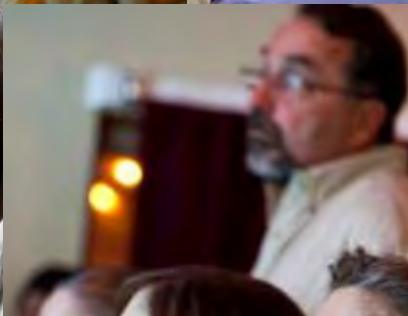# Findings from research and evaluation studies: What we've learned about our professional partners' participation in NISE Net

NISE Net Partners

NISE Net Evaluation and Research Studies

Evaluation studies:
- Judges merit or worth of a project
- Provides information for decision-making
- Is conducted within setting of changing actors, priorities, resources, & timelines

Research studies:
- Produces generalizable knowledge
- Advances broad knowledge and theory
- Is conducted in a controlled setting

http://publications.nigms.nih.gov/presentations/measuring_value/slide4.html

Findings from research and evaluation studies: What we've learned about our professional partners' participation in NISE Net

- **Professional Impacts Summative Evaluation**

  Juli Goss, Ryan Auster, Marta Beyer, & Leigh Ann Mesiti, Museum of Science, Boston; Amy Grack Nelson and Steve Guberman, Science Museum of Minnesota

- **Research on Museum Professionals and University Scientist Partnerships**

  Tina Stanford, Linda Shear, and Patrik Lundh, SRI International

- **Research on Organizational Change**

  Marta Beyer and Stephanie Iacovelli, Museum of Science, Boston; Steve Guberman, Science Museum of Minnesota
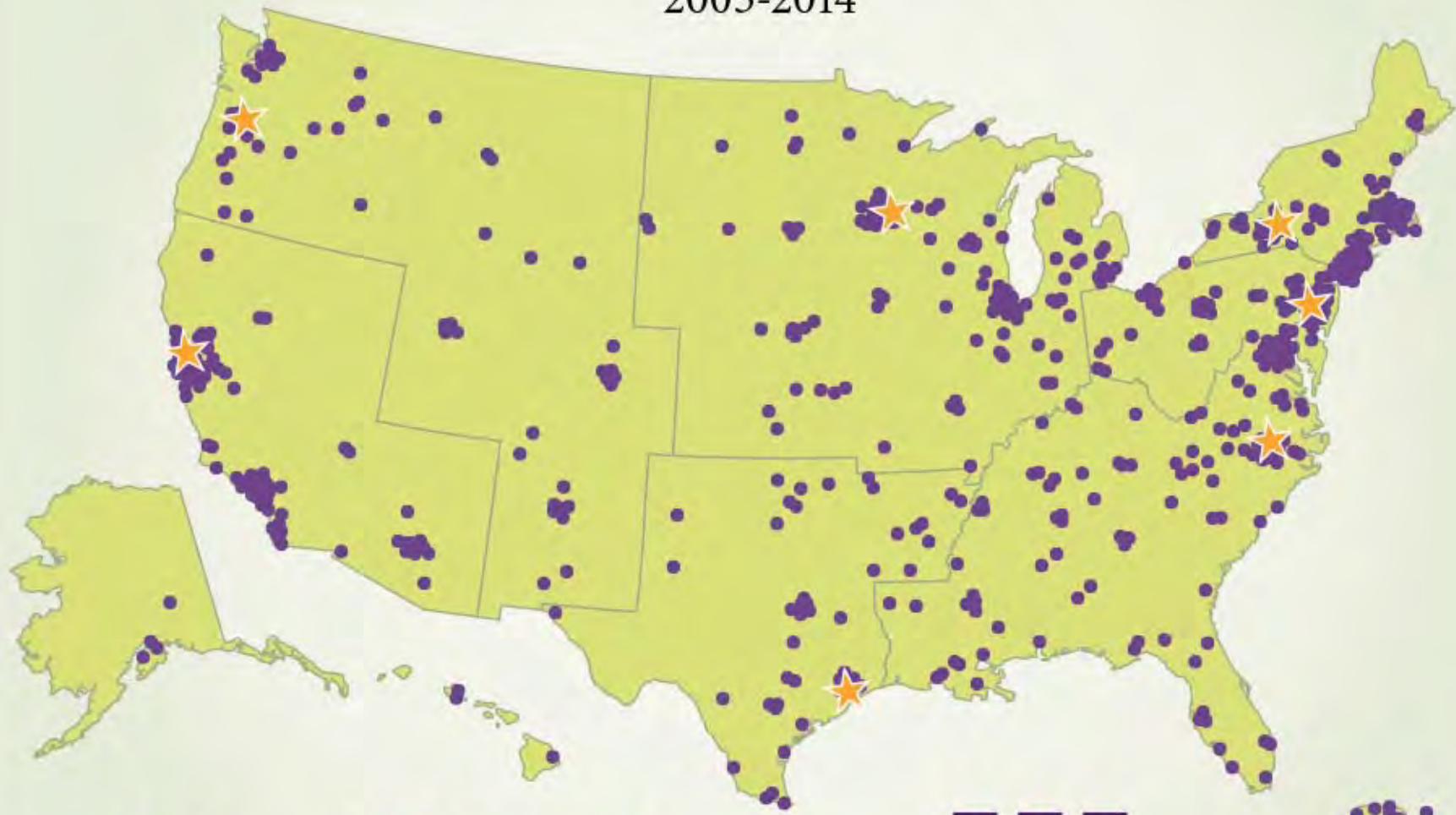
Professional Impacts

The Biggest Event for the Smallest Science!
¡El evento más grande de la ciencia más pequeña!

NISE Network Partners
2005-2014

322 MUSEUMS **192** UNIVERSITIES **41** OTHER

555 PARTNERS

Goals for Professionals

- Sense of Community

- Learning about Nano

- Use of NISE Net Products and Practices

Was NISE Net successful?

