NISE Net Online Workshop

Findings from Data Collection about Building with Biology Events

Wednesday, June 7, 2017

Welcome!

Today's presenters are:

Liz Kollmann and Katie Todd, *Museum of Science, Boston*

Claire Quimby, *Rockman Et Al.*

Gretchen Gano, *University of California, Berkeley*

As we wait to get started with today's discussion, please:

Update your display name. Include your first and last name, and institution

Introduce yourself in the Chat Box (click on the Chat Box icon at the bottom of your screen)

Questions? Feel free to type your questions into the Chat Box and we'll make sure to address those. Or use the "raise your hand" function located in the Participants List and we'll unmute your audio.

Today's discussion will be recorded and shared on nisenet.org at:

nisenet.org/events/online-workshop

Building with Biology

Activities and Conversations about Synthetic Biology

NISE Net Online Workshop:
Findings from Data Collection about Building with Biology Events

June 7, 2017

This presentation is based on work supported by the National Science Foundation under Grant No. DRL-1421179. Any opinions, findings, and conclusions or recommendations expressed in this presentation are those of the authors and do not necessarily reflect the views of the Foundation.

Agenda

- Background about the project
- Data collection findings
  - Public evaluation
  - Public viewpoints
  - Professional evaluation
- Questions

Building with Biology

Background about the Project

Building with Biology

Science centers are shifting their views of visitors

From…

Learners who may one day become scientists and engineers

To also include…

Citizens and decision-makers equipped to become active players in their communities

…through dialogues that address global challenges

Project Overview

- 3-year National Science Foundation grant
- Partnership of scientists and informal science educators
- Created public engagement with science (PES) activities that address the societal implications of synthetic biology
- Packaged them into 200 kits for events across the US

Museum of Science

BioBuilder Educational Foundation

Sciencenter

AAAS ADVANCING SCIENCE, SERVING SOCIETY

Science Museum of Minnesota

synberc

Building with Biology

Building with Biology Goals

- “The aim of this project is to foster activities in science museums through which public audiences can engage with scientists and engineers in conversations about what synthetic biology is, how research in the field is carried out, and the potential products, outcomes, and implications for society of this work.
- Researchers and publics will explore personal and societal values and priorities as well as research outcomes so that both groups can learn from each other.”

Building with Biology

Products

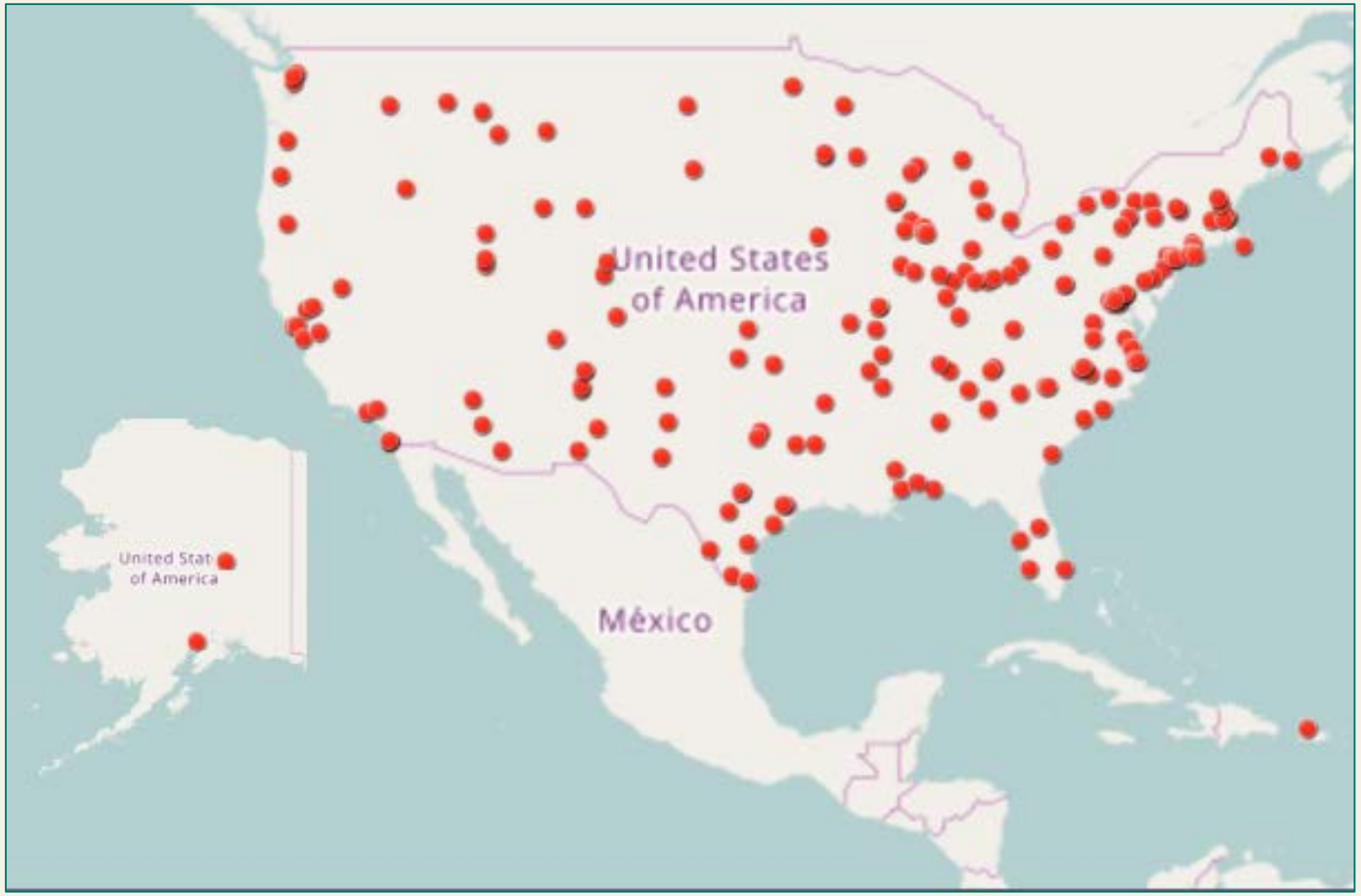
Hands-on activities

- Facilitated
- Shorter experiences + back-and-forth discussions

Forums

- Longer conversations
- Focus on societal and ethical issues
- Science content + personal experiences and values

Building with Biology Host Sites



Data Collection Questions

- What are the impacts of events and forums on participants?
- What are the public participants' viewpoints about synthetic biology?
- What are the impacts of participating in Building with Biology on informal science educators and scientists?

Building with Biology

Public Evaluation

Evaluation Questions

- What do participants **learn** from their PES experience?
- What do participants **value** about their participation?
- How does participation increase participants' **interest** in PES or science topics?

Methods

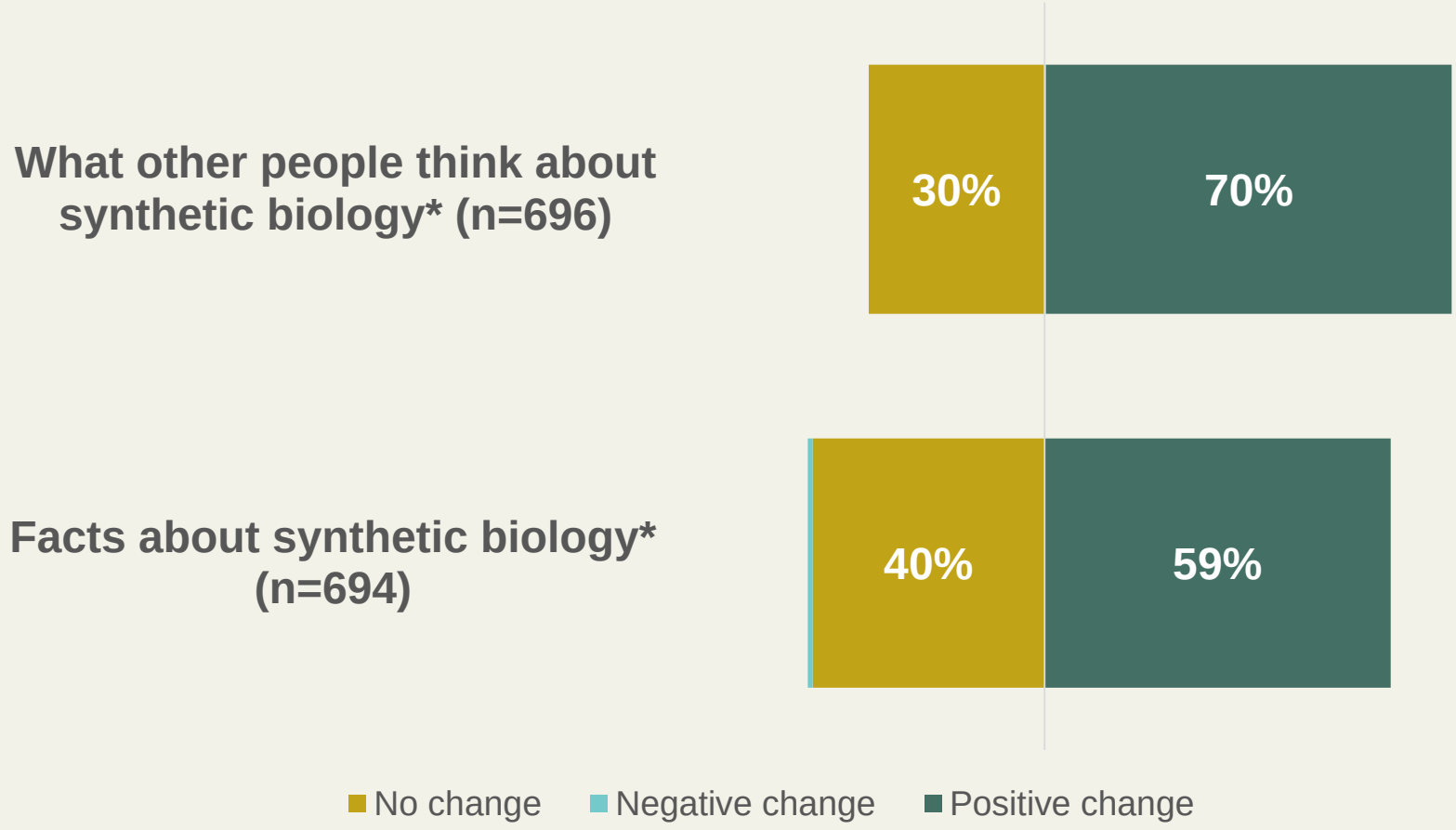
- Evaluation capacity building effort trained data collectors at 64 sites across the country
- 682 paper surveys collected from 43 event sites as part of a passport activity
- 721 paper surveys collected from 31 forum sites at end of program (both scientists and public)

