Pilot Events – Summer 2015

Data Collected from Forum Participants

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Introduction

In the summer of 2015, the Multi-Site Public Engagement with Science—Synthetic Biology project held a series of eight Building with Biology pilot events that were designed to foster Public Engagement with Science (PES) about synthetic biology by having scientist volunteers interact 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 that help describe the impacts of these events and offer suggestions about potential areas for change when the events are replicated at 200 sites in 2016. Specifically, the document describes data collected from volunteers and public visitors who engaged forums, also called conversation activities. Some of these forums were held at the same time as the Building with Biology events' hands-on activities, while other forums were separate events. The findings in this document are organized around the following evaluation questions:

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

To learn more about volunteers' experiences generally, or the publics' experiences at the Building with Biology events, please see the separate documents about those topics.

Data collection

This document shares data from volunteers and members of the public who participated in forums at the Building with Biology pilot events. Each site that led a forum collected paper surveys from the participants who were both volunteers and members of the public. The surveys asked about participants' experiences with the forum; what they learned; how the activity impacted their interest in activities related to synthetic biology; what they valued about the activity; and suggestions for improvement. The sites hosting the events estimated that a total of 243 people participated in Building with Biology conversation forums. There were 146 surveys collected from adults across the sites, for an estimated response rate of 60%.

The forums were designed so that all participants—be they members of the public, scientists, and/or volunteers—would engage in mutual discussion. Unlike the hands-on activities, volunteers did not facilitate

forums but acted as peers to other participants. All participants completed the same survey, and most of the data in this document is presented such that all participants' responses are combined. In this case, we present the data from 146 surveys. However, because volunteers and publics are two audiences of interest for this project, the survey included a question that asked respondents to identify whether they were visitors, volunteers, scientists or engineers, or synthetic biologists. In some cases we have displayed volunteer and visitor data separately to allow comparison between these two groups. When data are displayed in this way, we report data only from the 51 volunteers who did not also say they were visitors and the 39 visitors who did not also say they were volunteers. Of the volunteers, 75% (38 of 51) indicated that they were also scientists, engineers, or synthetic biologists. Only 18% (7 of 39) of the visitors noted that they were also scientists, engineers, or synthetic biologists.

Each Building with Biology host site selected which forum it would run, and data were collected about three different activities. In order to allow comparison with the public data collection (which includes the public's interaction with a number of different hands-on activities), we have chosen to combine the data from the different forums for the purposes of this document. While there were some differences between the different forums, each followed a similar format. Each host site that ran a Building with Biology forum will receive a separate memo that summarizes that site's data about the forum it used.

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 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 using the same coding frameworks to allow for comparisons across the answers to these questions.

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:

- While the activity was designed so that volunteers and the public participated as peers, more volunteers than visitors agreed that they shared their views, and more visitors than volunteers agreed that they considered the pros and cons of synthetic biology (2).
- Similar to visitors who engaged with hands-on activities, many forum participants reported that they learned facts about synthetic biology (6, 7 compare to visitor questions 11, 12).
- Unlike the participants in the hands-on activities, the forum participants frequently reported learning what others think about synthetic biology (6, 7 compare to visitor questions 11, 12).
- The forum participants valued hearing others' views, discussing the topic, and sharing their own views—values that were not prominent among hands-on activity participants (8, compare to visitor question 13).

- Respondents to the forum survey did not mention learning about science communication, while learning about science communication was a prominent theme among respondents to the online volunteer survey (6, 7, compare to volunteer questions 10-11).
- More visitors than volunteers reported that they learned about synthetic biology. Given the fact that many volunteers were synthetic biologists, this difference is unsurprising (5).
- Forum participants mentioned a desire for more background information to support their discussion (9).

Questions to consider

These data raise several questions for us to consider as we plan for Building with Biology events in 2016:

- How can we make sure visitors feel they have opportunities to share their views about synthetic biology?
- How can we encourage more volunteers to weigh the pros and cons of synthetic biology?
- How can we make sure visitors and volunteers have the background information they need to engage in the activity?

