we were there. Thank you."

"Jerusalem was spectacular! Thanks so much! Have been there several times. This was all I hoped it to be & more!"

General:

"The kids didn't want to leave! Thanks for providing a great fun & educational experience!"

"Enjoyed very much. A true gem of St. Louis. Thanks!"

"It was a wonderful visit to the Science Museum. There was so much to see and to do that I can't wait to return. It is one of the best science museums I have visited."

Gallery Content:

"We always loved the Science Center and look forward to seeing the old favorites and the new exhibits!"

"We visit fairly often. We enjoyed the energy exhibit for the first time today. It was well done."

"Enjoyed demonstrations and hands-on activities. Our 10 year old granddaughter loved Cyberville and aquarium."

"The kids had fun digging for bones. The whole museum is educational and entertaining."

Staff:

"Every employee was very friendly, informative, helpful and courteous. I wish I had their names - your staff is excellent."

"I was very pleased that on our last visit there were many staff members on hand to help and answer any questions! We had a great visit!!"

Opportunities for Improvement:

Gallery Content:

"Hope you'll be updating some of the older hands-on exhibits soon."

"Are outdoor activities or exhibits possible?"

Parking:

"Have access door at the parking lot instead of having people walk outside, around building in weather."

OMNIMAX®:

"Imax movie was expensive and not picture quality we expected."

Addressing visitor suggestions:

In the coming years, future planned improvements include:

- Ongoing exhibit updates including a new, outdoor agriculture exhibition.
- A new main entrance on the south side of the building - much closer to parking.
- Conversion to digital projection technology for the OMNIMAX® Theater and James S. McDonnell Planetarium.



Front-End Exhibit Evaluation

How does front-end evaluation inform the exhibit development process?

Front-end evaluation is the initial research into what visitors know, are interested in, and have questions about for a certain topic. It can involve online surveys, interviews, and/or focus groups with particular audiences, including content advisors. In the early stages of exhibit development, front-end evaluation provides key information used to shape an exhibition's design, experience, and content.

Developing an Agriculture Exhibition

In 2012, Saint Louis Science Center exhibit designers began planning for a new, outdoor agriculture experience. To help inform this process, the Science Center formed an advisory group consisting of scientists, farmers, educators, and community and industry leaders, all with expertise in fields related to agriculture. These advisors provided their perspectives on what they thought were the most important concepts to communicate to our visitors.

The range of topics advisors felt were important for visitors to learn varied as much as the group's backgrounds and viewpoints:

- Changes in agriculture over time
- Food production and understanding agriculture produces more than just food
- Basics of plant biology
- Technological innovations and the science behind agriculture
- Organic farming and basic agricultural practices such as planting
- Domestication and crop origins
- Usage and preservation of natural resources
- Risk factors and external influences

Evaluators also interviewed a sample of 56 Science Center visitors, including both adults and children, to understand what they already knew and were interested in learning about regarding agriculture, as well as what they expected to do in an agriculture exhibition at the Science Center. The complete report from this study is available online at: <http://informal.science.org/images/evaluation/AgFrontEndReportVisitorInterviews.pdf>. Key findings and their implications for exhibit development are presented on the following page.



Photo courtesy of Schilling Farms; Rodney Schilling, content advisor

Words respondents associated with farming/agriculture:

Animals	Overall Sample (N=56)
Cows	54%
Animals	46%
Pigs/Hogs	29%
Plants	Overall Sample (N=56)
Corn	73%
Crops	57%
Beans (soy)	29%
Plants	27%
Wheat	27%
Farmers and What They Do	Overall Sample (N=56)
Growing	41%
Raising	36%
Feeding	27%
Planting	25%

Familiarity with Farming

Finding

More than 90% of respondents had been to a farm at some point in their life and most rated themselves as “somewhat familiar” with farming. Things that came to mind were tractors, combines, cows, and corn.

Implication

Because many visitors are already familiar with farming, this exhibition can give visitors a chance to explore other farming methods and new ways to think about existing processes, allowing visitors to make connections beyond what they might expect as a “normal farm.”

Content Expectations

Finding

Visitors who were less familiar with farming heavily associated animals with farming. Those more familiar with farming were more likely to mention plants in describing their experiences on farms. Both groups of respondents mentioned farmers’ daily activities.

Implication

This suggests the importance of representing both animals and plants in the exhibition as well as demonstrating different aspects of what farmers do.

