



Pilot Events – Summer 2015

Data Collected from Visitors at Building with Biology Events

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Introduction

In the summer of 2015, the Multi-Site Public Engagement with Science—Synthetic Biology project (DRL 1421179) held a series of eight Building with Biology pilot events which were designed to foster Public Engagement with Science (PES) about synthetic biology by having scientist volunteers interact and have discussions with the public through hands-on activities and forums. The events took place at:

- Arizona Science Center (Phoenix, AZ)
- Chabot Space and Science Center (Oakland, CA)
- Museum of Life and Science (Durham, NC)
- Museum of Science, Boston (Boston, MA)
- New York Hall of Science (New York, NY)
- Pacific Science Center (Seattle, WA)
- Science Museum of Minnesota (Saint Paul, MN)
- Sciencenter (Ithaca, NY)

This summary document shares evaluation findings from these pilot events that describe their impacts on public participants and offer data about potential areas for change when the events are replicated at 200 sites in 2016. The document focuses specifically on the experiences of public visitors to the Building with Biology events who interacted with hands-on activities. The document addresses the following evaluation questions:

- What do publics learn from their PES experience?
- What do publics learn from scientists?
- Does participation increase public participants' interests in PES or synthetic biology? If so, how?
- What follow-up behaviors does participation prompt in public audiences?
- What do publics value about their participation in PES?

To learn more about what evaluation can say about volunteers' experiences or the forums, please see the separate documents about those topics.

Data collection

During the Building with Biology pilot events in 2015, sites collected data from public visitors through one of three survey methods. The reason for the variety in methods was to pilot data collection for next summer and understand the methods that might work the best when Building with Biology is expanded to 200 sites in summer 2016. The Passport Survey was a paper survey that visitors completed at the event as part of a passport activity. The Event Survey was a stand-alone paper survey that visitors filled out at the event. The Online Visitor Survey required data collectors to gather email addresses from visitors so the survey could be sent after the event. This document summarizes data from all three surveys.

Each of the three surveys was slightly different. Some questions were asked on only one survey, while some questions were on all three. Throughout the document, we will use the following symbols to indicate which surveys' data are being shared:

- The Passport Survey (n=33) will be marked by a superscript P: ^P
- The Event Survey (n=34) will be marked by a superscript E: ^E

- The Online Visitor Survey (n=18) will be marked by a superscript O: ^o

In some cases, there were slight wording variances in the questions because of the time that the survey was collected or to test different questions. In terms of the timing of survey implementation, the Online Visitor Survey was completed after the event, so questions were in the past tense. The Passport Survey and Event Survey were completed at the event, so those questions were in the present tense. In terms of testing different questions, the Passport Survey asked respondents to consider the experiences of other group members while the Online and Event Surveys asked only about the individual's experience. The Evaluation Team reviewed the data and found that there were no notable differences in the responses based on the different question wordings, so data have been combined for this document. Additionally, the surveys asked multiple questions (11 and 12) about learning. The reason for this was to understand if there were any differences in what publics learned from the events as opposed to the scientists. The Evaluation Team will be revisiting all of these questions to make final determinations about the best wording choices for the summer 2016 data collection.

Data analysis

Quantitative data from this survey were analyzed descriptively using counts, percentages, and averages as appropriate. Qualitative data were coded inductively or, when possible, using pre-defined code lists developed from prior evaluation of PES projects. These pre-defined code lists make it easier to compare responses within and across surveys. For example, the two questions in the learning section of this document ask visitors to use their own words to describe what they learned from scientists and from the event overall. While the two questions are different and the individual responses were different, the data were coded based on their thematic content, as defined by the same code lists for both questions. This means that you can compare how, for instance, 12 visitors noted they learned facts about synthetic biology from scientists, whereas 5 visitors noted that they learned facts about synthetic biology from the event overall.