YES

About this Study

3-year study

Annual Partner Survey
- 2012 (Y8): 296 responses
- 2013 (Y9): 354 responses
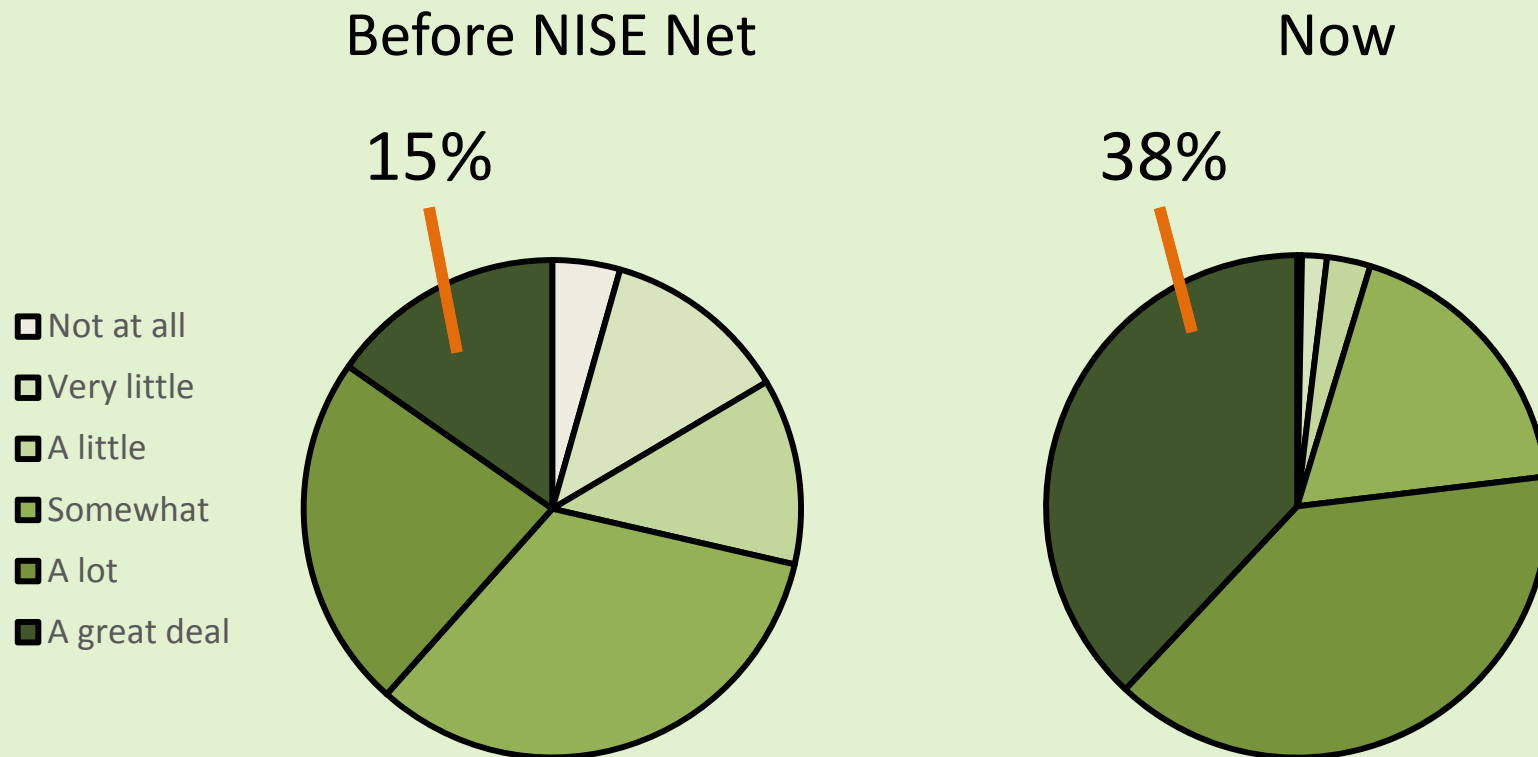- 2014 (Y10): 324 responses

Interviews
- 21 professionals interviewed yearly
- Represent a range of Network experiences

Sense of Community

Did you identify with a broader community of scientists and museum professionals…

Before NISE Net

Now

15%

38%

☐ Not at all
☐ Very little
☐ A little
☐ Somewhat
☐ A lot
☐ A great deal

*statistically significant increase for all involvement levels and organization types

n=321

Sense of Community

When describing how their community had shifted, professionals said NISE Net…

- Expanded the types of organizations with whom they connected

- Helped them focus collaboration with a nano-themed event

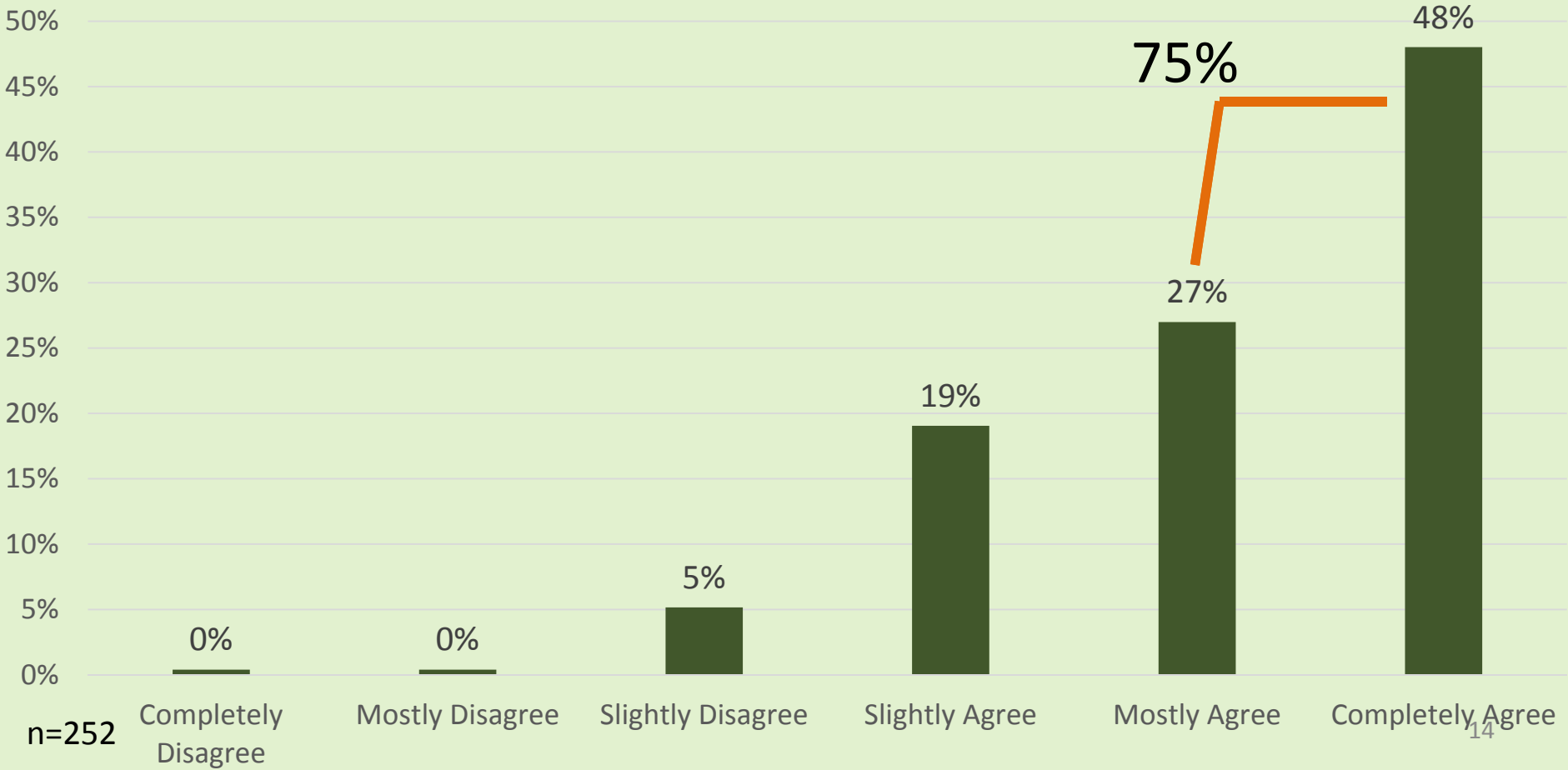- Made them aware of national connections

Sense of Community

"**I always identified with a community of scientists.** But never had any interactions with people associated with the museum side of things. **Through NISE Net, I became involved with our local children's museum.** But also at the local conference, I was able to see what some other museums are doing. Became aware of other science museums and what they do. And **that would not have happened without being exposed to NISE Net.**"

- University partner

Sense of Community

The majority of professionals agree they feel confident initiating a partnership with an informal learning or research organization.