Topic Interests

Finding

Children were interested in animals, growing food, farmers, and technology used on farms. Adults were more interested in the economic and environmental factors of agriculture as well as health and nutrition concerns.

Implication

Understanding which topics are of greatest interest to different age groups helps to determine which experiences are best suited for adults, for children, and for mixed age groups.

Experience Expectations

Finding

Children typically expected to see animals and plants, have hands-on experiences, and see or use farm machinery and tools. Adults’ expectations connected more closely to learning about the processes of farming.

Implication

Outdoor, hands-on experiences with tools, plants, and animals will allow visitors to engage in authentic farming activities.

Connections to Food

Finding

Food was not top of mind for respondents when they thought about farming or agriculture despite most respondents mentioning animals and/or plants. Only 38% of respondents mentioned food. Children were less likely to mention food in their responses than adults.

Implication

In order to communicate one of the key concepts advisors felt was important for visitors to learn, designers will need to make connections between food (and other farming products) and the processes by which they are developed or created.

Technology

Finding

When asked about technology used in agriculture, two-thirds of respondents talked about machines such as tractors and combines. The majority of adults also mentioned genetic engineering, with both positive and negative associations, as well as varying levels of knowledge about the topic.

Implication

Big machines will likely be a key component of the exhibit experience. Understanding audiences’ different levels of knowledge and diversity of perspectives about genetic engineering will make it important to approach genetic engineering through the lens of science.

Educational Programs

How do we track engagement in Science Center programs?

At the Saint Louis Science Center, we define programs as, “staff-led interactions scheduled for a specific audience with written educational goals and objectives.” The Science Center offers programs to a wide range of audiences, including: children, families, educators, school groups, and adults.

Since 1997, the Saint Louis Science Center has collected information about the experience of participants in our programs. Our System for Assessing Mission Impact (SAMI) tracks the frequency with which programs occur, the number of participants, and total hours of interaction. A sampling of program participants are invited to complete a brief survey that includes four questions, each on a 4-point scale, that assess knowledge gained, enjoyment of the program, interest in science, and attitude towards science. The survey also provides space for participants’ comments about their experiences in their program as well as basic demographics.

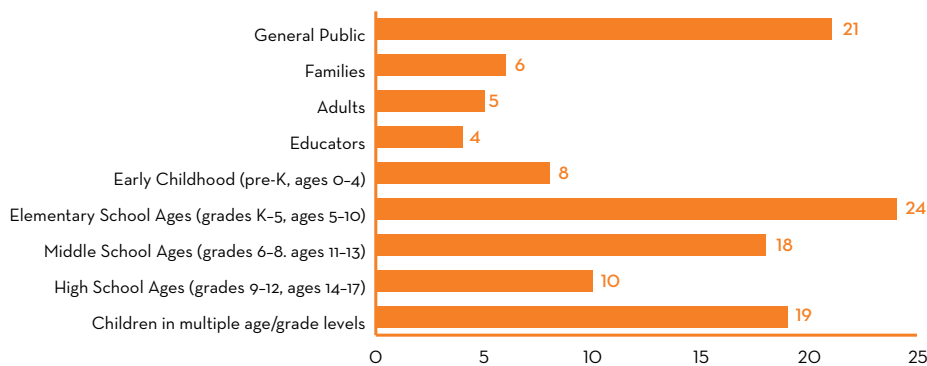
What types of programs does the Science Center offer?

In 2013, education staff delivered 78 programs a total of 6,273 times. Programs included seasonal programs such as Summer Science Blast, recurring programs such as Examining the Evidence, and daily programs such as Amazing Science Demonstrations.

An “interaction” represents each time a visitor participated in a

program. Interactions varied in length from a five-minute trip through activities at Pi Day to a seven-day Paleotrek in Montana. In 2013, 266,510 program interactions took place for a total of 237,759 hours of engagement. We track programs based on the audiences they serve. Some programs, such as Summer Science Blast, serve more than one type of audience.

Number of Programs by Audience



Audience Served	Interactions
General Public	182,714
Families	818
Adults	1,076
Educators	274
Early Childhood (pre-K, ages 0-4)	52,001
Elementary School Ages (grades K-5, ages 5-10)	11,090
Middle School Ages (grades 6-8, ages 11-13)	5,175
High School Ages (grades 9-12, ages 14-17)	2,491
Children in multiple age/grade levels	10,871

“I got to fly a plane for the first time. I will never forget this!”