Themes within the data

These data present several descriptive themes that will be further explored through additional data collection in 2016. The themes are listed below, with the relevant question number(s) from the data in parentheses for reference. You will also find boxes in this document with questions to consider based on these themes:

- Visitors to Building with Biology events had a range of experiences, but most found the events enjoyable and reported increased interest in follow-up behaviors about synthetic biology (2, 3, 6 – 9).
- Visitors reported learning about synthetic biology and how it interacts with society. To a lesser degree, they learned about the scientist volunteers. This learning about synthetic biology was also seen from forum respondents, but forum participants rarely mentioned learning about the significance of synthetic biology and did not discuss learning about the benefits of synthetic biology (10 – 12, compare to forum data question 6, 7).
- Overall, visitors valued learning and interacting with experts (13).
- While visitors reported learning from the events, some of the data suggest that visitors were less likely to feel like they contributed to the events (6).

- One survey question asked visitors whether they considered the benefits of synthetic biology. All respondents agreed that they had considered these benefits. However, when visitors were asked whether they considered the risks of synthetic biology or weighed its pros and cons, not everyone agreed. Therefore, visitors seemed to consider the benefits of synthetic biology more than they weighed pros and cons or considered the risks of synthetic biology (5).
- Some visitors valued the event as a positive experience for children, whereas some felt the event could be improved for younger audiences (13, 14).
- Visitors who interacted with the hands-on activities valued different things from forum participants. While both groups valued access to information and experts, those who interacted with hands-on activities valued the positive experience for children and the topic of synthetic biology, two topics that forum participants did not mention valuing. In contrast, forum participants most valued hearing diverse viewpoints, which was much less prominent among visitors to the hands-on activities (13, compare to forum data question 8).

Questions to consider

These data raise several questions to consider as the 2016 Building with Biology events are planned:

- How could the events be adjusted so they increase visitors' balanced consideration of the pros, cons, risks, and benefits of synthetic biology?
- How could the activities, or the way they are facilitated, be improved so they offer visitors more opportunities to share their views about synthetic biology?
- How could the activities, or the way they are facilitated, be adjusted so they offer visitors more opportunities to learn about viewpoints different from their own?
- How do we want to address data that suggest Building with Biology events could be improved for children in a way that does not negatively impact public engagement with science goals?

Authorship

This document was created by the multi-institutional evaluation team for the Multi-Site Public Engagement with Science project. Members of this team include Sarah Cohn (Science Museum of Minnesota), Elizabeth Kollmann (Museum of Science, Boston), Angie Ong (Spotlight Impact), Sarah Pfeifle (Museum of Science, Boston), and Katie Todd (Museum of Science, Boston). Any questions about this document or the evaluation of this project should be directed to the team leader, Elizabeth Kollmann, at ekollmann@mos.org.

Presentation of data

The following sections present data collected from public participants at the eight Building with Biology pilot events that were held in the summer of 2015. Data are organized by theme.

Visitors represented a range of ages, genders, and group types.

Demographics of survey respondents

1a. What is your age? ^{E, O}

	Responses (n=44)
Minimum	18
Maximum	68
Mean	43.4
Standard deviation	11.5

Demographics of group members

1b. What are the ages of your group members? ^P

	Responses (n=85)
Minimum	2
Maximum	72
Mean	25.1
Standard deviation	19.3

1c. What is your gender? ^{E, O}

	Responses (n=46)
Female	63%
Male	37%

1d. What are the genders of your group members? ^P

	Responses (n=85)
Female	58%
Male	42%

1e. Who visited the museum with you today? ^{E, O}

	Responses (n=48)
I am here with a group that includes children and adults	73%
I am here with an adult-only group	23%
I am here alone	4%

Most groups engaged with at least two activities.

2. How many activities do you think you visited at this event? ^E

	Responses (n=30)
0-1	7%
2-5	60%
6 or more	33%

3. How many stamps did you collect on each page of the passport? ^P (n=26)

This question asked about four actions for which passport holders could earn stamps. Visitors could do the actions multiple times and collect as many stamps as they wished, except that the graffiti board was designed so that most visitors would only do that action once. This table shows the percentage of passport survey respondents who did each action, and the average number of times respondents did the actions.