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 and volunteer participants in the Building with Biology forums that were held in the summer of 2015. Data are organized by theme.

Forum participants represented various backgrounds, ages, genders, and group types.

1a. Which of the following statements describe you? Check all that apply. (n=140)

I am a volunteer for this event	41%
I am a museum visitor	32%

I am a scientist or engineer	58%
I am a synthetic biologist	31%

1b. What is your age? (n=137)

Minimum	18
Maximum	76
Mean	31.9
Standard Deviation	12.9

1c. What is your gender? (n=139)

Female	50%
Male	50%

1d. Who visited the museum with you today? (n=127)

I am here alone	49%
I am here with an adult-only group	29%
I am here with a group that includes children and adults	17%
I am here with a school or tour group	5%

In some cases, volunteers and visitors experienced the forums differently.

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

	Strongly disagree	Disagree	Agree	Strongly agree
I shared my views about synthetic biology.				
Visitors (n=34)	3%	9%	50%	38%
Volunteers (n=41)	0%	5%	56%	39%
I considered the pros and cons of synthetic biology.				
Visitors (n=35)	0%	3%	57%	40%
Volunteers (n=41)	0%	15%	51%	34%
I enjoyed this activity.				
Visitors (n=35)	3%	3%	40%	54%
Volunteers (n=42)	0%	2%	60%	38%

? Question to consider: How can we make sure visitors feel they have opportunities to share their views about synthetic biology?

? Question to consider: How can we encourage more volunteers to weigh the pros and cons of synthetic biology?

3. Did you interact with a scientist during this activity?

	Yes	No	I'm not sure	Other
Visitors (n=35)	86%	0%	14%	0%
Volunteers (n=41)	81%	2%	2%	15%

Forums increased participant—especially visitor—interest in future synthetic biology activities.

4. How much did this activity increase your 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.				
Visitors (n=35)	3%	20%	40%	37%
Volunteers (n=41)	12%	20%	46%	22%
Learning how synthetic biology is connected to my daily life.				
Visitors (n=35)	6%	17%	37%	40%
Volunteers (n=40)	13%	20%	45%	23%
Talking to a scientist about the impacts of scientific research in my community.				
Visitors (n=35)	6%	29%	23%	43%
Volunteers (n=40)	15%	23%	33%	30%
Sharing my views about synthetic biology with friends and family.				
Visitors (n=35)	9%	20%	31%	40%
Volunteers (n=40)	5%	33%	30%	33%

Participants learned from interacting with one another and from the forum experience overall.