Distribution of evaluation sites

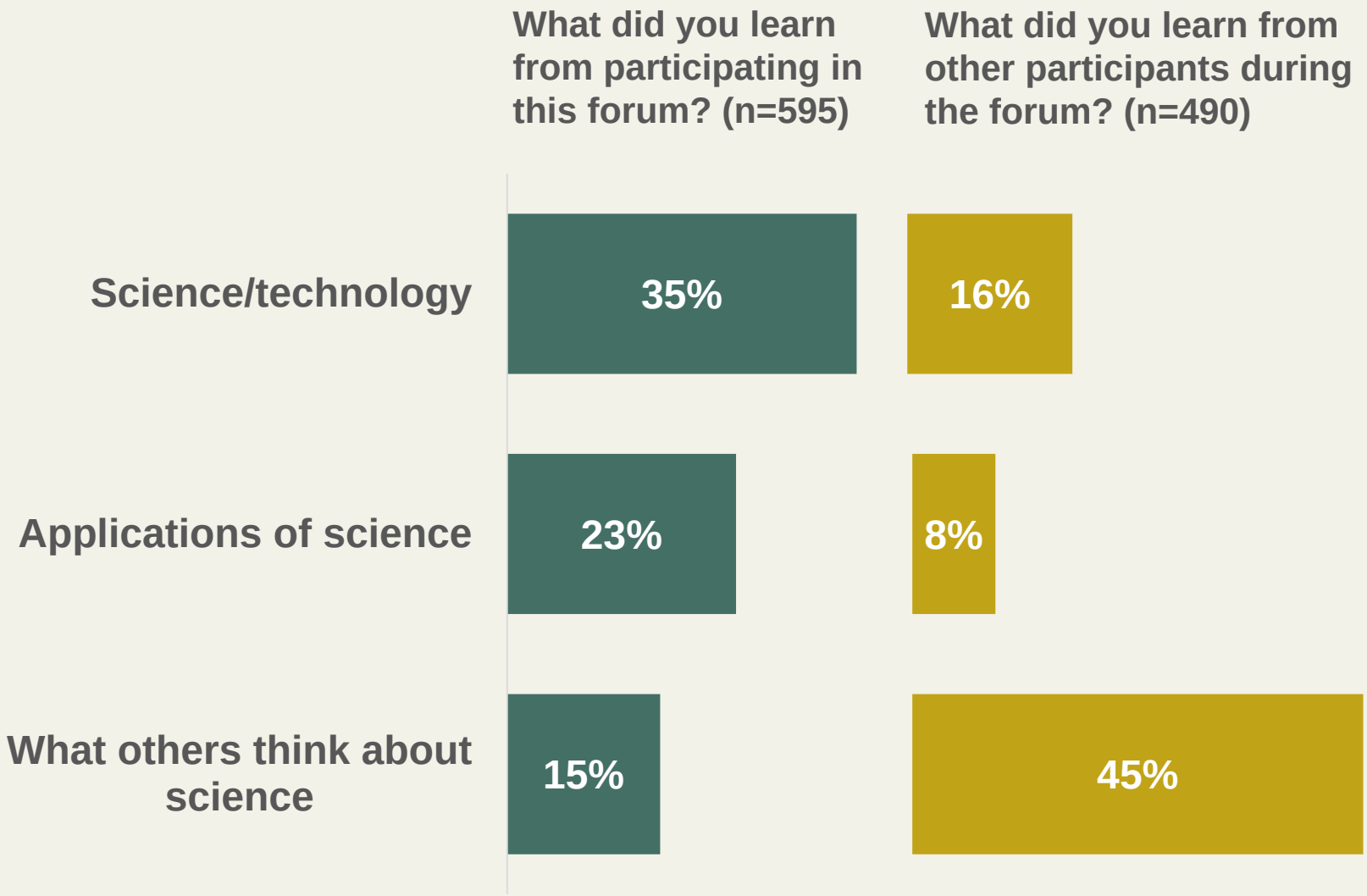
Forums

Forum participants' learning

How much did you know about the following topics BEFORE this forum, and how much do you know AFTER the forum?



Forum participants' learning



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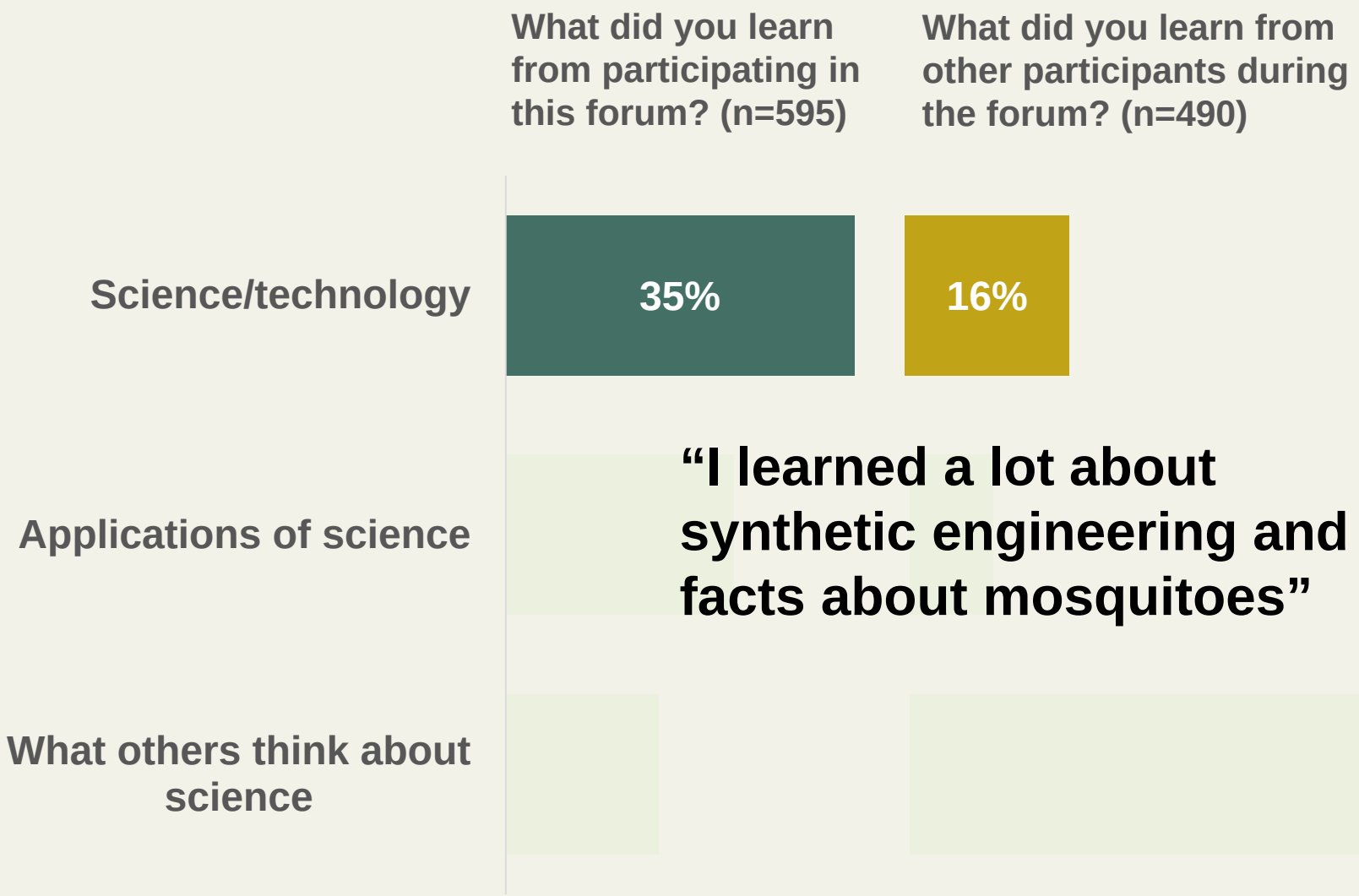
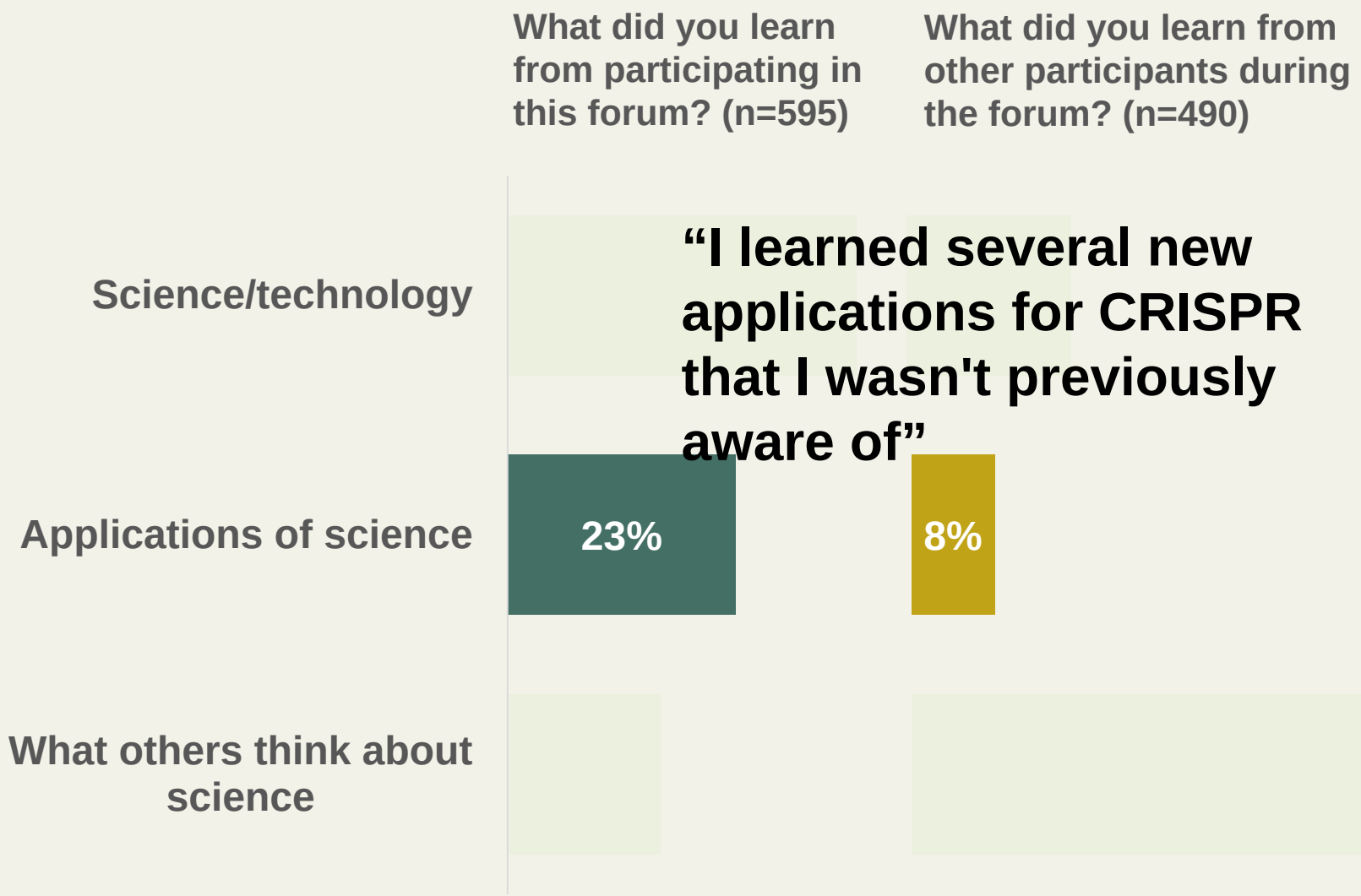