Talk to a scientist	
Respondents who got a stamp	96%
Average number of stamps collected	4.4
Ask a volunteer a question	
Respondents who got a stamp	96%
Average number of stamps collected	3.4
Tell a volunteer what's good and bad about synthetic biology	
Respondents who got a stamp	85%
Average number of stamps collected	2.4
Write on the graffiti board	
Respondents who got a stamp	73%
Average number of stamps collected	1.1

Most respondents knew that some of the volunteers were scientists.

4. Were you aware that some of the people who facilitated the activities at this event were scientists? ^{P, E, O}

	Responses (n=84)
Yes	90%
No	4%
Unsure	6%

Respondents considered the benefits of synthetic biology, but some did not consider the pros and cons or the risks.

5. Thinking about your experience at this event, how much do you agree or disagree with each of the statements below?

	Strongly disagree	Disagree	Agree	Strongly agree
I considered the pros and cons of synthetic biology. (n=63) P, E	5%	10%	67%	19%
I considered the benefits of synthetic biology. (n=18) ^o	0%	0%	67%	33%
I considered the risks of synthetic biology. (n=18) ^o	0%	17%	56%	28%

? Question to consider: How could the events be adjusted so they increase visitors' balanced consideration of the pros, cons, risks, and benefits of synthetic biology?

Visitors enjoyed the events but some did not feel like they contributed.

6. Thinking about your experience at this event, how much do you agree or disagree with each of the statements below?

	Strongly disagree	Disagree	Agree	Strongly agree
I enjoyed this event. (n=84) ^{P, E, O}	2%	1%	37%	60%
I would recommend this event to others. (n=18) ^o	0%	0%	50%	50%
I would come to another event like this. (n=18) ^o	0%	0%	50%	50%
I shared my views about synthetic biology. (n=83) ^{P, E, O}	6%	17%	51%	27%

? Question to consider: How could the activities, or the way they are facilitated, be improved so they offer visitors more opportunities to share their views about synthetic biology?

Groups felt the events increased their behavior and future interest in synthetic biology activities.

7. Since the Building with Biology event, have you done any of the following? (Check all that apply) ^o

	Responses (n=18)
Paid more attention to references to synthetic biology in print, TV or radio	90%
Explained what synthetic biology is to others	60%
Discussed the pros and cons of synthetic biology	60%
Searched for more information about synthetic biology	40%
Knowingly purchased products that used synthetic biology	20%

8. How would you rate your interest in the following activities? ^o

	Not at all	Somewhat Interested	Interested	Extremely Interested
Learning how synthetic biology is connected to my daily life				
Before participating in this event (n=18)	6%	28%	44%	22%
After participating in this event (n=16)	0%	25%	38%	38%
Sharing my views about synthetic biology with friends and family				
Before participating in this event (n=18)	17%	39%	33%	11%
After participating in this event (n=16)	6%	31%	25%	38%
Checking out news stories (online, TV, and/or print) about synthetic biology				
Before participating in this event (n=18)	6%	39%	39%	17%
After participating in this event (n=16)	0%	25%	38%	38%
Talking to others about the impacts of scientific research in my community				
Before participating in this event (n=18)	11%	39%	28%	22%
After participating in this event (n=16)	0%	13%	50%	38%

9. How much did this activity increase your group's interest in the following activities?

	Not at all	A little	Somewhat	A great deal
Checking out news stories (online, TV, and/or print) about synthetic biology (n=63) ^{P, E}	2%	22%	46%	30%
Learning how synthetic biology is connected to my daily life (n=63) ^{P, E}	2%	13%	41%	44%
Talking to a scientist about the impacts of scientific research in my community (n=33) ^E	9%	21%	24%	45%
Sharing my views about synthetic biology with friends and family (n=32) ^E	3%	19%	38%	41%
Talking to others about the impacts of scientific research in my community (n=30) ^P	3%	20%	60%	17%

Visitors learned from interacting with scientists and participating in Building with Biology events.