75%

| Category	Value
Completely Disagree	0%
Mostly Disagree	0%
Slightly Disagree	5%
Slightly Agree	19%
Mostly Agree	27%
Completely Agree	48%

n=252

Sense of Community

The majority of professionals have initiated a partnership with an informal learning or research organization.
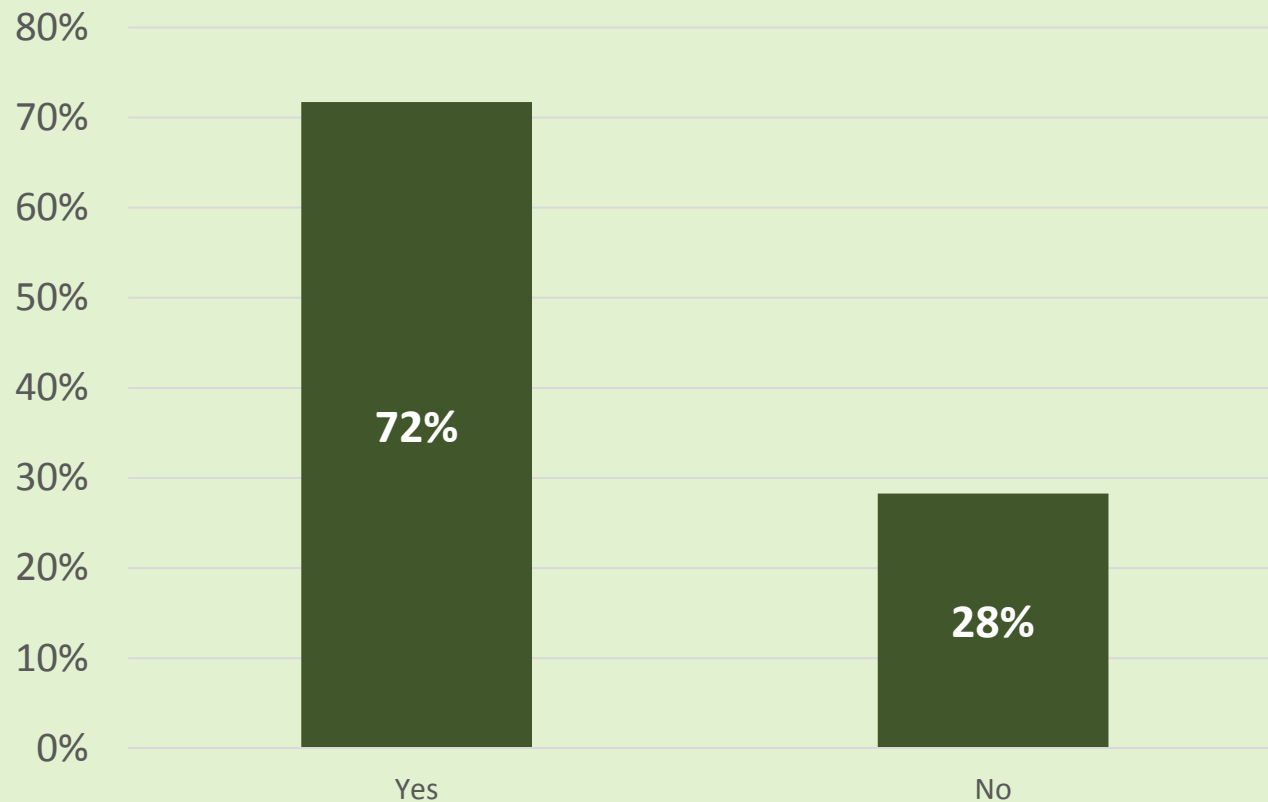
n=244

Sense of Community

The majority of professionals are using NISE Net resources to initiate partnerships.
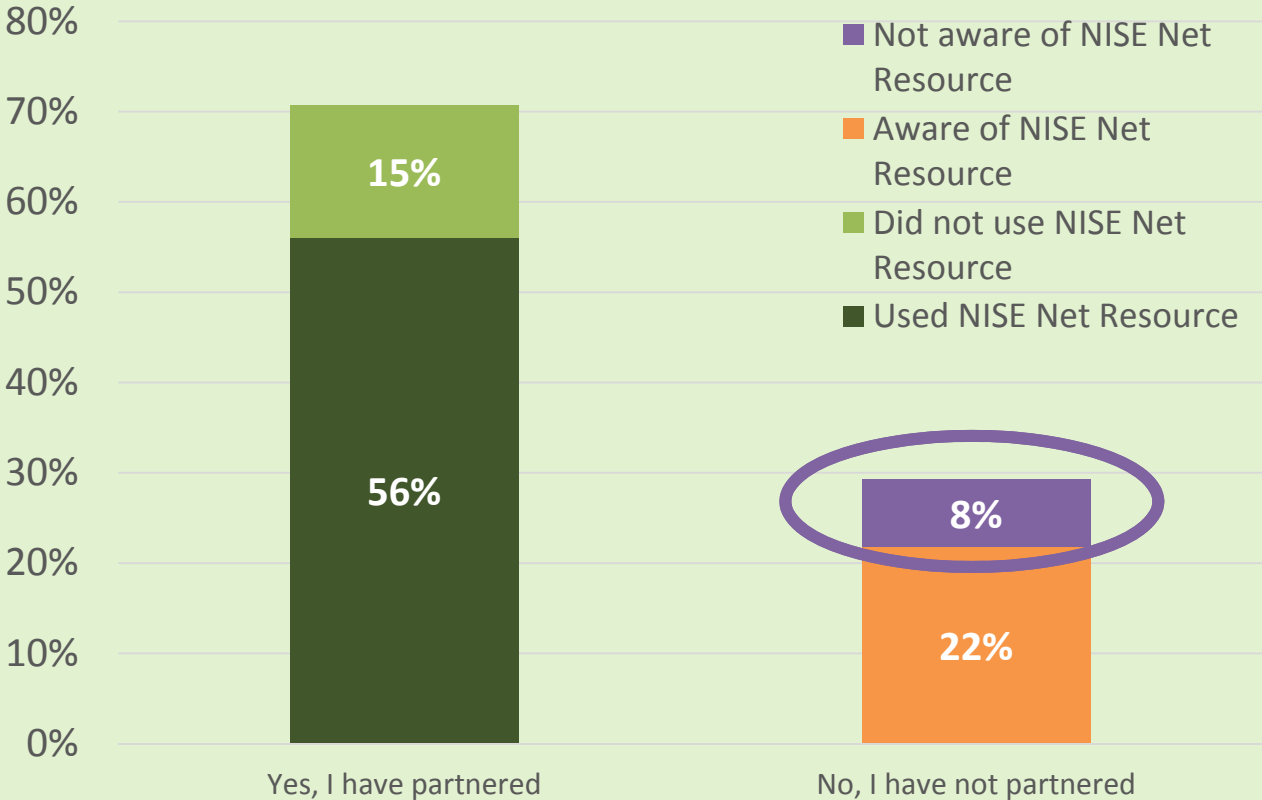
n=238

Learning about Nano Concepts

I feel confident in my ability to explain to another adult…

How much has NISE Net affected your confidence in explaining to another adult…

a. The size of a nanometer.
b. How nano-sized materials behave compared to macro-sized materials.
c. How scientists work at the nanoscale.
d. Examples of nano in nature.
e. Innovations that are possible because of nanotechnology.
f. Ways that nanotechnology improves existing products.
g. Risks or potential risks of nanotechnology.
h. How the future of nanotechnology may be influenced by political, economic, and personal values.

Learning about Nano Concepts

All respondents feel confident about their understanding of nano, but some groups attribute more of this learning to NISE Net.

- Highly involved partners attribute more to NISE Net than less involved partners

- ISE partners attribute more to NISE Net than University partners

Learning about Nano Concepts

"Pretty much **everything I know about nano I know from NISE Net**."