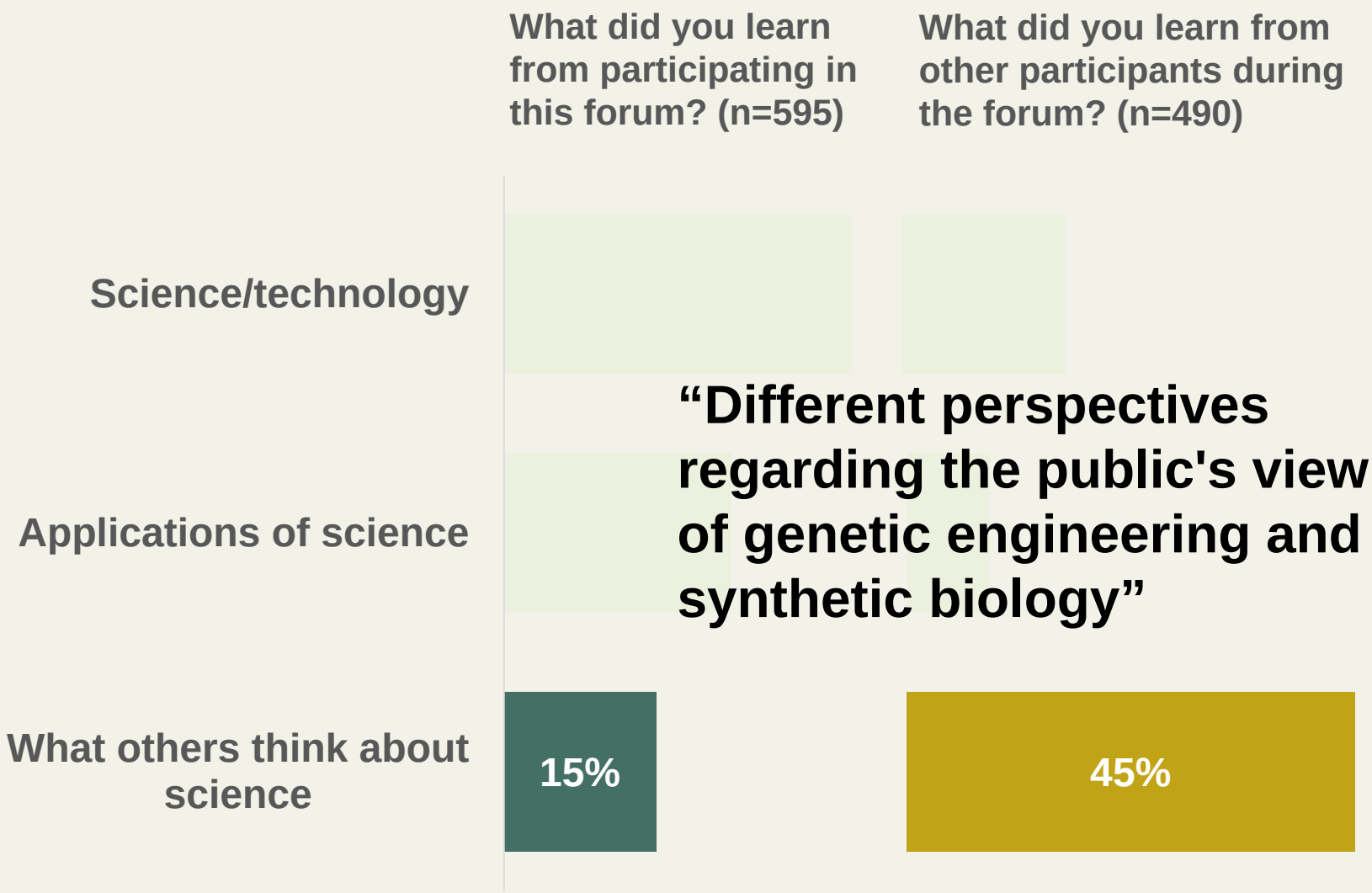
"I learned a lot about synthetic engineering and facts about mosquitoes"

Forum participants' learning



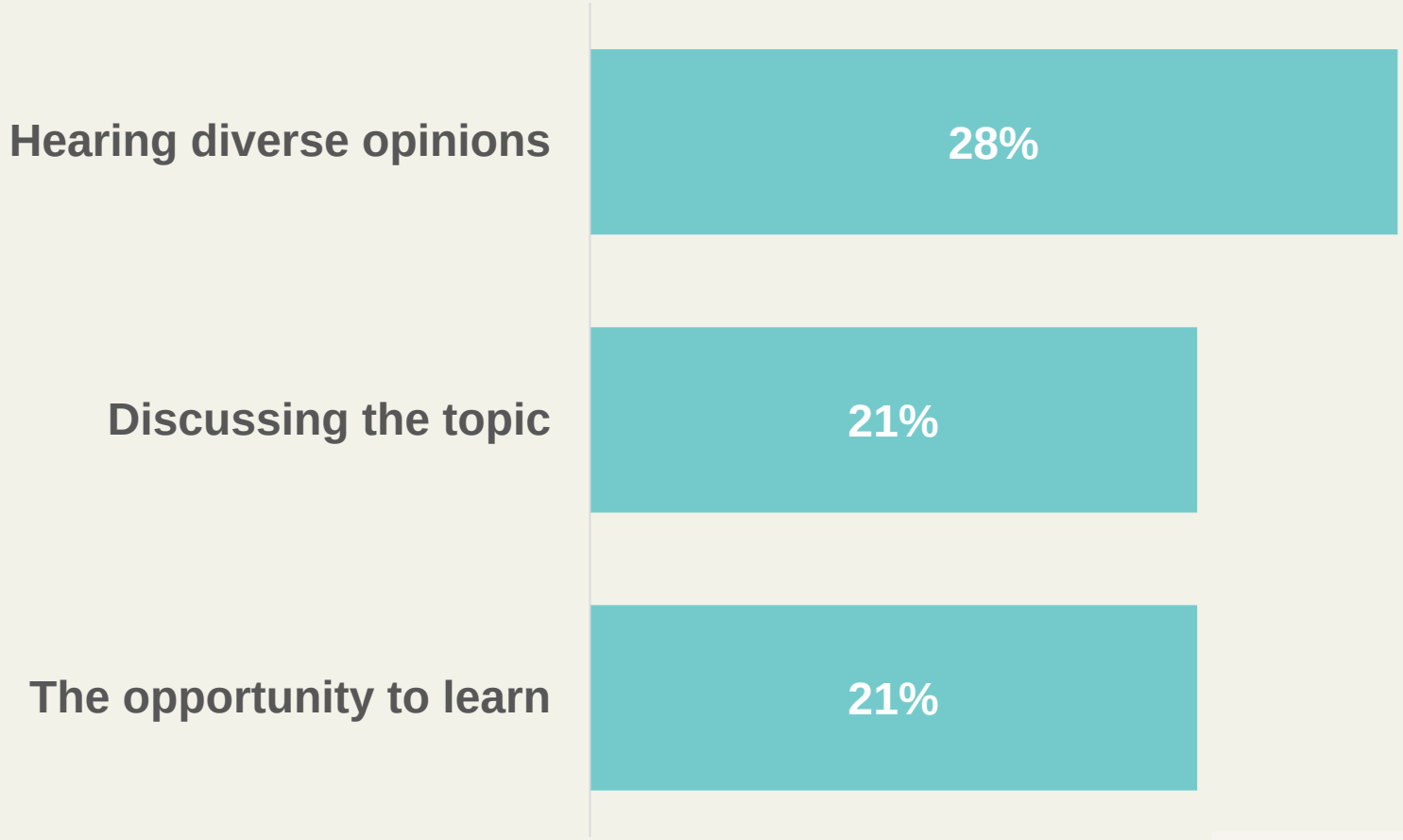
"I learned several new applications for CRISPR that I wasn't previously aware of"

Forum participants' learning



Forum participants' values

What, if anything, did you value about your participation in this forum? (n=433)