10. Thinking about your experience at this event, how much do you agree or disagree with each of the statements below?

	Strongly disagree	Disagree	Agree	Strongly agree
I am more informed about synthetic biology now than I was before this event. (n=82) ^{P, E, O}	5%	2%	49%	44%
I learned about viewpoints different from my own. (n=84) ^{P, E, O}	4%	10%	52%	35%

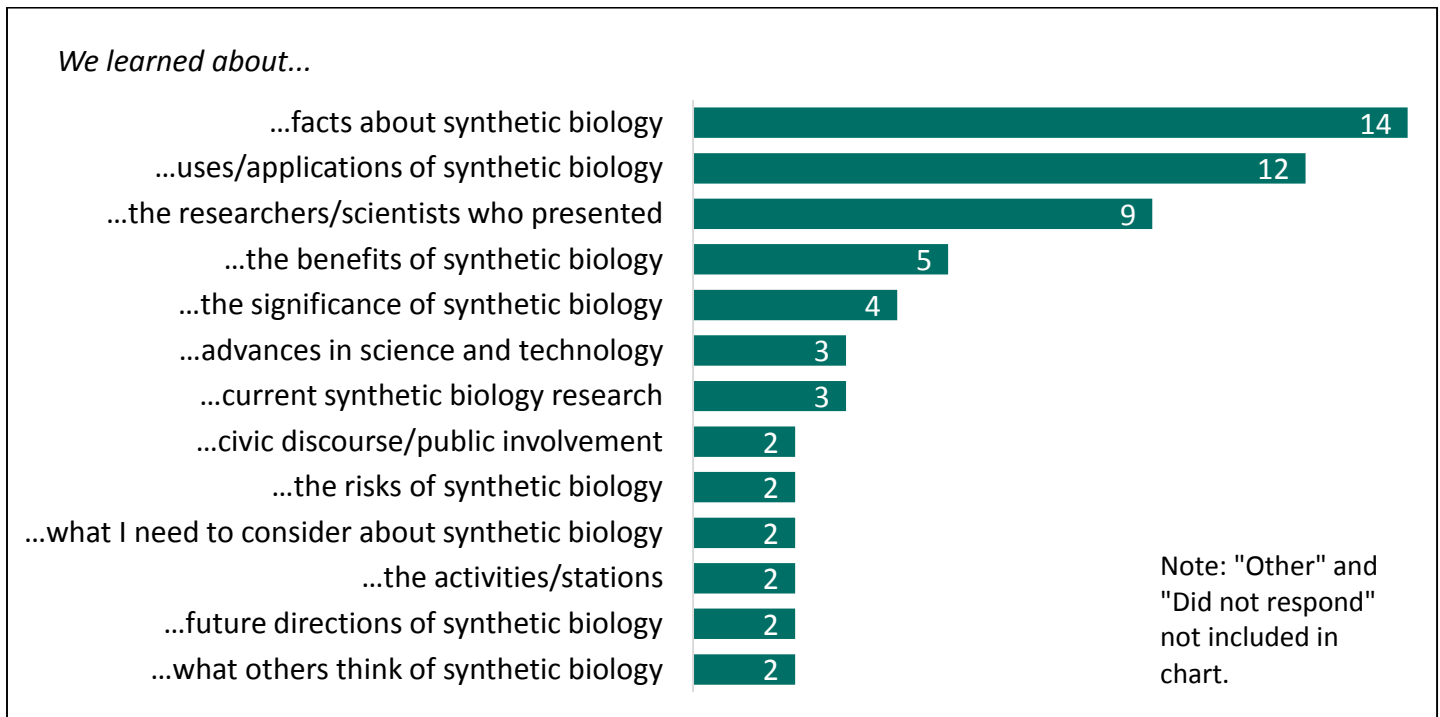


Question to consider: How could the activities, or the way they are facilitated, be adjusted so they offer visitors more opportunities to learn about viewpoints different from their own?

11. What, if anything, did you and your group members learn from interacting with these scientists? (n=58)

P, E, O

This open-ended question was coded using an existing code list. The chart here shows the number of responses per theme, and the table below lists example quotations for each coded theme. In some cases, a single response may be counted in more than one code.