- ISE partner

"For me having worked in the field for long time. I had a pretty good understanding. What it has allowed me to do, is to broaden. Most of my work is focused on a certain aspect of nano. **This has helped broaden my presentations of what nano is.**"

- University partner

Using Public Engagement Products

Did you personally engage any public audience in nano at any time of the year...
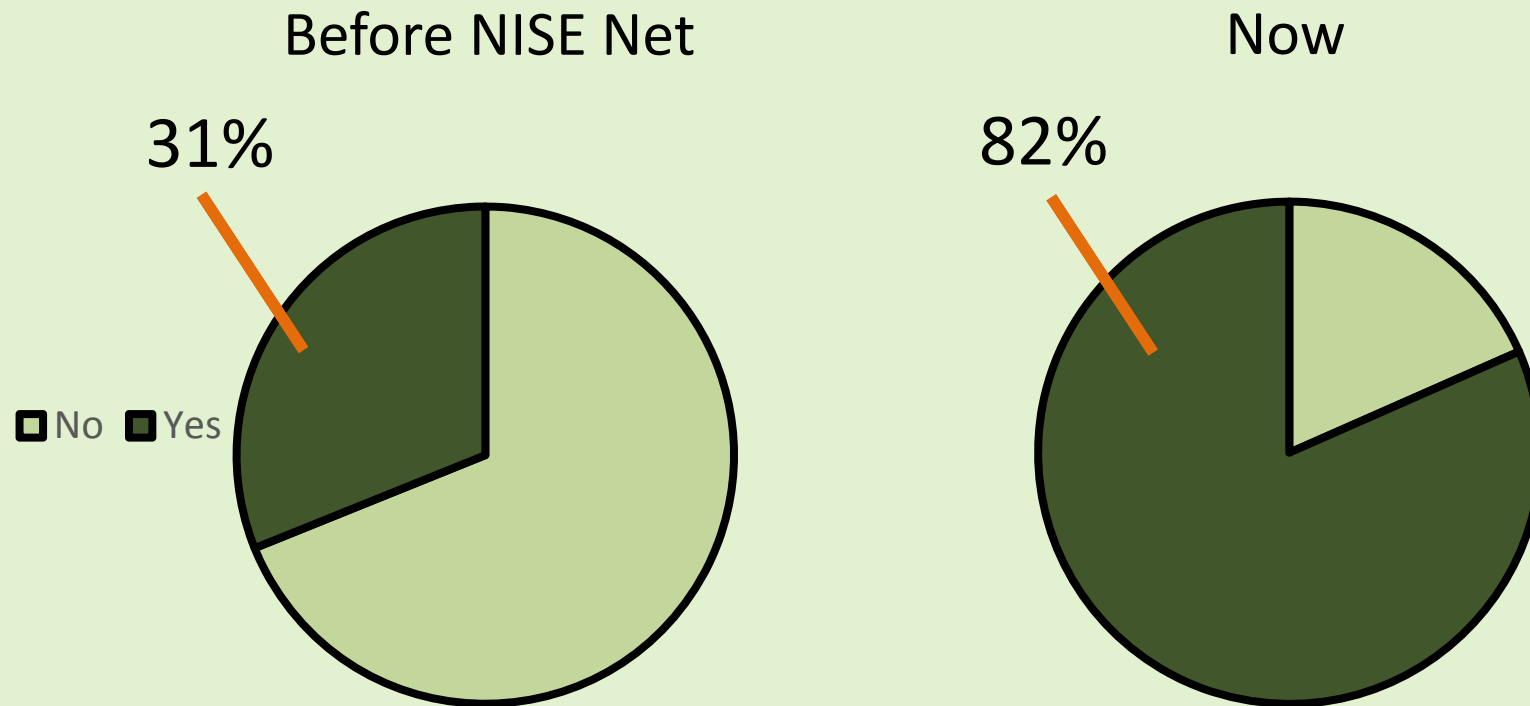
Before NISE Net

Now

31%

82%

☐No ■Yes

*statistically significant increase for all involvement levels and organization types

n=322

Using Public Engagement Products

Professionals use a range of NISE Net products
- Especially cart demonstrations, media, and classroom activities

Professionals' Use of NISE Net Products

Legend: ■ Yes ■ No

Product	Yes	No
Cart/Hands-on	84%	16%
Media (print)	78%	22%
Media (video)	66%	34%
Classroom	65%	35%
Stage	36%	64%
Sci Cafes	18%	82%
Mus Theater	17%	83%
Forums	14%	86%
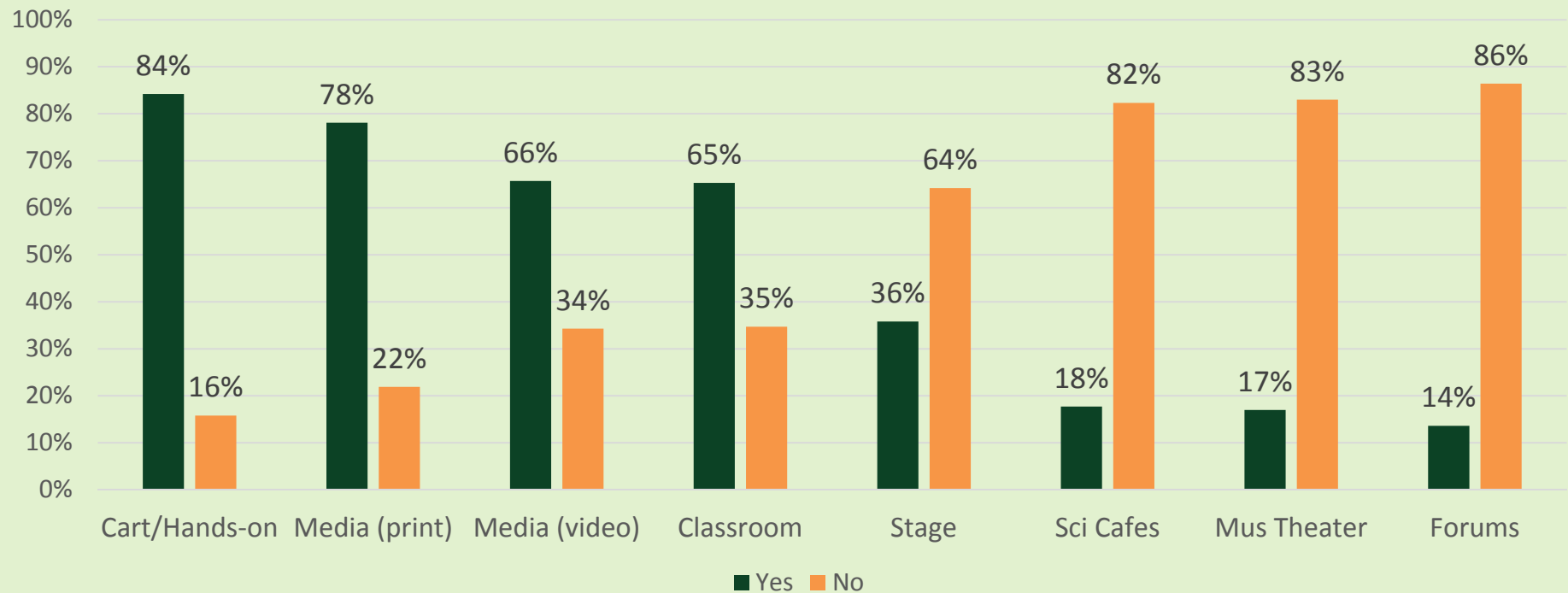
n=265