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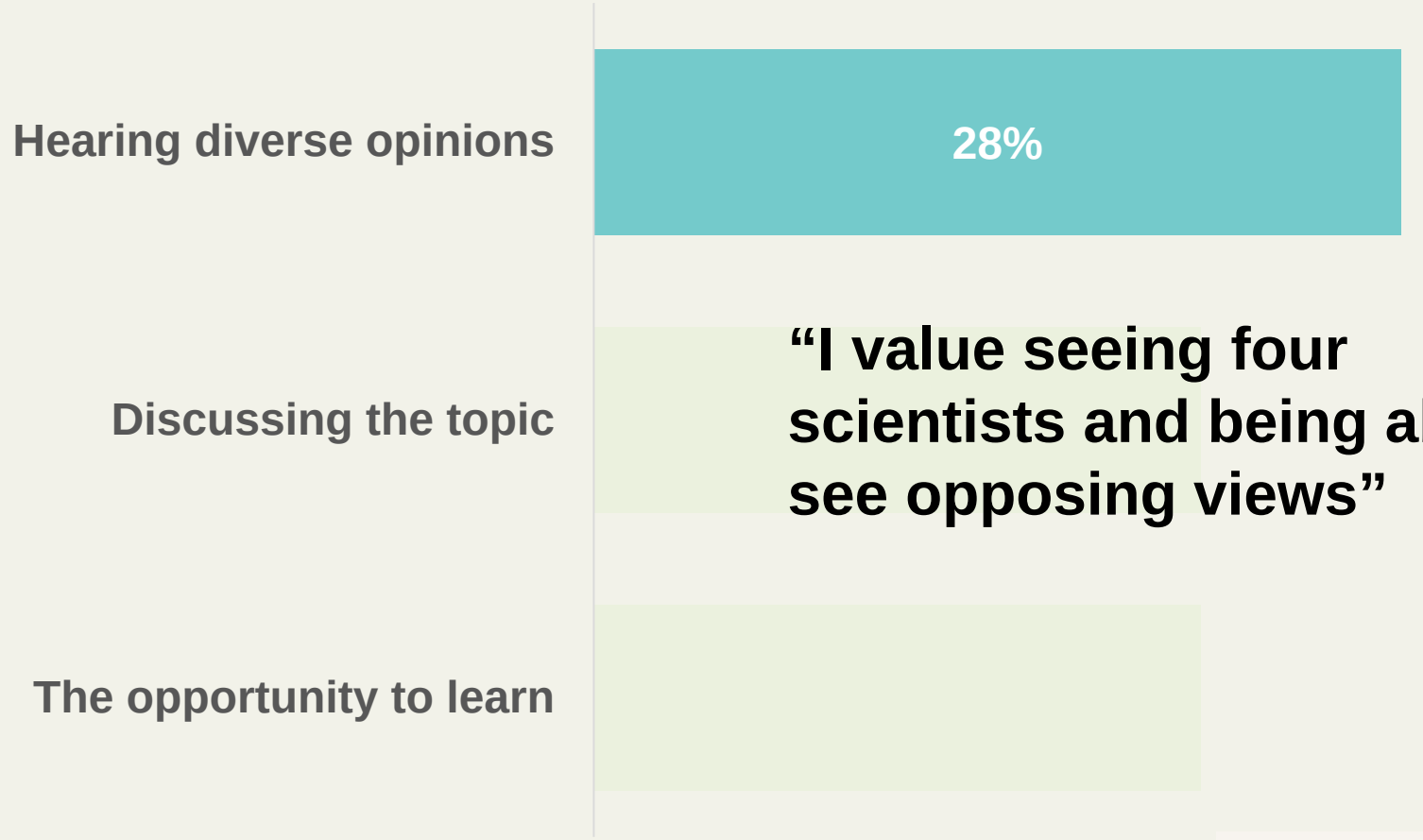

"I value seeing four scientists and being able to see opposing views"

Forum participants' values

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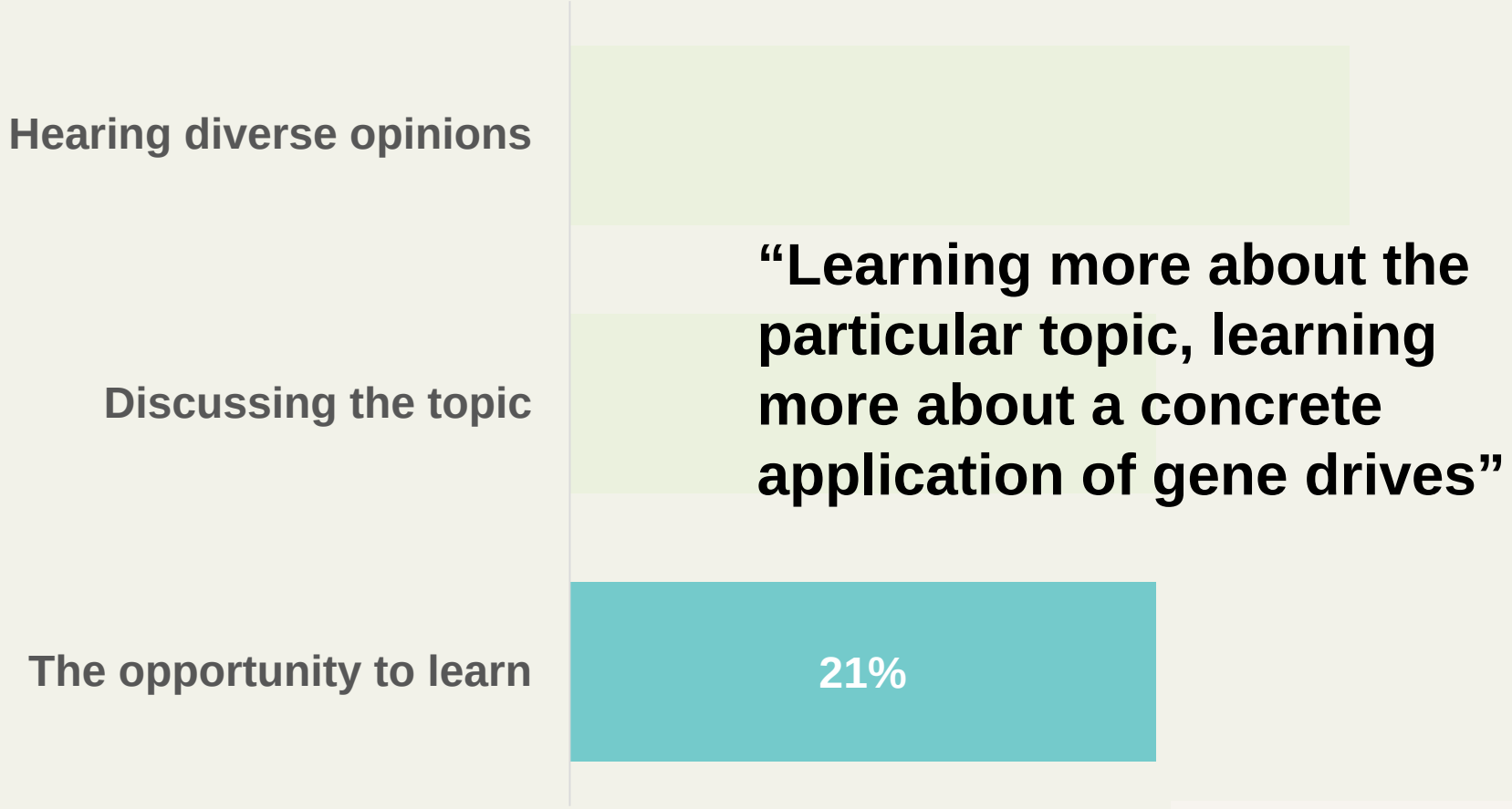
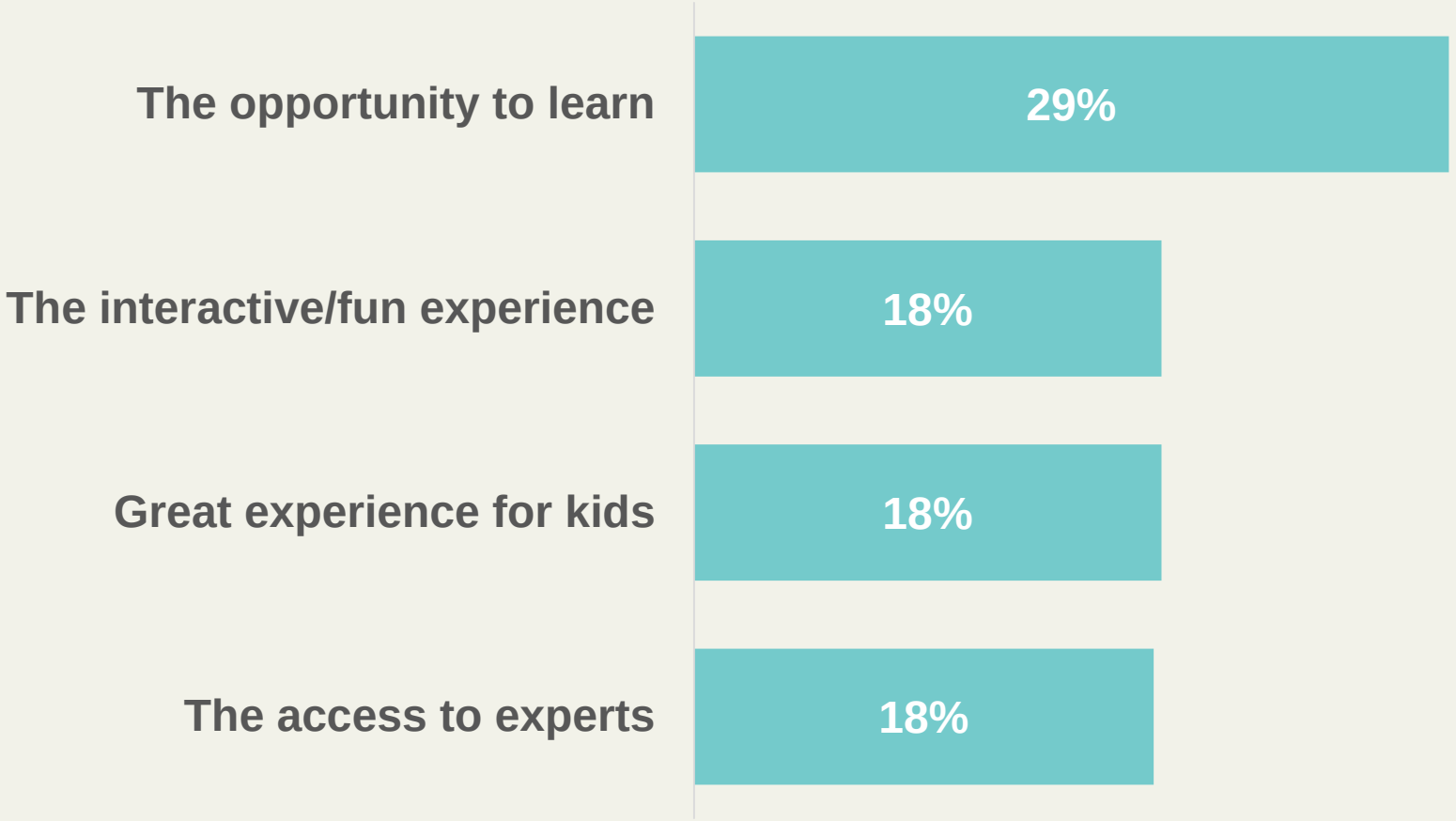


Public event visitors' values

What, if anything, did you value about your participating in this event? (n=301)