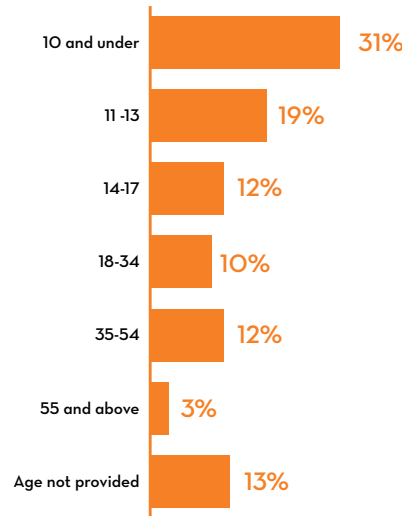
- Summer Science Blast, Flight Academy Camp Participant

Who participates in programs?

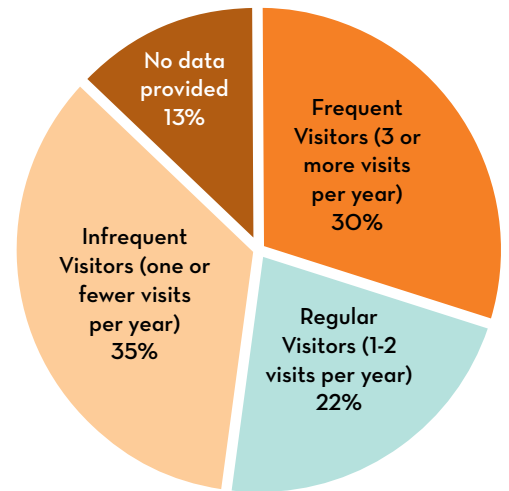
During many programs, participants had the opportunity to fill out a brief survey about their experience. In 2013, program participants completed a total of 6,758 survey cards. Through the survey cards, we learn about their experience as well as gather basic demographic information.

Science Center Members completed 20% of the survey cards. Another 55% of the cards were completed by non-members. The remaining 25% did not indicate their membership status.

Program Survey Respondents' Age Ranges



Program Survey Respondents' Visit Frequency

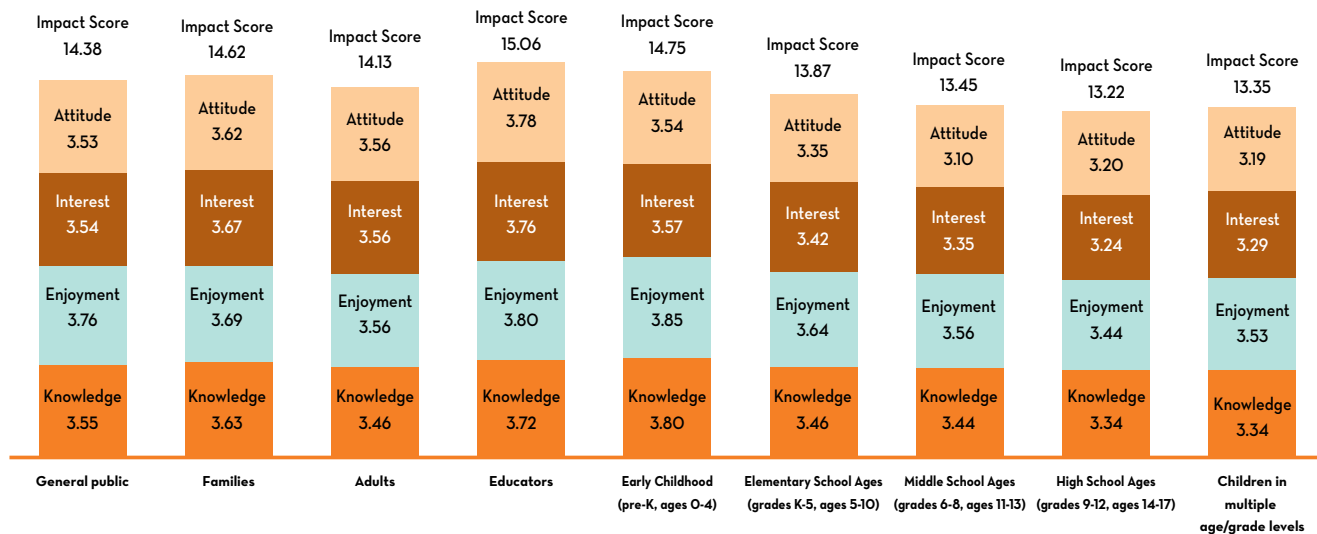


What is the immediate impact of programs?