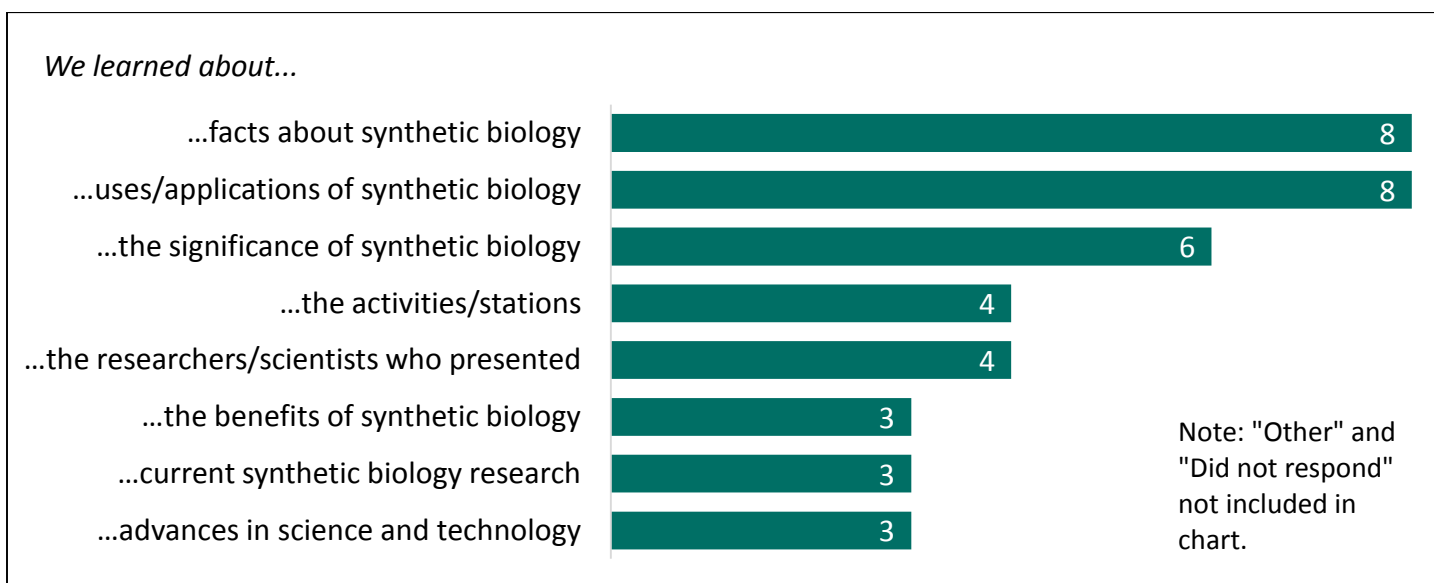


Code	Example Quotes
Facts about synthetic biology	"About different genes, and genome hybrids and disease fighters."
Uses/applications of synthetic biology	"The role synthetic biology can play in vaccines."
Researchers/scientists who presented	"Their devotion and passion for experimentation."
Benefits of synthetic biology	"It sounds like there is a lot of potential for good."
The significance of synthetic biology	"We can change problems we thought were unchangeable."
Advances in science or technology	"The different things scientists can do; great for career exploration. Also, being a scientist is fun!"
Current synthetic biology research	"It was great hearing about the diversity of projects that involve bioengineering."
Civic discourse or public involvement	"The field is fascinating and needs more attention (and resources) from the public."
Risks of synthetic biology	"There are many pros but the cons of GMO is dangerous."
What I need to consider about synthetic biology	"That I am uncomfortable with aspects related to food. Would like more explanation about pros and possible harms due to GMOs."
The activities/stations	"Fun projects. Most designed for older than our kid (2 yr)."

Future directions of synthetic biology	"How it will be used in the future."
What others think of synthetic biology	"I got to think about different viewpoints."

12. What, if anything, did you and your group members learn from participating in the event overall? (n=52)
P, E, O

This open-ended question was coded using an existing code list. The chart here shows the number of responses per theme, and the table below lists example quotations for each coded theme. In some cases, a single response may be counted in more than one code.