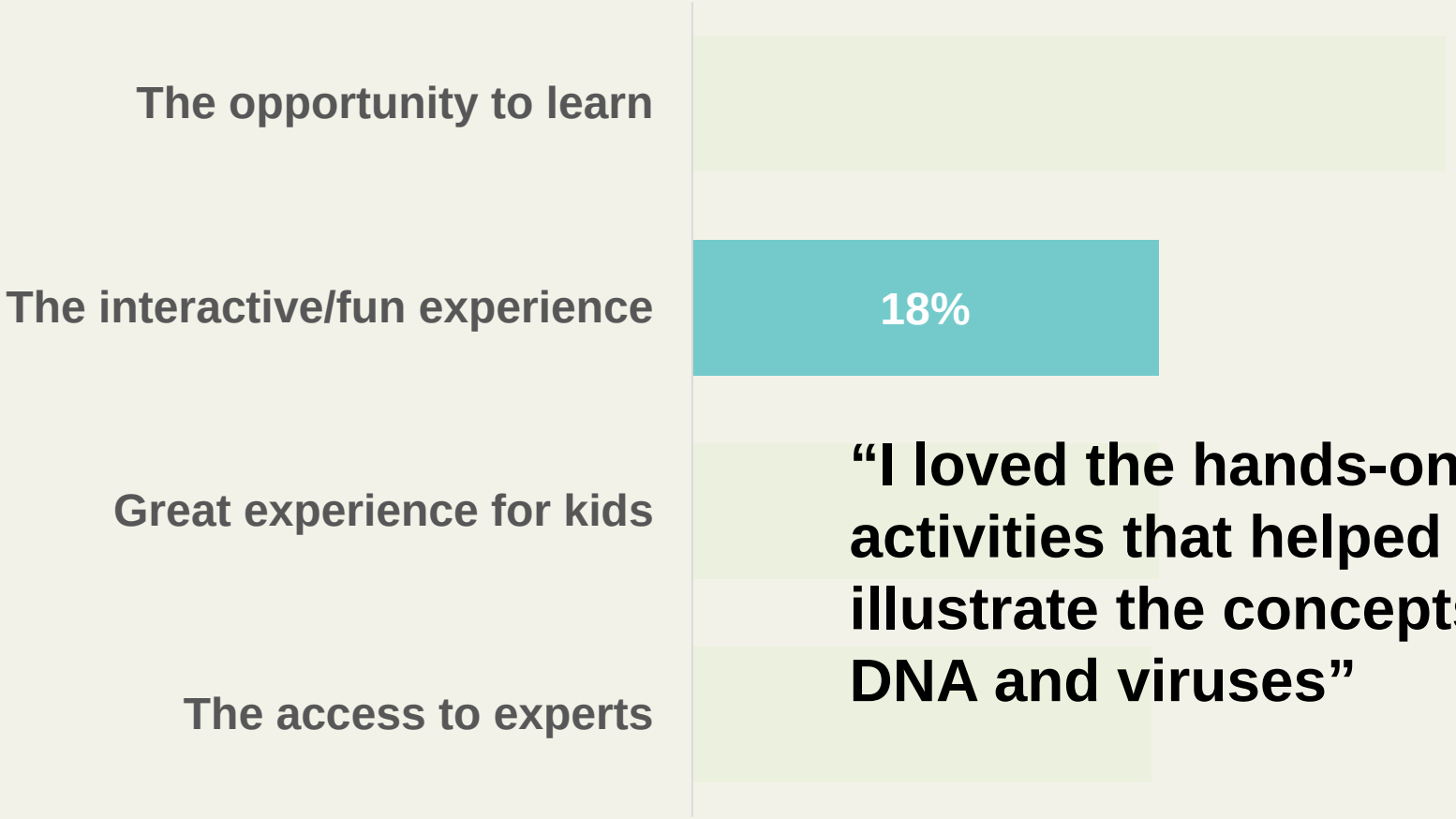
Public event visitors' values

What, if anything, did you value about your participating in this event? (n=301)

"Learning about a new topic"

Public event visitors' values

What, if anything, did you value about your participating in this event? (n=301)



"I loved the hands-on activities that helped illustrate the concepts of DNA and viruses"

Public event visitors' values

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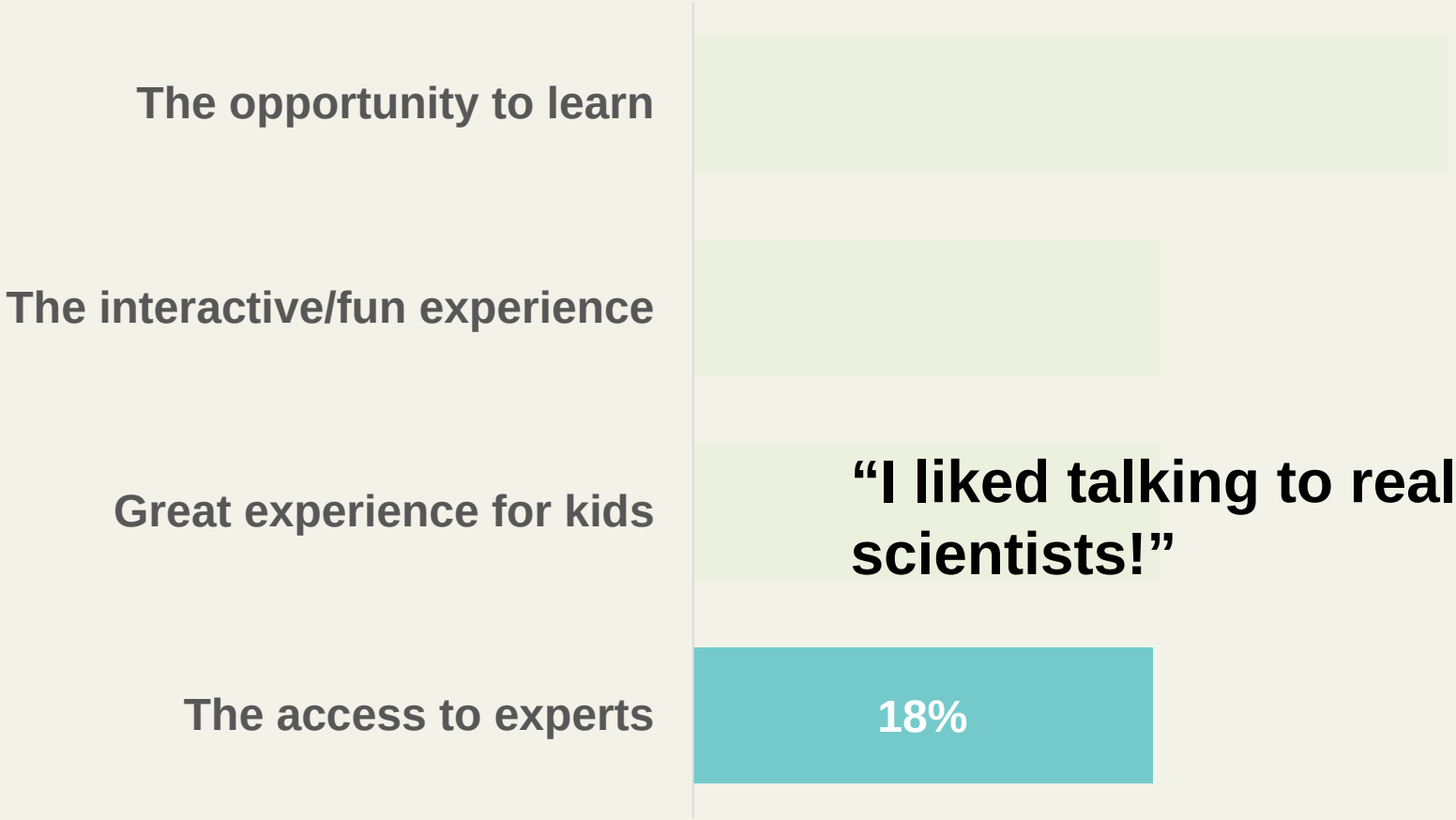
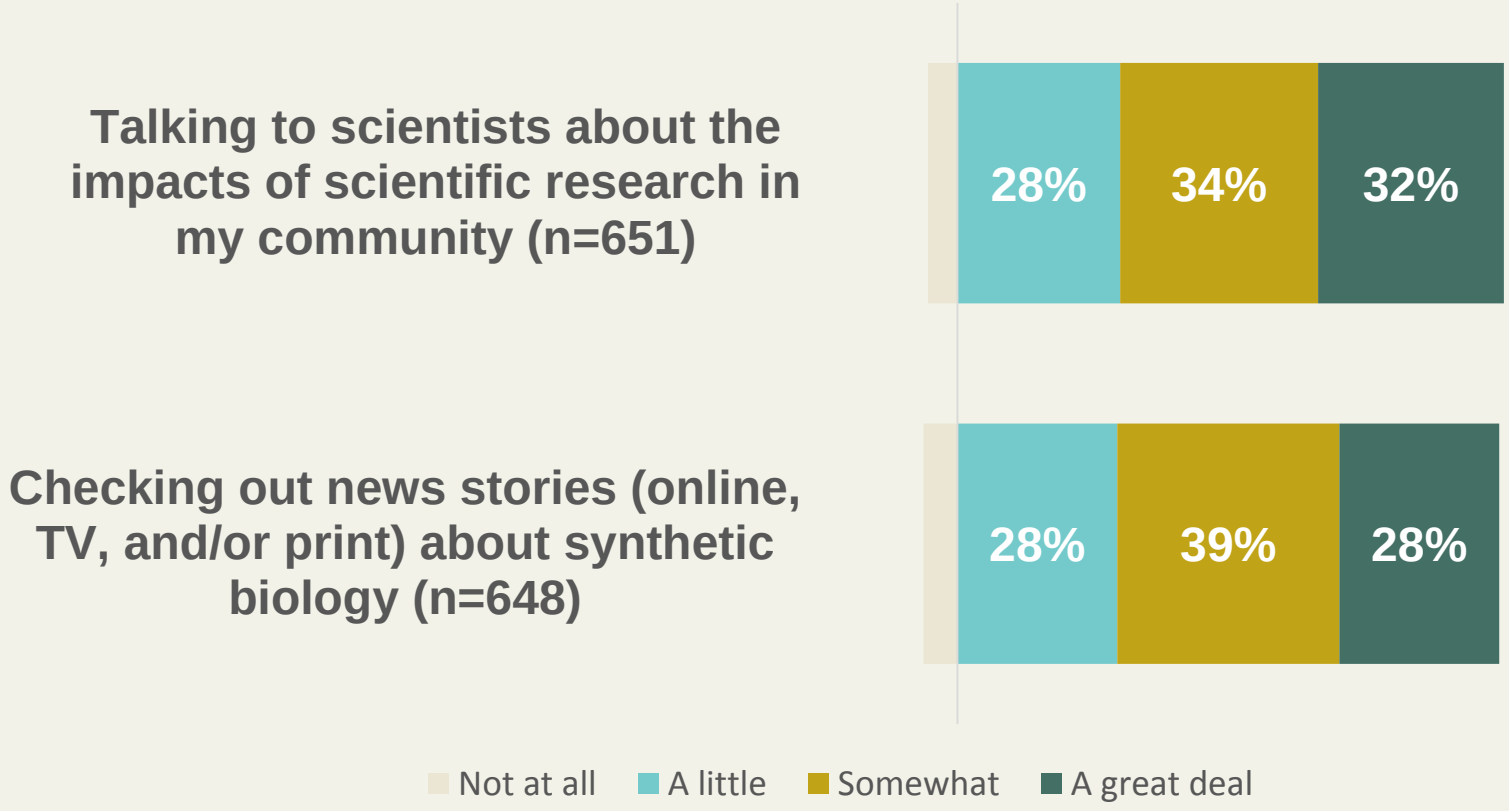


Public event visitors' interests

How much did the event increase your interest in the following?