Using Public Engagement Products

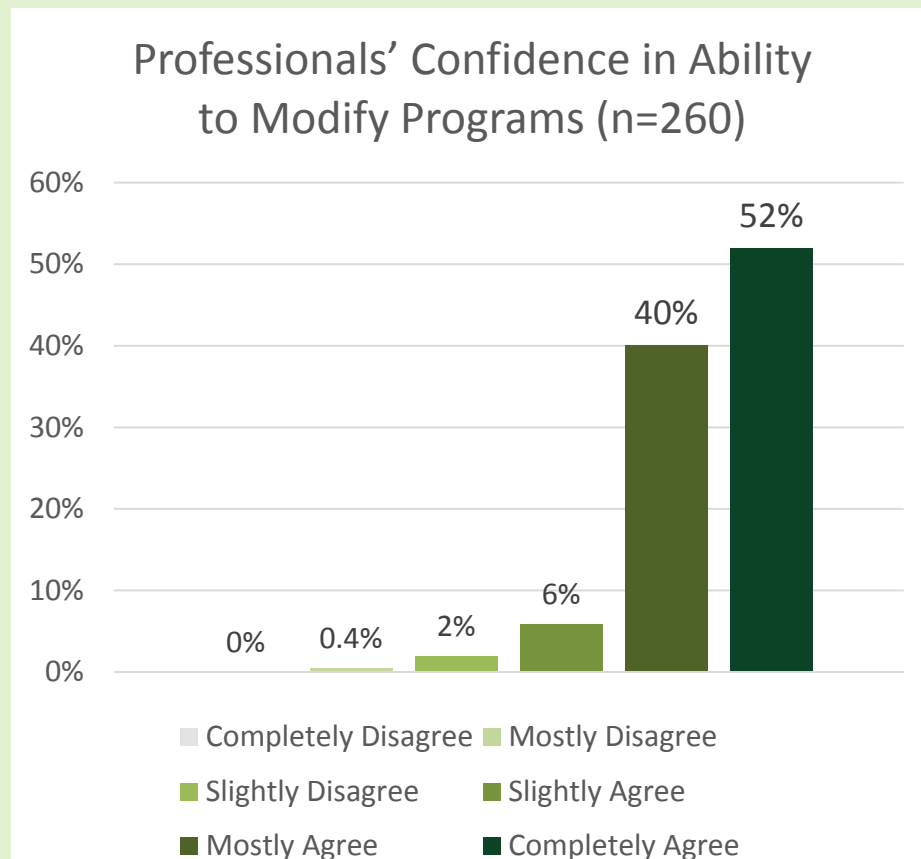The majority of respondents feel confident in their ability to modify and adapt programs for their audiences.

- • This is similar across involvement levels and across organization types

The most frequent modification is

- • "incorporating a NISE Net product into an existing program" (193 of 260; 74%)

Professionals' Confidence in Ability to Modify Programs (n=260)

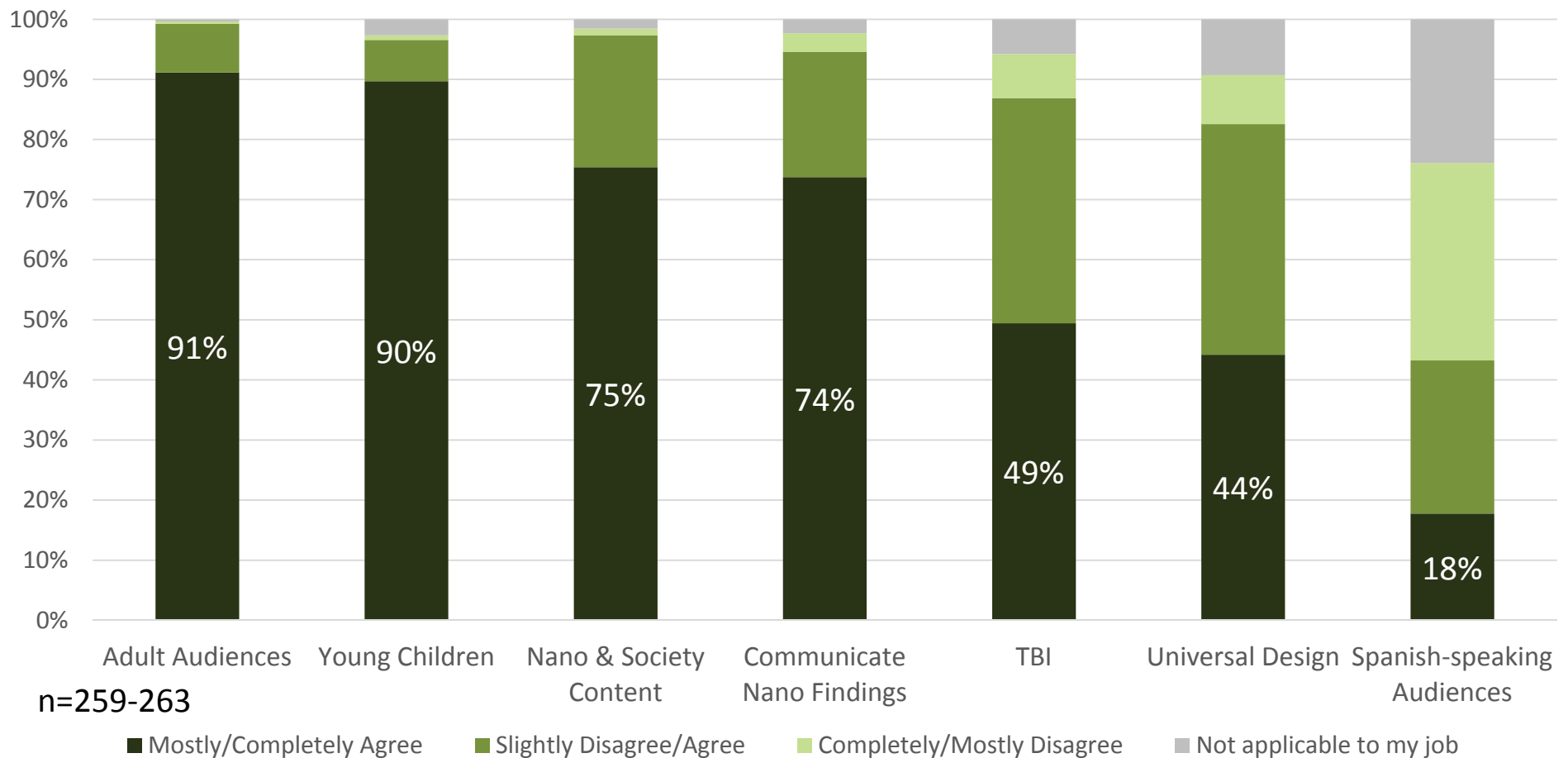| Response	Percentage
Completely Disagree	0%
Mostly Disagree	0.4%
Slightly Disagree	2%
Slightly Agree	6%
Mostly Agree	40%
Completely Agree	52%

Public Engagement Practices

- Engage **adult** audiences

- Engage **young** children

- Engage audiences with **nano and society** content

- **Communicate to a public audience findings** from the field of nano research

- Use **team-based inquiry** to incorporate evaluation into my work

- Apply principles of **universal design**

- Engage **Spanish-speaking** audiences

Learning about Public Engagement Practices

Professionals are confident in their understanding of many practices

- Especially engaging adults, engaging children, conveying nano & society content, and communicating nano research findings to the public

n=259-263

Legend: ■ Mostly/Completely Agree   ■ Slightly Disagree/Agree   ■ Completely/Mostly Disagree   ■ Not applicable to my job

Chart values:
- Adult Audiences: 91%
- Young Children: 90%
- Nano & Society Content: 75%
- Communicate Nano Findings: 74%
- TBI: 49%
- Universal Design: 44%
- Spanish-speaking Audiences: 18%