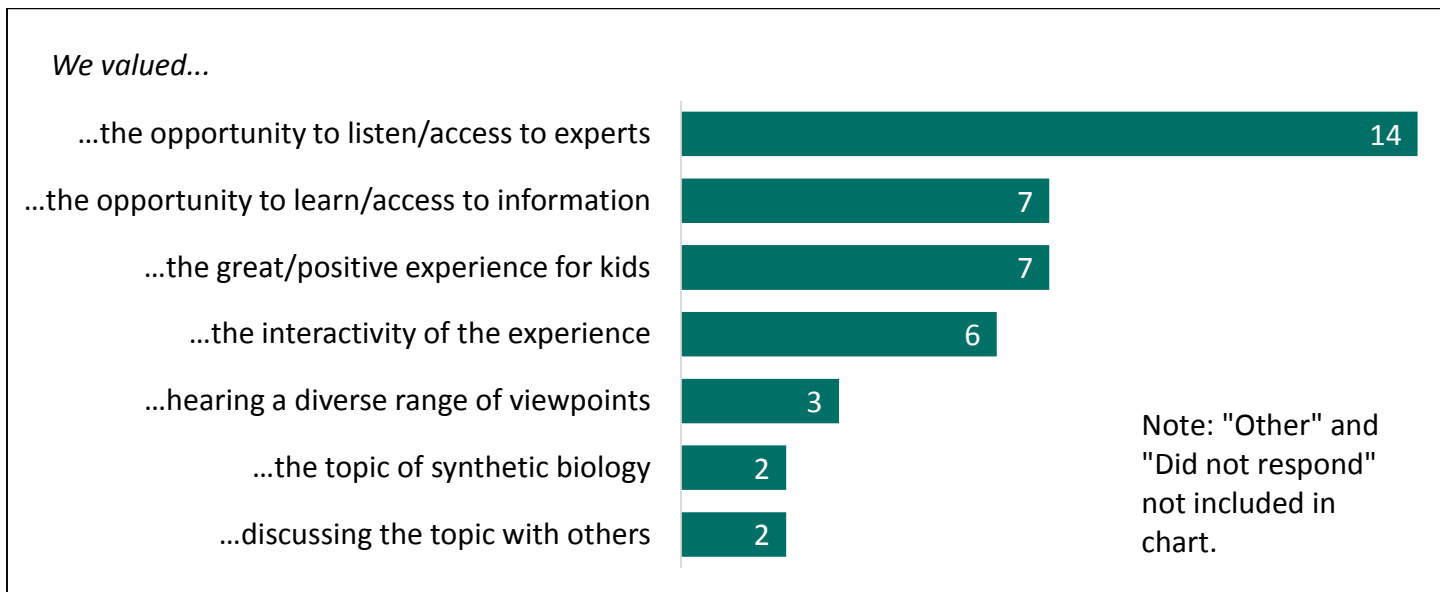
Code	Example Quotes
Facts about synthetic biology	"Counter culture labs 3-D printing tobacco and carrot cells."
Uses/applications of synthetic biology	"Quite lot of applications which I was not aware about."
The significance of synthetic biology	"We already use synthetic biology in a lot of common products."
The activities/stations	"Hands on learning- helpful to the kids."
The researchers/scientists who presented	"Interesting what the scientists want to accomplish with their projects and getting options from them (the visitors) and synbio scope."
The benefits of synthetic biology	"You can use synthetic biology to benefit the world."
Current synthetic biology research	"E.coli is used in much of current research. RNA can snake configurations for more than one function. Research is on a cusp of new possibilities."
Advances in science and technology	"Real progress is being made."

Visitors valued learning from the events and the positive experience for children.

13. What, if anything, did you and your group members value about your participation in the event? (n=42)

P, E

This open-ended question was coded using an existing code list. The chart here shows the number of responses per theme, and the table below lists example quotations for each coded theme. In some cases, a single response may be counted in more than one code.