Saint Louis Science Center's Definition of "Impact":

On an individual level, impact results from a Science Center offering that enables a participant to make personal connections between the content and experience of the offering and their own knowledge and experiences. In the short-term, this is illustrated by a change in knowledge/understanding, attitude, interest, or enjoyment.

Mean Impact Ratings by Audience



On the program surveys, participants answer four rating scale questions, which correspond to the four main components of the Impact definition: knowledge/understanding, enjoyment, interest in science, and attitude toward science.

The Knowledge, Enjoyment, Interest, and Attitude ratings, each of which is on a four-point scale, are summed to produce the Impact Score. The lowest possible Impact Score is four and the highest is 16. The Impact Score therefore provides a numerical way to represent the impact that participation in a program has on an individual.

Impact Scores serve as indicators of success. Staff can monitor how scores for one program relate to other programs delivered to the same audiences. In 2013, Impact Scores for individual programs ranged from 10.14 to 15.81 out of 16.00, with 92% of the programs having Impact Scores of at least 13.00, indicating a relatively high level of impact, overall.

Collectively, Science Center programs had a 2013 year-end Impact Score of 13.95. This is the second highest year-end Impact Score since the Science Center started collecting Impact data in 2009.

Summative Program Evaluation

How do we assess the effectiveness of programs?

Program evaluation informs the development and refinement of program content and design at various stages. When a program has been fully implemented or reaches the end of a funding period, summative evaluation studies assess the program's overall impact and success. These in-depth studies, which include interviews, observations, surveys, and more, provide feedback to funders as well as program developers. In addition to providing data about program effectiveness, summative evaluations also inform potential modifications if the program is continuing and provide insights that may be applicable to future programs.

What is the impact of YES on teen participants?

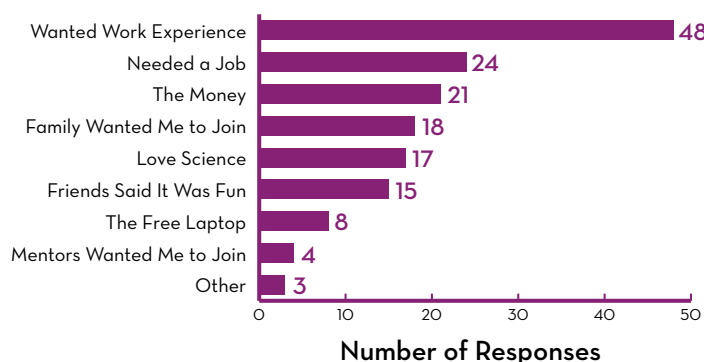
The YES (Youth Exploring Science) Program, which began in 1998, serves St. Louis area teenagers in a work-based, inquiry-based learning environment. YES teens are primarily recruited from over 65 partnering community organizations. Through the four plus-year program, educators strive to support these youth in gaining professional, academic and real world skills to assist them in building self-confidence and personal success. They gain exposure to STEM-related academic and career pathways, and gain experience through their work for the Science Center. The program is structured around different "components", focused around a topic, including astronomy, biology/environmental science, chemistry, engineering/design, science journalism, and teaching science to younger children.

From October 2010 through September 2013, the Science Center received funding from the United States Office of Naval Research (ONR) to explore ways to strengthen, refine, and share the YES Program model. Klein Consulting, under the leadership of Christine

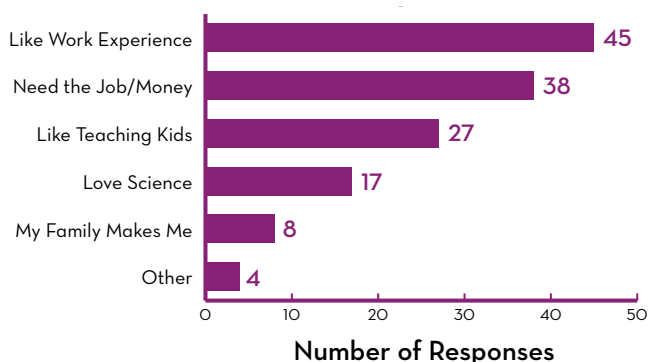
Klein, Principal, and with support from Carey Tisdal, Director, Tisdal Consulting, conducted a summative evaluation of the program as part of the support from ONR. The full evaluation explored the impact of the program on participants, how the program met its goals and objectives, the effect of increasing the number of teens in the program, and strategies for sharing its best practices. For this summary, we focus specifically on the impact on participants. The complete report is available at <http://informal-science.org/images/evaluation/CommunitySTEMOutreachSummativeEvaluation.pdf>.