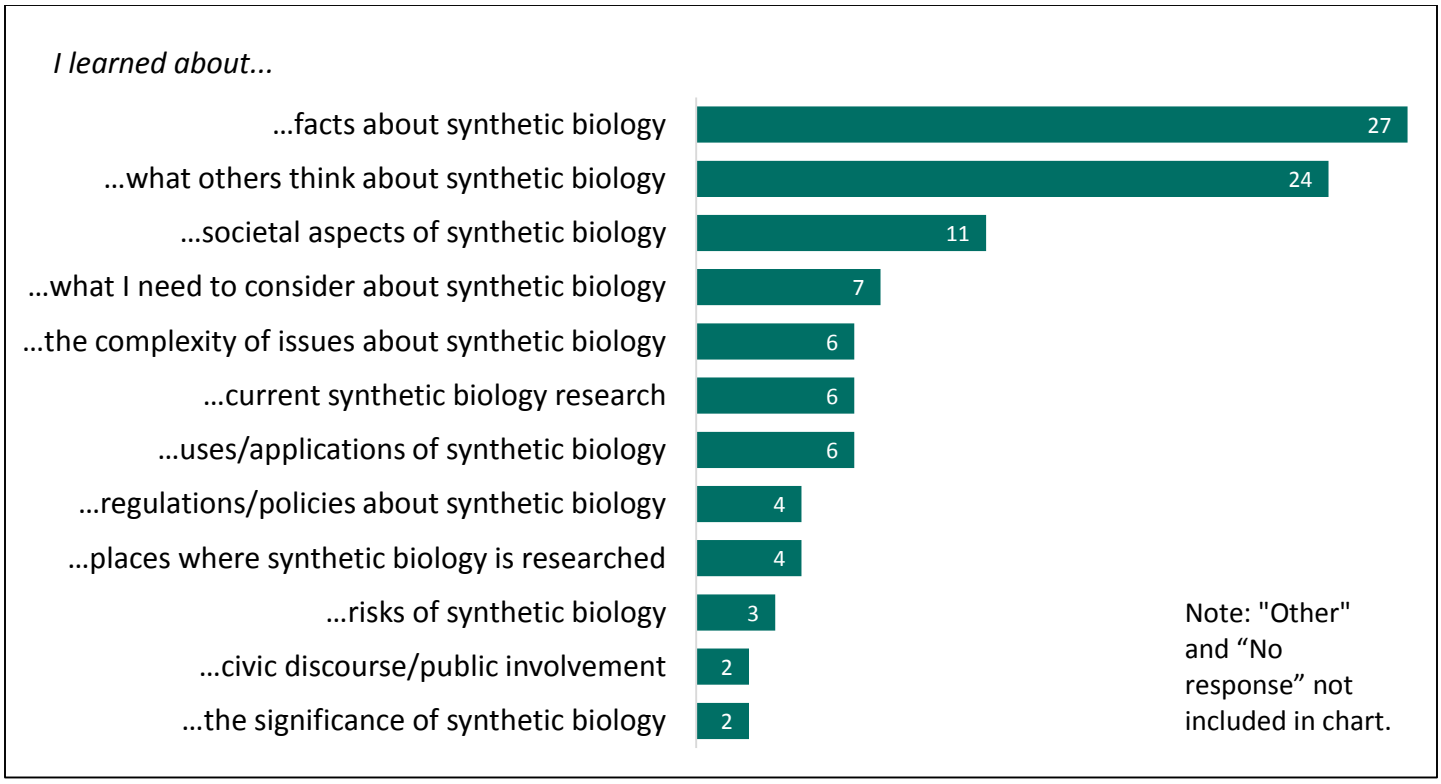
5. Thinking about your experience at this conversation activity, how much do you agree or disagree with each of the statements below?

	Strongly disagree	Disagree	Agree	Strongly agree
I am more informed about synthetic biology now than I was before this event.				
Visitors (n=34)	3%	6%	44%	47%
Volunteers (n=42)	7%	19%	60%	14%
I learned about viewpoints different from my own.				
Visitors (n=35)	0%	9%	46%	46%
Volunteers (n=41)	0%	12%	54%	34%

Note: The fact that volunteers reported less learning about synthetic biology is unsurprising, given the fact that 75% of the volunteers were scientists, engineers, or synthetic biologists, compared to just 18% of visitors.

6. What, if anything, did you learn from participating in this conversation activity? (n=103)

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.