Using Public Engagement Practices

Professionals are implementing many practices
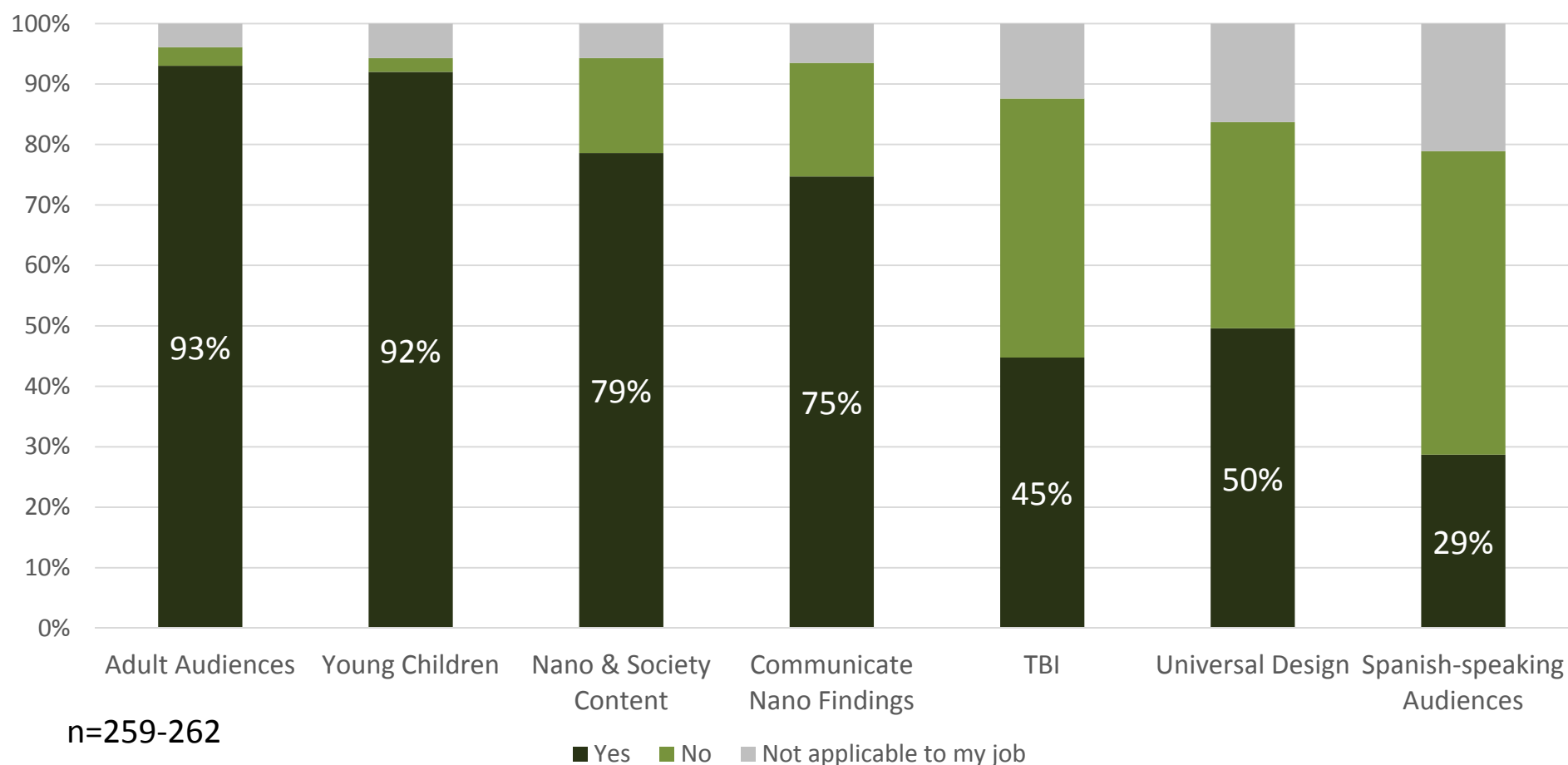
- Especially engaging adults, engaging children, conveying nano & society content, and communicating nano research findings to the public
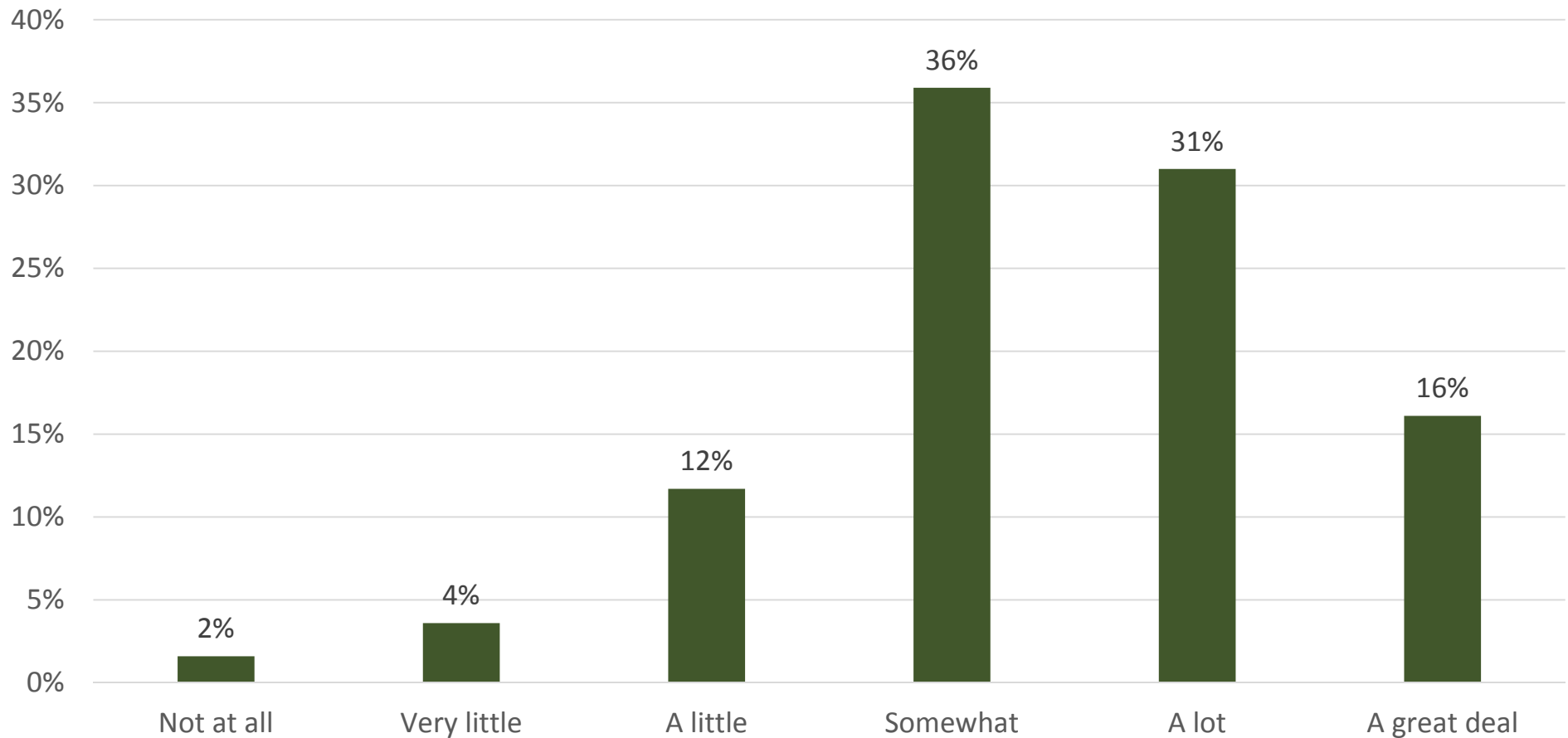

n=259-262

…and beyond!