Key Takeaways

- **Forum participants** learned about others' viewpoints, as well as facts and applications of synbio. They valued diverse opinions, discussion, and learning.
- **Public event visitors** learned facts and applications of synbio, as well as the significance of the field. They valued the fun, kid-friendly events, where they could learn about synbio from experts.
- Participants in both types of events reported increased interest in future PES activities and learning more about synbio.

Public Viewpoints

Building with Biology

Activities and Conversations about Synthetic Biology

Multi-Site Public Engagement with Science Project Meeting

Public Views data

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Role

- Collect ideas and attitudes shared between public and scientists during engagement activities.
- Create materials for dissemination to professional and scientific audiences.

Overview

- MSPES data collection methods
- Data overview
- Public opinion on synthetic biology
- Select findings: Awareness, Risks and Benefits, Applications
- New questions

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Methods

- **Level 1:** Thick description that is tied to public interactions with activities collected by researcher observers and interviewers.
- **Level 2:** Low-tech and/or technology assisted questionnaires that focus on Ethical, Legal and Social (ELSI) dimensions of syn bio administered in concert with kit activities.

Participant Surveys

- How might synthetic biology change our lives?
- What question would you most like to ask a scientist about synthetic biology?

SHOULD WE ENGINEER THE MOSQUITO?

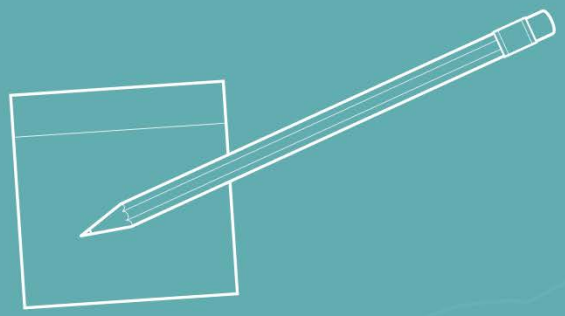
Forum

- Will you release GE mosquitos in Mombasa? Why or why not?
- If you choose to release GE mosquitoes, will you use a gene drive? If so, which type?
- If you choose to release GE mosquitoes, who should handle the release? At what scale?
- What were the reasons behind your group's decision?

Building with Biology

How might synthetic biology change our lives?

Write your ideas on sticky notes and share them on the graffiti board!



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Data Overview

- Public views data from **32 museums**
  - Graffiti board data from all:
    - Each site between 5-50 data points
    - **~500 data points (sticky notes!) total**
  - Limited Mosquito Forum data from 7 sites:
    - Between **4-8 forum rounds** for each

Public Opinion on Synthetic Biology

- Awareness
- Risks and benefits
- Confidence in actors and institutions
- Support for modes of governance (regulation, etc.)
- Applications

Synthetic Biology Project

The Woodrow Wilson International Center

For Scholars By Hart Research Associates March 6, 2013

Building with Biology

Public Opinion on Synthetic Biology: Awareness

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Findings: Awareness

- Data suggest that publics engaged with the kit activities and events **associate applications of synthetic biology with a broader range of (actual or planned) uses**
  - Health and therapeutic applications
  - Alternative or augmented food sources
  - New life forms; de-extinction
  - Playful/DYI Bio inventions

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Public Opinion on Synthetic Biology: Risks and Benefits

Building with Biology

Findings:
Risks and Benefits

- Graffiti board data suggest that that publics engaged with the kit activities and events **see primarily positive changes**
  - Negative associations relate to health and environmental effects, rather than moral or religious reasons

Building with Biology

Public Opinion on Synthetic Biology: Applications

Building with Biology

Findings: Applications

- Will you release GE mosquitos in Mombasa? Why or why not?
  - **Over 90%** of forum teams would release
- If you choose to release GE mosquitoes, will you use a gene drive? If so, which type?
  - **Just over half** of forum teams would utilize gene drive

Building with Biology

Limitations

- Generalizing **views and associations reported** when experiences were fresh to attitudes and behaviors in the public at large
- Linking **demographic characteristics of individuals** to views recorded in artifacts
- Linking **site specific characteristics** about how kits were used and staffed to views recorded in artifacts

New Questions

- Do participant responses to the same questions differ across data collection instruments/modes?
- What types of engagement inform/influence impressions (activity materials, engagement with volunteers)?
- To what degree does the nature and length of engagement inform public views responses?
- Does engagement support participants' learning and civic action related to similar scientific and technical topics?

Professional Evaluation

Rockman et al

external evaluation focused on hosts & facilitators

- What are the benefits and challenges of informal science educators partnering with scientists for outreach events?
- What are hosts/facilitators' existing experience in doing outreach? How does training in PES affect their approach or their outlook on the role of the public?
- What are the benefits and challenges of doing PES centered on synthetic biology?
- To what extent do the Building with Biology forums and activities succeed in fostering meaningful discussions between scientists and the public?

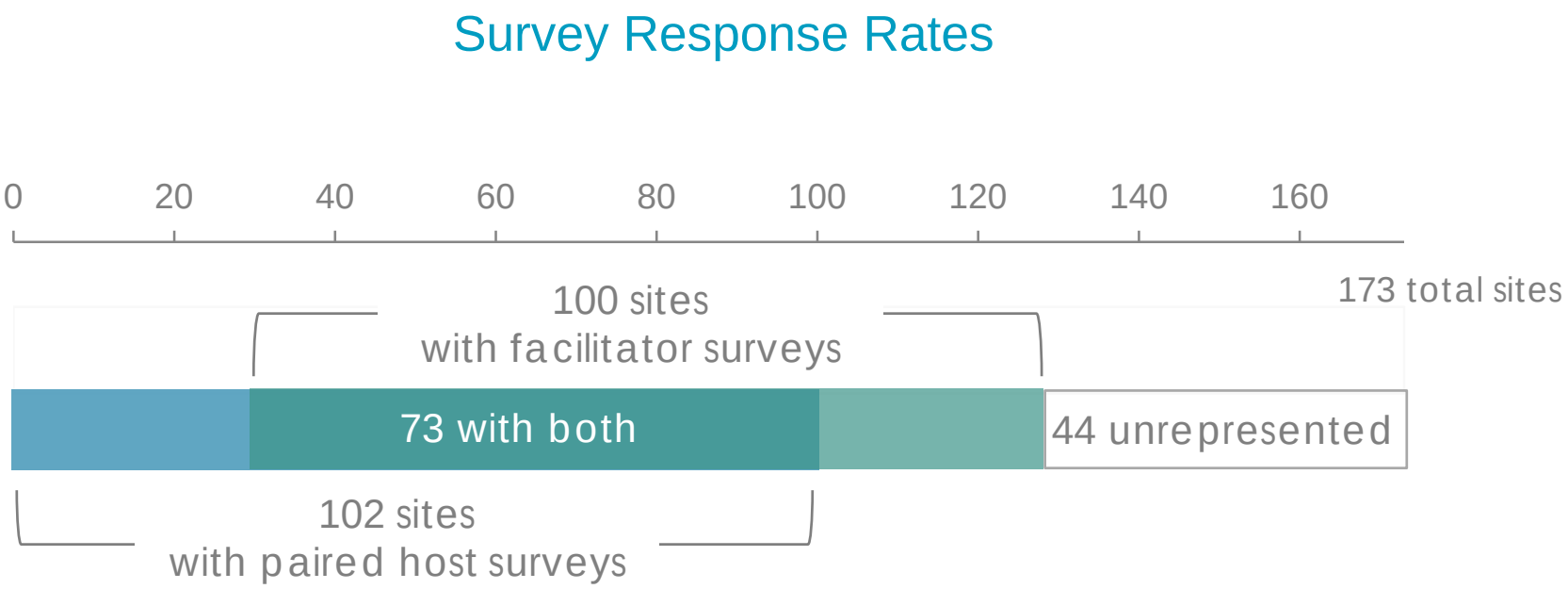
Rockman et al

Methods

	Pre	Post
hosts (informal science educators organizing Building with Biology events)	• Surveys (n=139)	• Surveys (n=116) • Interviews (n=13)
facilitators (scientist volunteers facilitating activities and forums)		• Surveys (n=324) • Interviews (n=22)