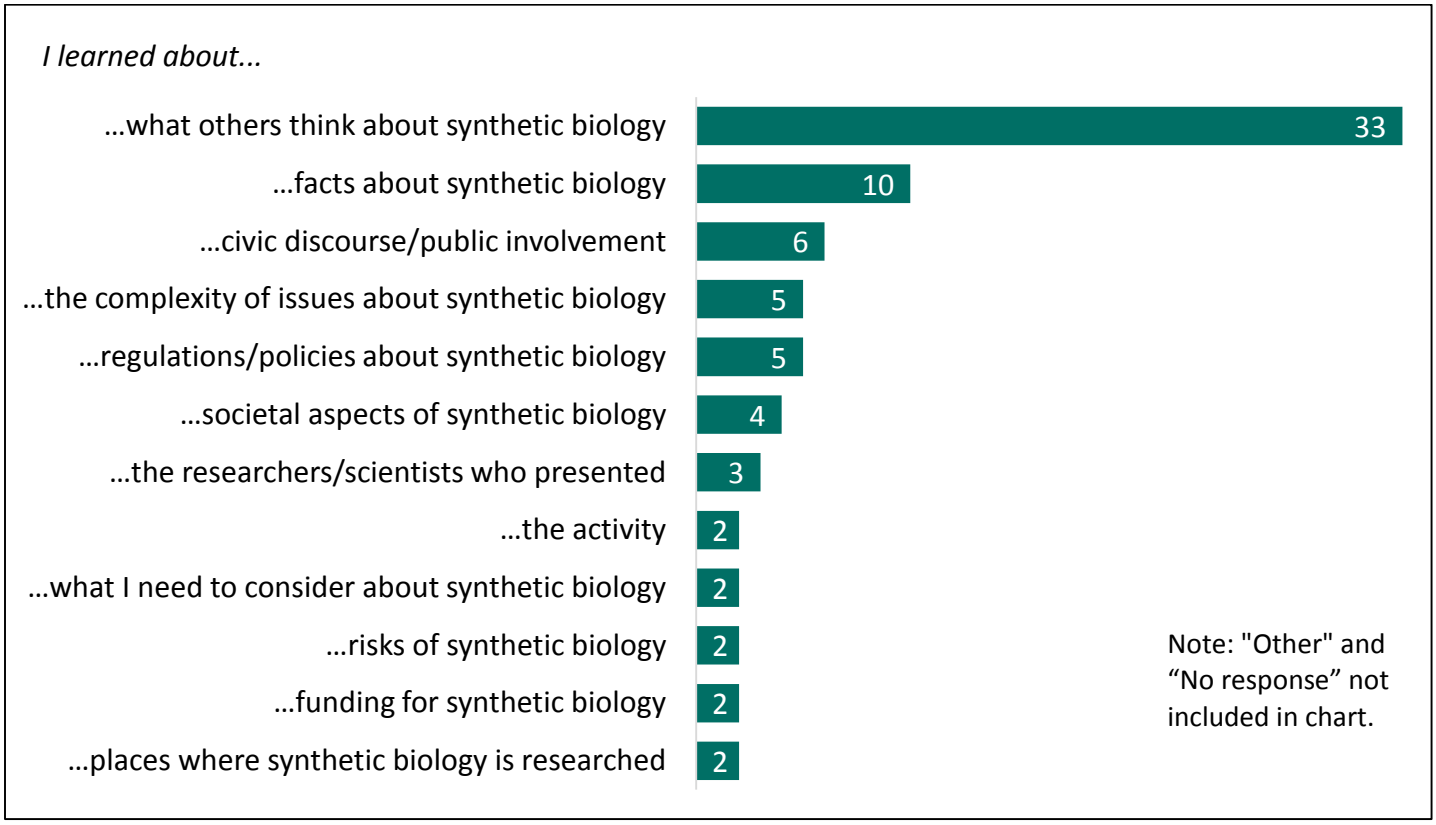


Code	Example Quotes
Facts about synthetic biology	"Learned about different approaches proposed as solutions for control of mosquitos and thus control of malaria transmission"
What others think about synthetic biology	"There are so many different perspectives that are just as important to consider"
Societal aspects of synthetic biology	"The biggest controversy surrounding synthetic bio + GM is the relationship between the public, the government, and private biotech firms"
What I need to consider about synthetic biology	"That a community biolab is not as practical as I had originally thought"
The complexity of issues about synthetic biology	"About complications with bioengineered solutions - ecological, economic, and public"
Current synthetic biology research	"Current methods and research involving genetic engineering and synthetic biology"
Uses/applications of synthetic biology	"About different ways synthetic biology could solve global health problems"
Regulations/policies about synthetic biology	"What types of policy discussions need to back scientific solutions"

Places where synthetic biology is researched	"How community biolabs are currently established"
Risks of synthetic biology	"DIY practitioners don't think much about long term risks and consequences"
Civic discourse/public involvement	"We need to have a broader public understanding of science in general as well as synthetic biology and genetic engineering, specifically"
The significance of synthetic biology	"Was introduced to the whole subject of synthetic biology"

7. What, if anything, did you learn from other participants during this conversation activity? (n=89)

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.