Evaluation data included information on the 438 teens who participated in the YES Program over the three years supported by ONR. Demographic data included information on gender (53% female), ethnicity (87% Black or African-American), grade level in school (grades 7-12), cohort, and school type (most teens from public Missouri schools). Psychometric data included why teens joined the YES Program and why they kept coming back each year.

Why New Teens Joined YES



Why Teens Keep Coming Back to YES



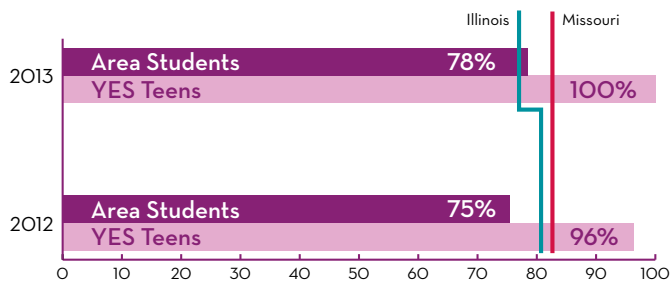
"I am forever grateful to the YES program. ... It kept me motivated and kept me loving science and mathematics."

- Former YES Teen, 1999-2003

Short term impact:

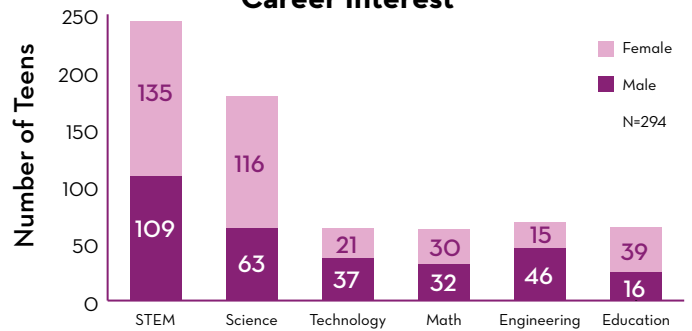
Results indicated that after 16 months of participation in YES, teens were more likely to 1) recognize the benefits and drawbacks of scientific advances to society, 2) see scientists as real people rather than media-produced stereotypes, 3) indicate enjoyment of their lessons in school science classes, and 4) be interested in science out of school and outside of the YES Program, and were slightly more likely to 5) have adopted the attitudes of scientists.

High School Graduation Rate



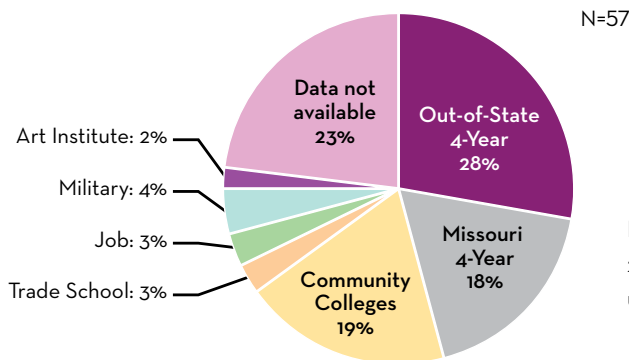
Short-term impacts also included high school graduation rates. Using data from seniors reached by YES staff and a weighted average for teens from the same area schools and districts, evaluators found that YES teens who completed their senior year in the YES program graduated at higher rates than area students.

Career Interest



Surveys of current YES teens asked them to list up to five careers they were interested in pursuing. Number of teens in the graph above show those who listed at least one career choice in science, technology, math, engineering, and education, with 83% (244/294) choosing at least one STEM career.

Post-High School Plans of YES Seniors, May 2013



Data on post-secondary plans of 57 graduating seniors in May 2013 showed that 70% planned to attend a four-year college or university, a community college, art institute, or trade school.

Long term impact:

When asked how well the YES Program prepared them for the workforce, a small sample (22) of YES alumni who responded to a survey gave a 4.53 average on a 5-point scale (5 = greatly helpful). When asked how well the YES Program prepared them for post-secondary education, the resulting average was 3.80 (helpful) on the same 5-point scale. When asked what influenced their choice of career, family and school experiences were most prominent with YES experiences a close third. Results indicate that networking, teambuilding, and teaching younger children were the aspects of the program that influenced respondents the most. Many of the respondents to the alumni survey were still in trade school, college, or graduate school at the time of the survey. Their areas of study varied widely with business and engineering as the two most prominent.





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