In some capacities, NISE Net has surpassed its goals by supporting professionals beyond nano.

NISE Net has:
- Impacted partnerships about other topics
- Helped professionals communicate other STEM topics
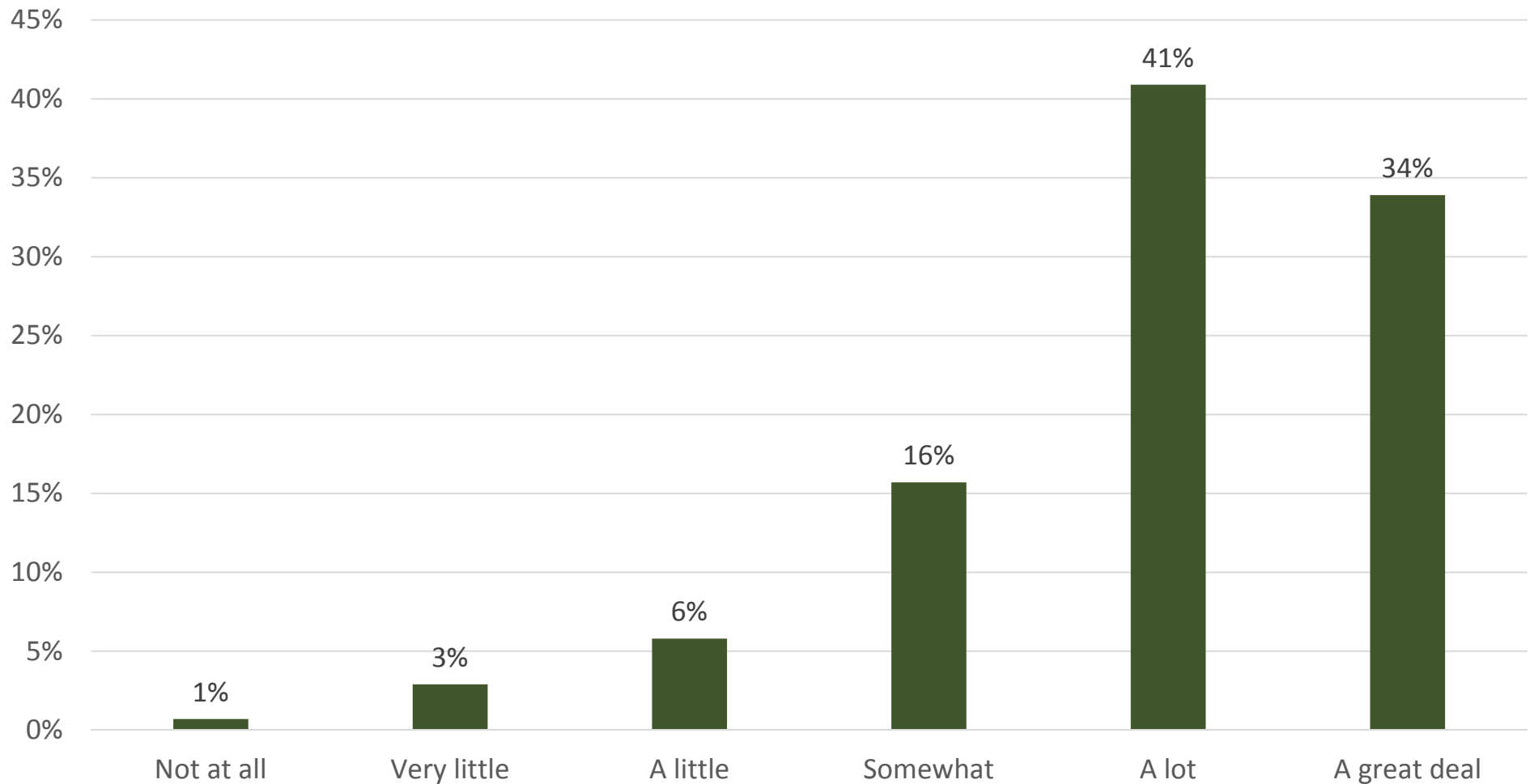- Promoted public engagement practices that extend beyond nano

Partnerships – beyond nano

To what extent has NISE Net increased the amount of ANY partnerships or collaborations between your organization and another? (n=248)

Using Public Engagement Practices – beyond nano

Have you drawn on NISE Net information to do any of the following with content areas other than nano (n=256 to 258)

Legend: ■ Yes ■ No ■ Not applicable to my job

Category	Yes
Adult Audiences	52%
Young Children	59%
Societal Implications	46%
Communicate Science Findings	45%
TBI	34%
Universal Design	32%
Spanish-speaking Audiences	16%
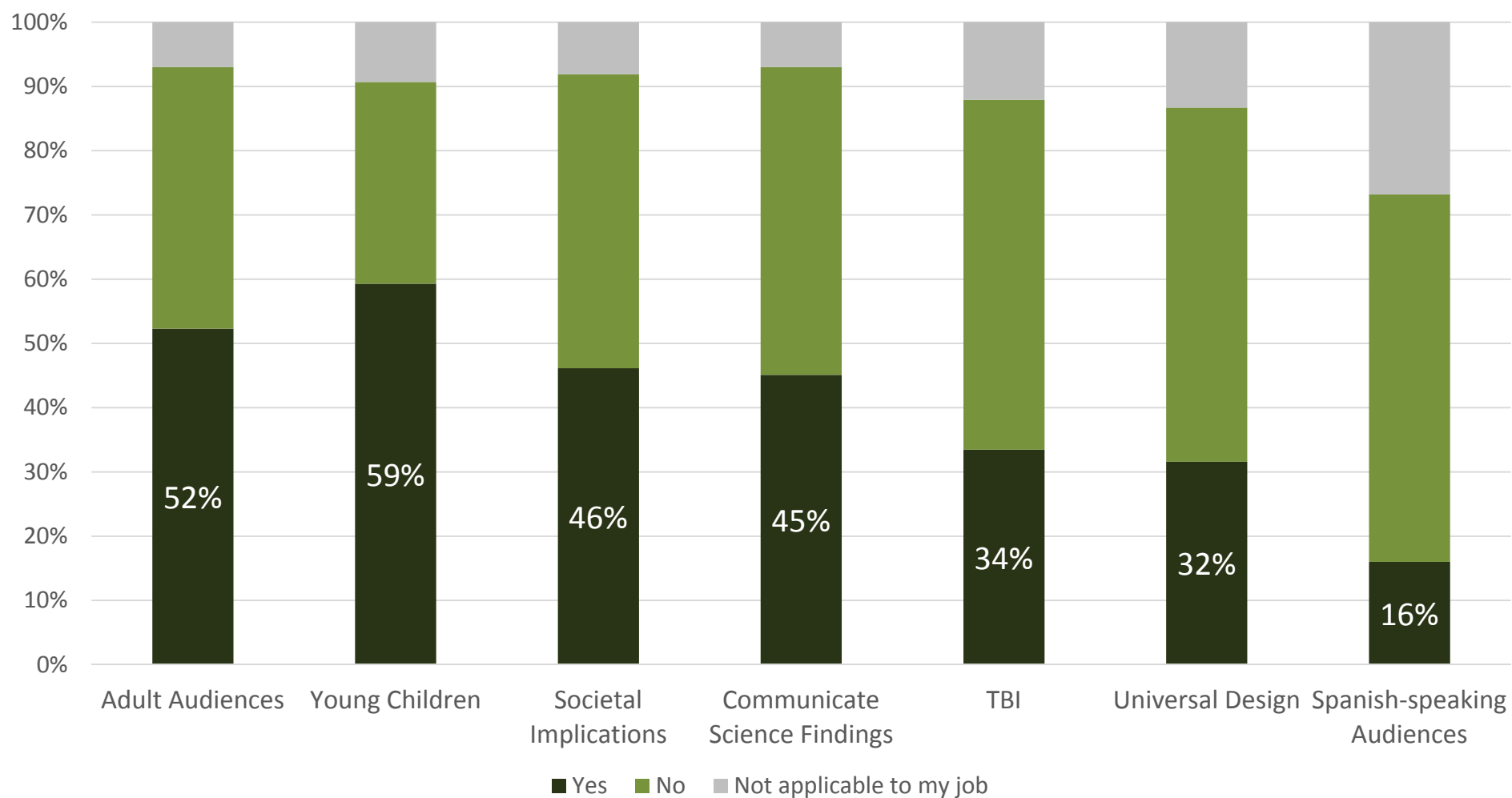
NISE Net as a model