Code	Example Quotes
What others think about synthetic biology	"People have different ways of defining what is risky about a technology like this"
Facts about synthetic biology	"There is more known about modifying bacterial genomes than other organisms (more practice, more control over, etc.)"
Civic discourse/ public involvement	"Community engagement is important"
The complexity of issues about synthetic biology	"I learned that there is a conundrum when dealing with public health issues. The issues at hand can have multiple things to

	influence it. Factors such as… political pressure and who and where the solution comes about"
Regulations/policies about synthetic biology	"Patent law and commercial production of bioengineered solutions are complex"
Societal aspects of synthetic biology	"To consider the consequences of certain actions"
The researchers/scientists who presented	"They enjoy and are knowledgeable of what they do"
Comment about the activity	"Interesting interaction"
What I need to consider about synthetic biology	"Rethinking my own point of view towards biology as well as appreciation towards life"
Risks of synthetic biology	"Our discussions brought up possible consequences that I hadn't previously considered"
Funding of synthetic biology	"How complicated the funding of research can be and the pressure to publish"
Places where synthetic biology is researched	Others showed me that fully independent bio labs are difficult to implement (Volunteer)

Participants valued a number of things about their experience, especially aspects of the discussion.

8. What, if anything, did you value about your participation in this conversation activity? (n=82)

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.

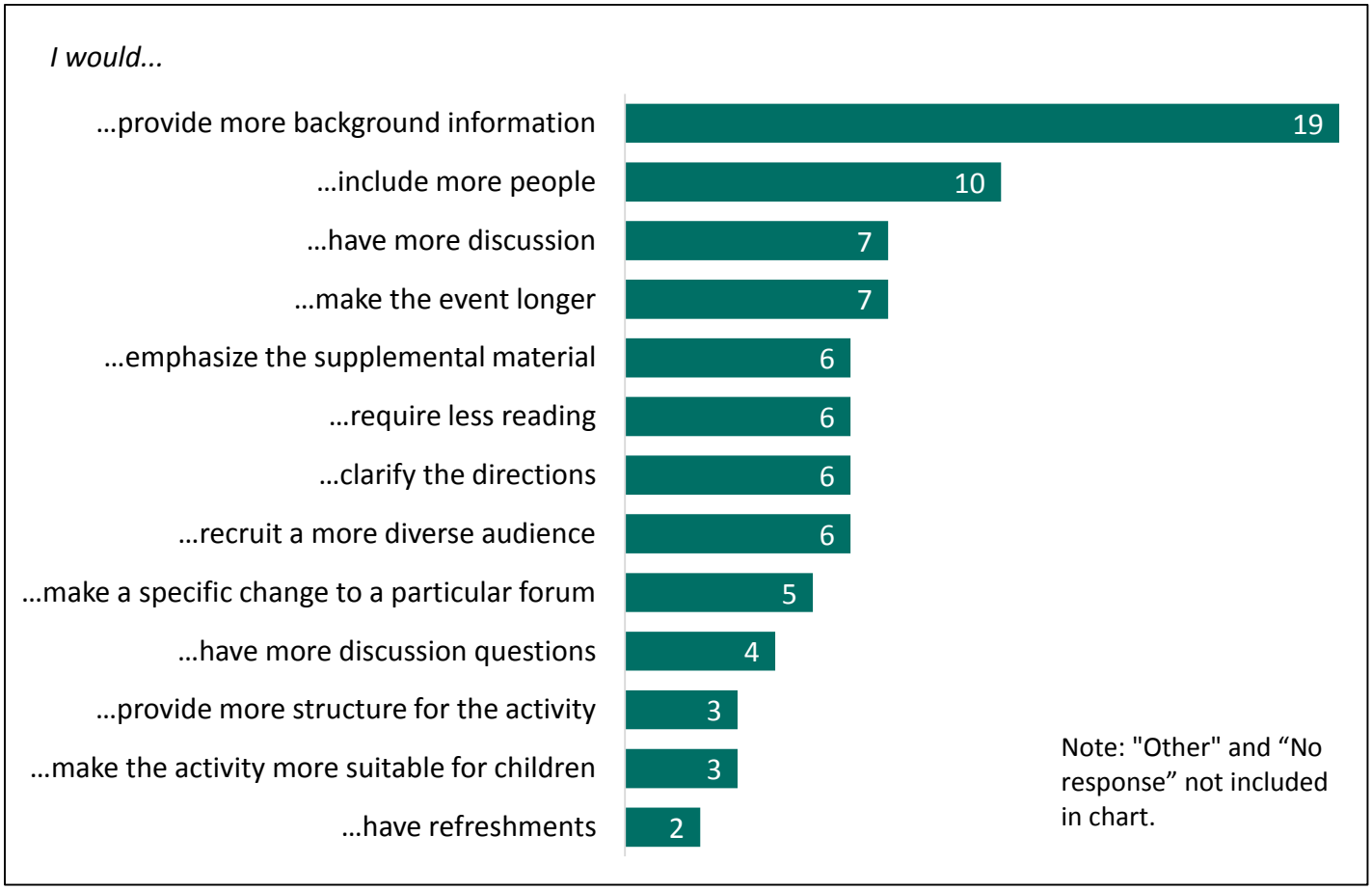
Code	Example Quotes
Hearing diverse viewpoints	"I appreciated exploring the different perspectives of various stakeholders"
Discussing the topic with others	"It was nice to talk about how to regulate and communicate science to the public"