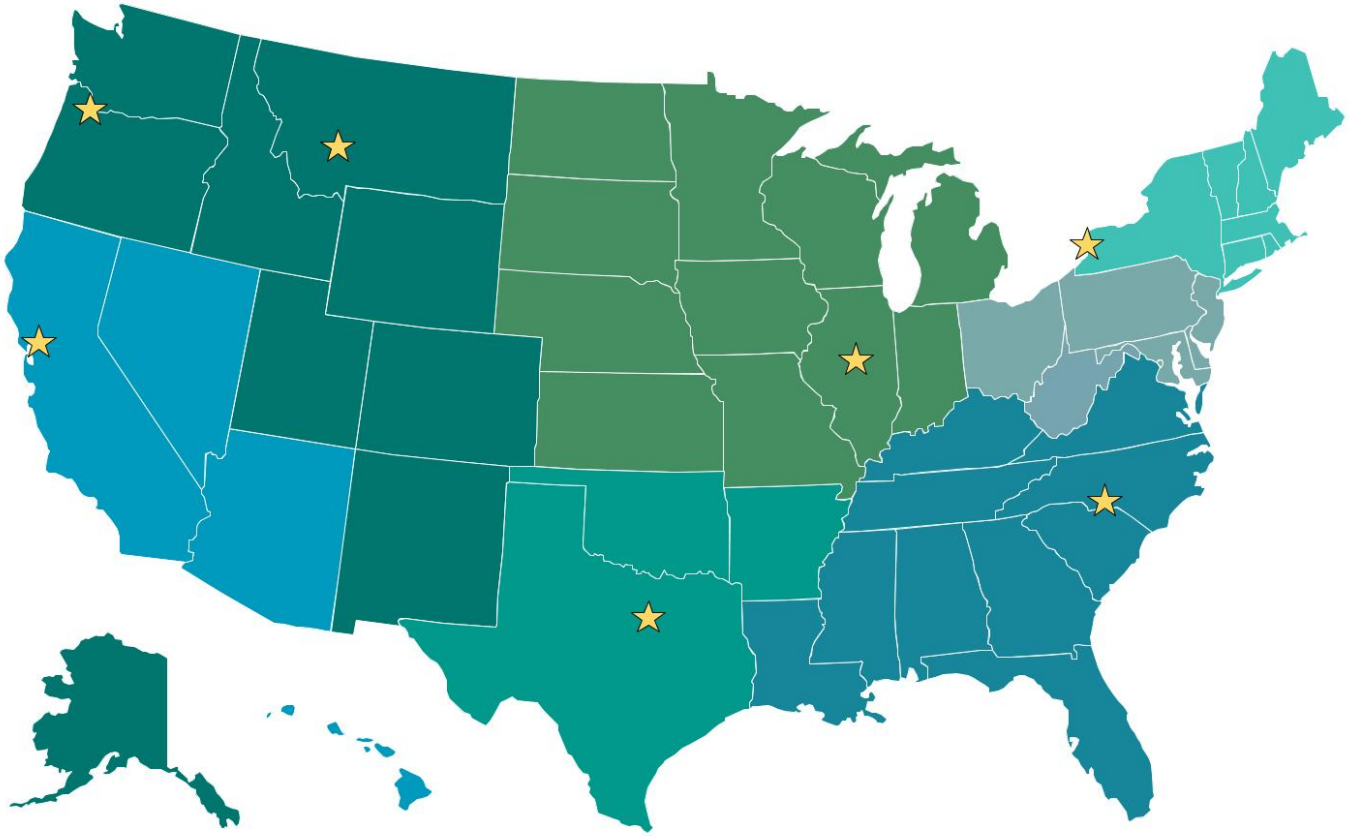
Rockman et al

Methods



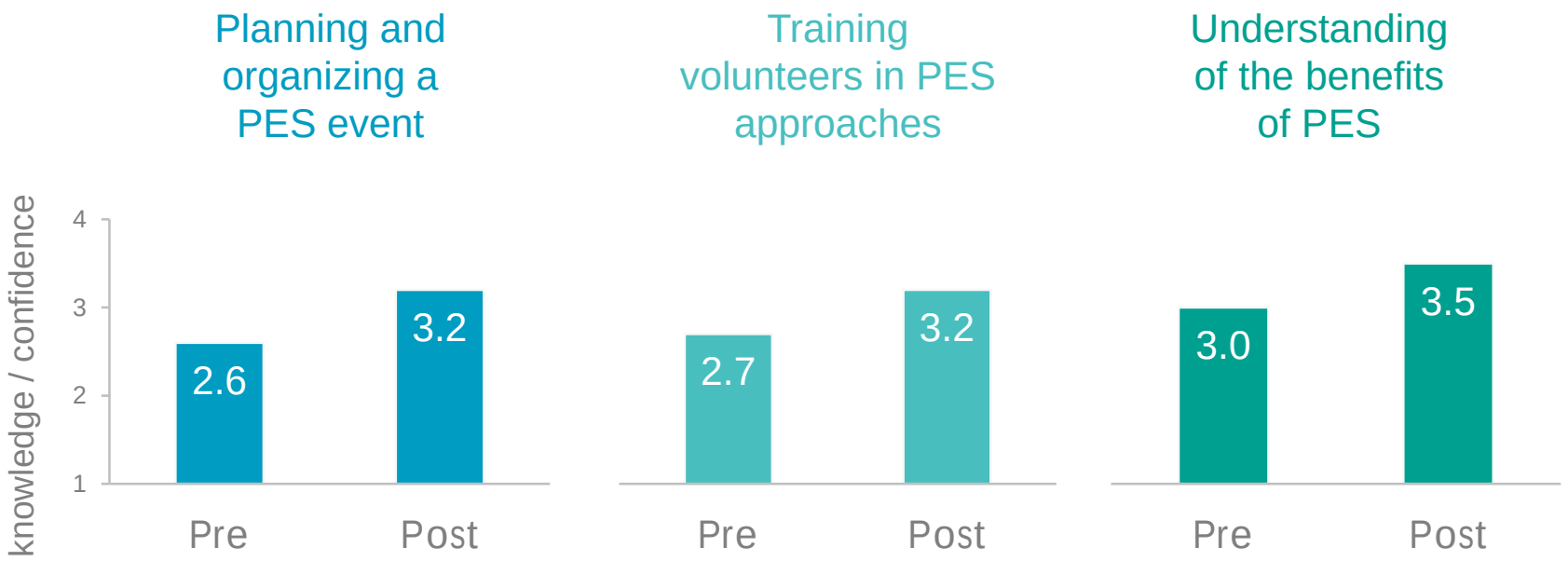
Rockman et al

Site visits



Outcomes for hosts

Improved understanding of PES



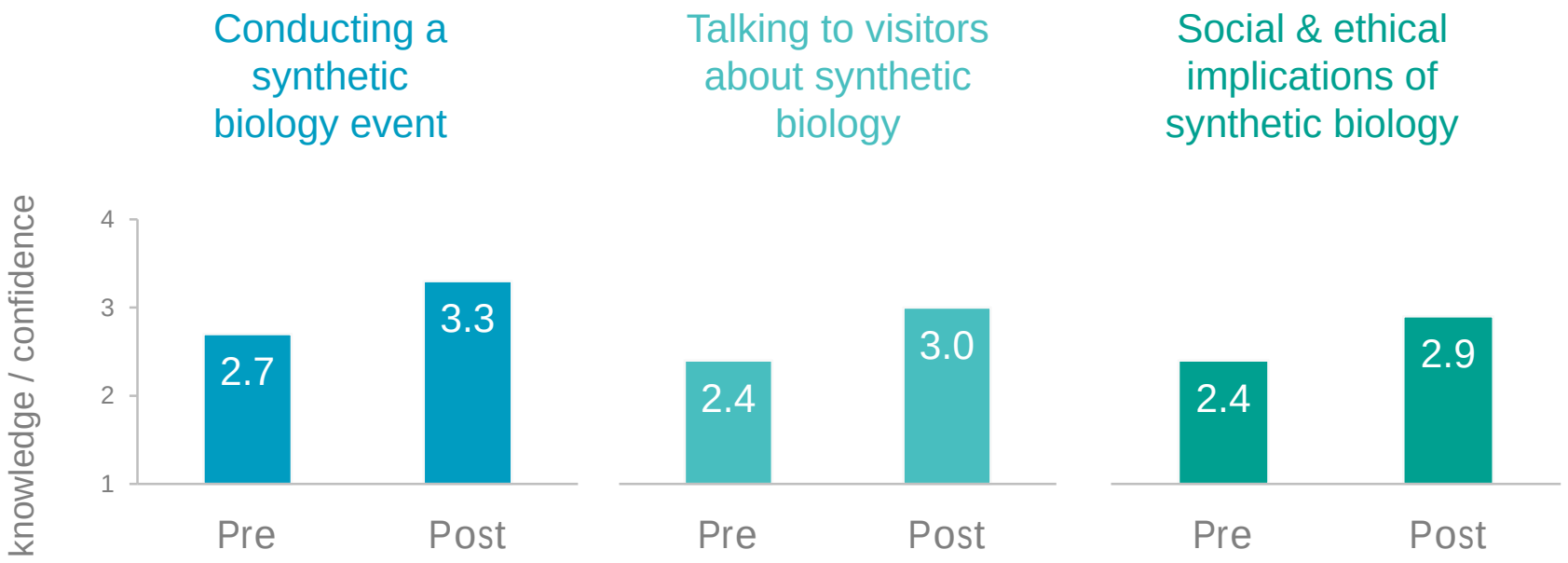
Outcomes for hosts

Experience with forums

“This forum event was different than our other adult programming as we were asking the visitors to talk, think and share their opinion in written form and reporting back to another party. Our previous events were lecture plus community discussion and participation but the visitor's opinion this time is shared with others. Our visitors were very pleased that they learned a lot.”