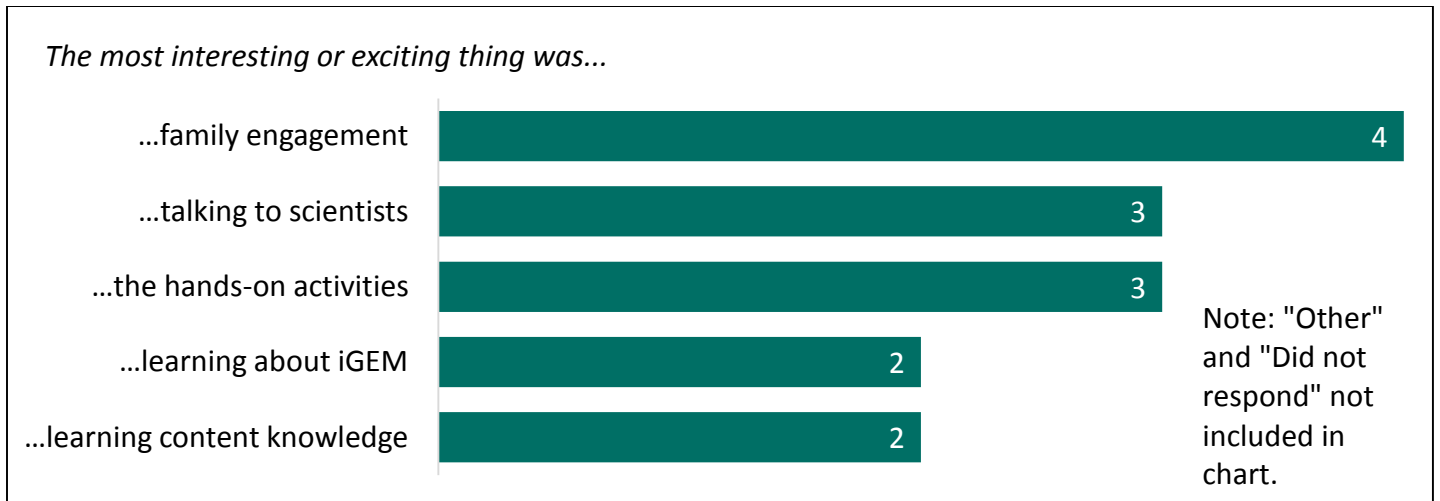


Code	Example Quotes
Opportunity to listen/access to experts	"Speaking with the individuals who did hands on activities with the kids."
Opportunity to learn/access to information	"Learning new material."
Great/positive experience for kids	"Great for kids to interact with real scientists."
The interactivity of the experience	"I feel the interaction part was strongly better than what I've seen before."
Hearing a diverse range of viewpoints	"Great ideas from kids."
The topic of synthetic biology	"Learned about home based synthetic biology."
Discussing the topic with others	"I enjoyed the variety of activities and the conversations with well-trained volunteers."

Respondents found different aspects of the event to be interesting and exciting.

14. What was the most interesting or exciting thing you did at this event? (n=12) ^o

This open-ended question was coded by theme. The chart here shows the number of responses per theme, and the table below lists example quotations for each coded theme. In some cases, a single response may be counted in more than one code.