Considering/sharing my opinions	“The opportunity to add personal insight to the discussion alongside involved scientists”
The opportunity to learn/access to information	“Exposure to great scientific ideas”
The opportunity to listen/access to experts	“Being able to explain biology to others, and having scientists to back up what I said”
Meeting other participants	“Meeting others and hearing their different thoughts on the subject”
The format of the activity	“I really enjoyed considering the opinions of the "missing" council members”
The interactivity of the experience	“Interacting with excited young people and receptive parents to discuss benefits and risks of synthetic biology”

Participants offered some suggestions for improving the forums.

9. What, if anything, would you change about the conversation activity? (n=83)

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.



Code	Example Quotes
Provide more background material	"Include data pertaining to costs of each technological option"
Include more people	"Turn out from the public could have been higher. As a scientist, that is the best way for us to gain from these conversations"
Have more discussion	"A chance to compare with other groups, maybe a 5 min q/a to ask other groups about their choice"
Make the event longer	"More time for introductions and for wrap-up after groups share"
Emphasize the supplemental material	"I would make the supplementary info part of the main activity"
Require less reading	"Somehow make the background info easier to get. It took a long time to read everything out loud"
Clarify the directions	"Clarify the instructions, we started talking about the technology and then talking about genetically modified in general, but then both-> it was confusing"
Recruit a more diverse audience	"Bring in more people with opposing viewpoints"
Make a specific change to a particular forum	"No need for the "pretend you are on city council" aspect - conversation went on without it!"
Have more discussion questions	"Have more directed questions"
Provide more structure for the activity	"More leadership from expert/scientist in the group"
Make the activity more suitable for children	"Too complex if kids are involved"
Have refreshments	"It would be helpful to have coffee or tea, especially after the activities earlier in the day"

? Question to consider: How can we make sure visitors and volunteers have the background information they need to engage in the activity?

The Multi-Site Public Engagement with Science—Synthetic Biology project and its Building with Biology events are funded by the National Science Foundation (DRL 1421179). This document has been created by the project's Evaluation Team. Any opinions, findings, or conclusions in this material are those of the authors, and do not necessarily reflect the views of the National Science Foundation.