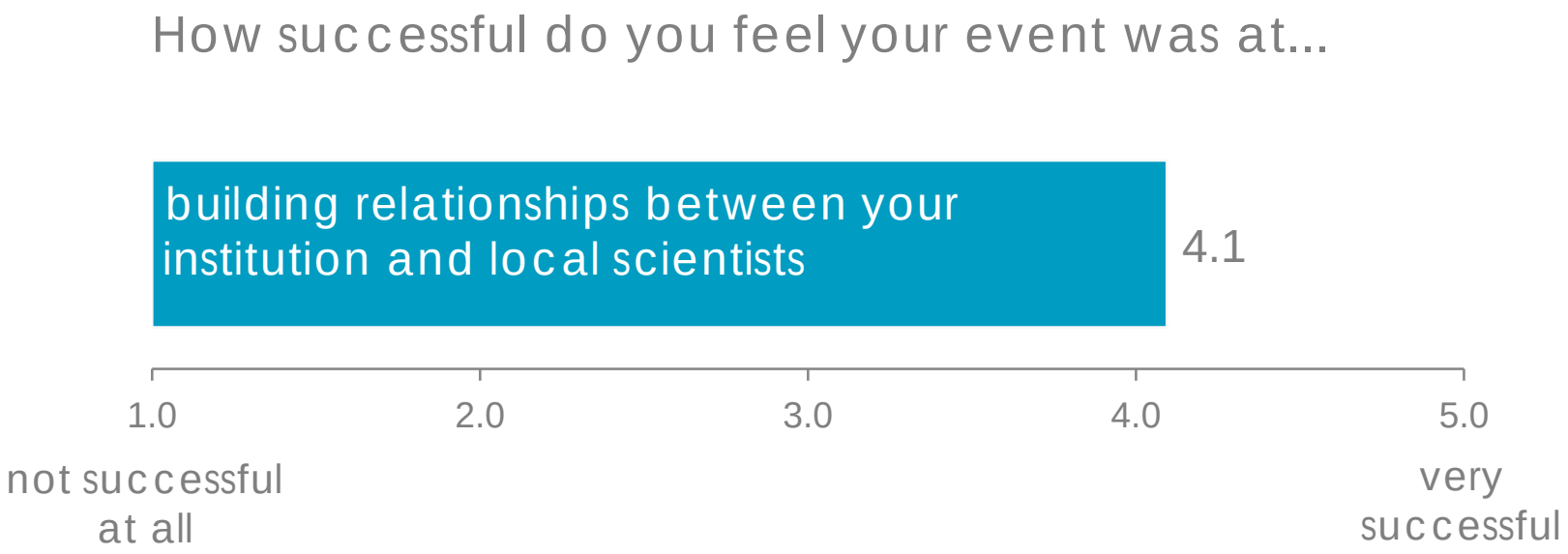
Outcomes for hosts

Improved understanding of synthetic biology



Outcomes for hosts

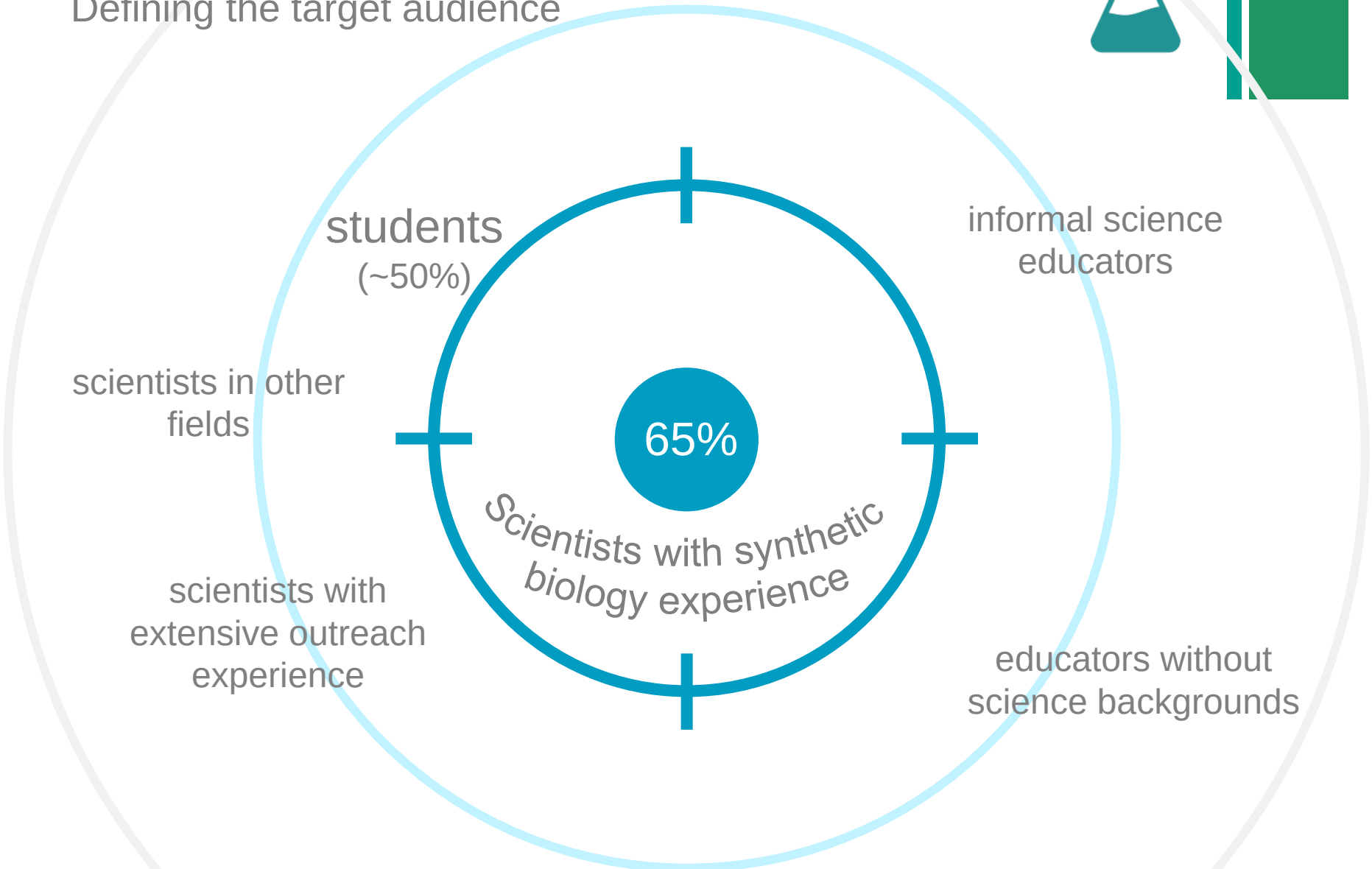
Relationships with scientists



"They're the experts with the content. We're the experts with education. It just makes sense that we come together…I think there's great value on both sides of the coin."

Outcomes for facilitators

Defining the target audience



Outcomes for facilitators

Outreach as a spectrum

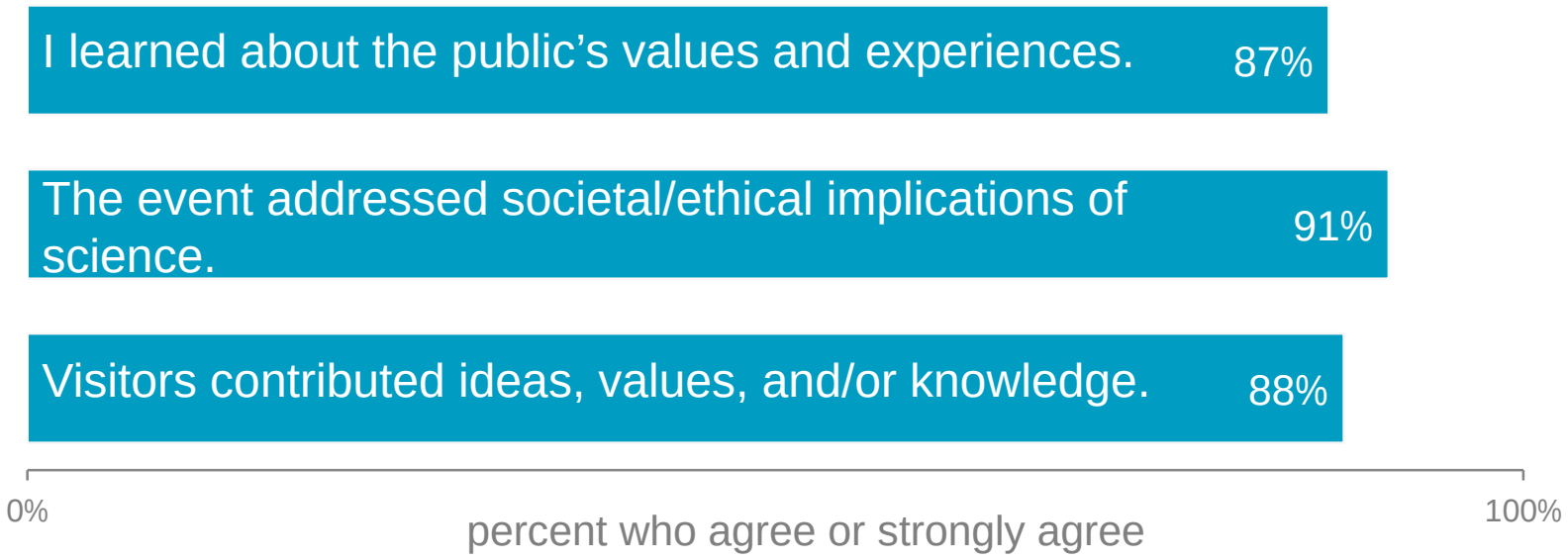
“I learned that we have to a much better job educating the public about scientific concepts.”

“I learned that it is okay to discuss rather than inform.”

Outcomes for facilitators

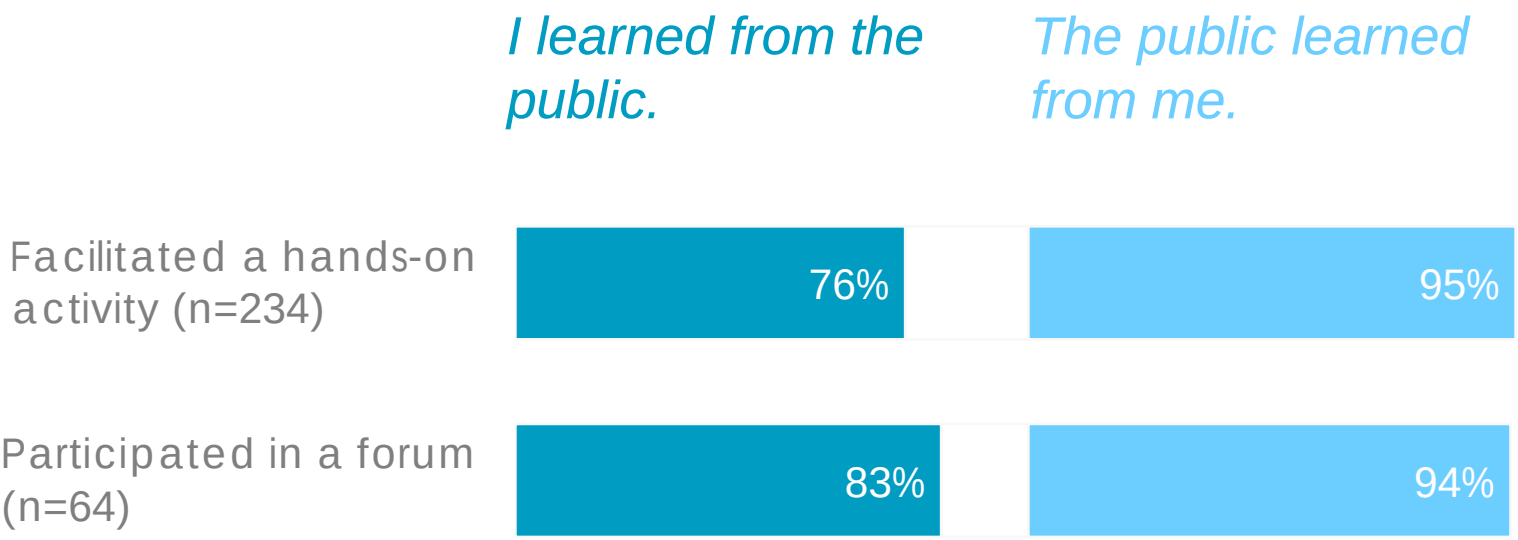
Advancing toward PES

“I learned how to engage in a discussion with the public, and to better listen to the concerns and questions they may ask. I feel that it is OK that the public may disagree with the research, as long as they are informed and the scientists understand where concerns may come from.”



Outcomes for facilitators

Forums



"I was overwhelmed about how deeply and creatively many members of the public are thinking about science."

Outcomes for facilitators

Forums

How did this experience change your understanding of synthetic biology?

It positively influenced the way I think about the public's ability to engage in thinking about scientific research.	90%
It increased my interest in doing public outreach in the future.	88%
It influenced the way I think about scientific research.	56%

"Synthetic biologists sometimes can be very focused on the specifics and the elements of the field that people are researching, but they should also focus on the application of the science and how what they are doing will benefit the public." – scientist facilitator

Long-term Impacts & Future Opportunities

- Impacts on the ways scientists think about their work and present it to others – creating conversations, thinking about applications
- Relationships between informal science educators and scientists that will be carried on into future events
- Increased likelihood of doing these events in the future

Questions