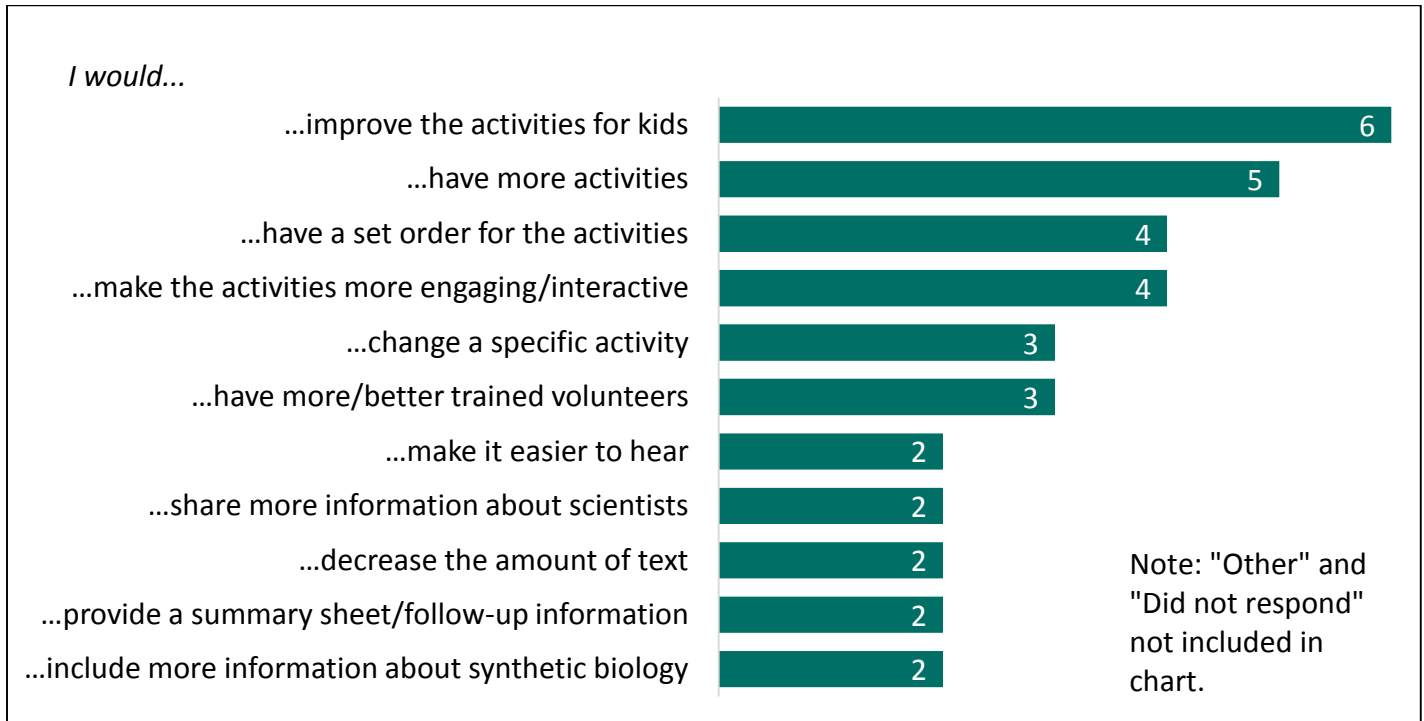


Code	Example Quotes
Family engagement	"Son was engaged"
Talking to scientists	"I enjoyed talking to scientists about their research in person!"
The hands-on activities	"Interactive activities with kids"
Learning about iGEM	"Learned about the iGEM program"
Learning content knowledge	"Learning about viruses"

Respondents offered some suggestions about how the events could be improved.

15. What, if anything, would you change to improve this event for you and your group members? (n=50) ^{P, E, O}

This open-ended question was coded by theme. The chart here shows the number of responses per theme, and the table below lists example quotations for each coded theme. In some cases, a single response may be counted in more than one code.



? Questions to consider: How do we want to address data that suggest Building with Biology events could be improved for children in a way that does not negatively impact public engagement with science goals? Might we be able to market the events for a more suitable audience, or would we want to change the activities or facilitation such that they were more appropriate for children and family groups?

Code	Example Quotes
Improve activities for kids	"Please make the stations more child friendly (don't use so many scientific words)."
Have more activities	"Offer more variety."
Have a set order for the activities	"I would re-arrange the order of some of the booths. There were some that would make sense clustered together."
Change a specific activity	"More games/ engaging props."

I have a suggestion for a specific activity	"Timeline of Genetic Manipulation. Delete 1953 Watson & Crick. Replace with Rosalind Franklin."
Have more/better trained volunteers	"Have the Volunteers more prepared."
Make it easier to hear	"Difficult to hear and really focus/ learn due to noise all around."
Share more information about scientists	"Personal stories of scientists. Share info about scientists."
Decrease the amount of text	"Many tables also had too much text."
Provide a summary sheet/follow-up information about follow-up.	"A summary sheet/link to useful websites to take away."
Have more information about synthetic biology	"I didn't make the connection that the biology this event was talking about was synthetic biology."

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