"I think that the NISE Net activities are so well put together. I think in general we have probably **begun to emulate some of the way the activities are put together**. But I'm not sure it's an actual thing I can articulate or measure in any particular way, but I think it has influenced us."　　　　　　　- Museum partner

"I relied more heavily this year on some of the NISE Net materials on how to engage visitors. …the students each got one of the nano kits that they got some time with and then demonstrated to the class and then they had to do something similar but for astrobiology, **the kit as a model for teaching a concept**. "

- University partner

"I'll say that we probably use **the way the activities are put together as a model** for some of the things we do since we do a new program every week."

- Library partner

Conclusion

NISE Net has achieved its goals for professionals.

NISE Net has supported professionals in some ways that extend beyond nano content.

See the full results in our report available this Fall.

Museum Professionals and University Scientist Partnerships

- **Tina Stanford, SRI**

- **Linda Shear, SRI**

- **Patrik Lundh, SRI**

Study Background

- Focused on partnerships between university scientists and museum professionals who worked closely together to develop a specific product

- Purpose to understand how these partnerships work, what makes them successful, and how they build capacity for collaborators

- Lots of research on various cross-institutional partnerships in informal education, but little research on how these particular kinds of partnerships work

SRI Education

A Unique Opportunity!

To study how professionals from two different institution types:

*Informal Science Museums*
and
Research Universities

work together to support the goal of public education of a complex, cutting-edge science

Not much prior research has been conducted In this area!

SRI Education

Research Questions

RQ1 What key aspects of museum-scientist partnerships support their collaborative efforts to produce educational materials and strategies for communication with the public?

RQ2 How do scientists and museum professionals use these products to communicate complex scientific ideas to the public?

RQ3 How do museum-scientist partnerships build the capacity of each partner?

University scientists

RQ3

Partnerships

RQ1 Products RQ2 Public

RQ3

Museum professionals

SRI Education
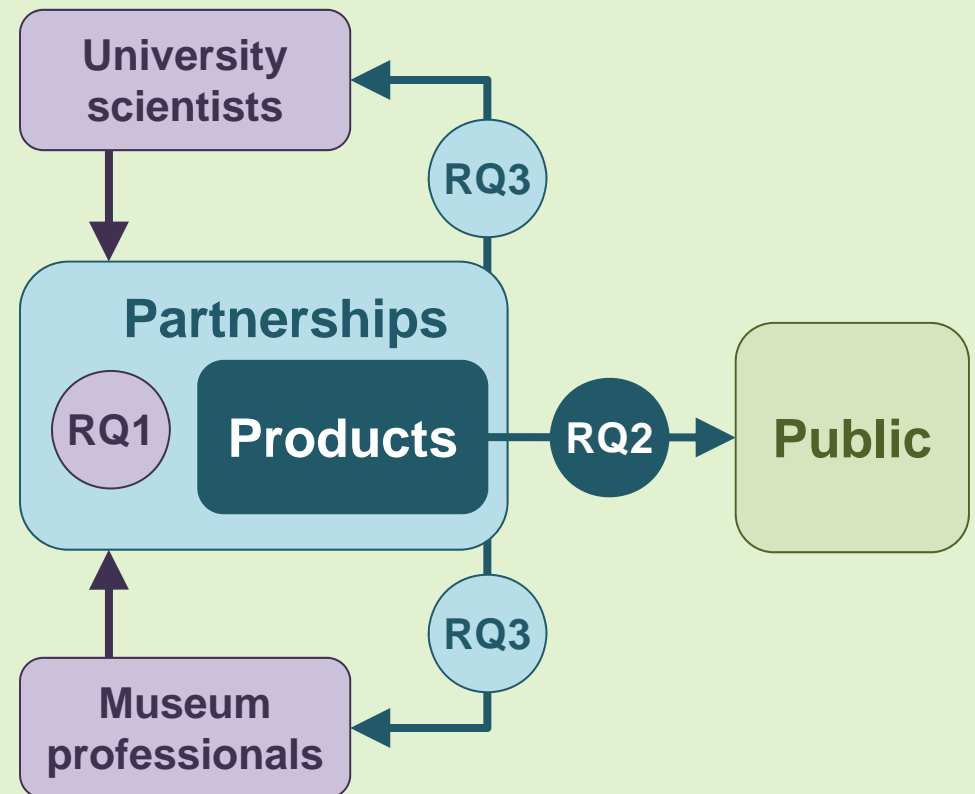
Methodology

We began our study in Year 6 of NISE Net.

Data sources included observations, interviews, and document examination from:

- Nano & Society work group
- Content Map development
- NanoDays
- Early Scientists Communication and Training Workshops
- Additional interviews with selected partnership participants and staff
- General network activities and reports
- Social Network Analysis

NISE Network

SRI Education

Main Challenge: Cultural Differences

Universities

Science Museums

SRI Education

RQ 1: What makes partnerships work?

Key ingredients of success

- The content map work helped to create a conceptual landscape and a set of priorities and directions.

- The development of positive relationships was key to good collaboration.

- The role of goals—shared goals and overlapping or complementary goals

- Time and persistence enabled building on successes and failures.

- Collaborators leveraged each other's perspectives and expertise.

SRI Education

RQ 1: What makes partnerships work?

Example: Partnership as dating

How one museum structures and organizes partnerships

- Have a conversation & visit: Get to know each other

- Make a list of what you want: Explore mutual benefits

- Wait: See if there is interest; if there is, they will contact you

- Negotiate: Communicate about goals, tasks, outcomes

- Create partnership agreement: Put it in writing

- Explore: Test the partnership with small, low-risk project

- Nurture relationship: communicate, share, and be honest

- Expand: Move to bigger projects if it makes sense

SRI Education

RQ2: How are materials used to communicate with the public?

Focus on NanoDays:

- One of the most important initiatives of NISE Net

- Created by scientists and university professionals working together

- SRI focused on how NanoDays activities showcase the outcomes of the work of partnerships, and how scientists and museum professionals communicate with the public

RQ2: How are materials used to communicate with the public?

NanoDays activities were designed to:

- Communicate specific nano ideas that are accessible to visitors

- Engage visitors in ways that are hands-on and connect with their experiences

SRI Education

RQ2: How are materials used to communicate with the public?

NanoDays materials and facilitation:

- Initiated visitors

- Connected to visitors' knowledge and experiences

- Engaged visitors with nano

SRI Education

RQ2: How are materials used to communicate with the public?

Example

Thin Films at the California Academy of Sciences

RQ3: How do partnerships build capacity?

Capacity building outcomes

- Building social capital

- Increased knowledge about nano and communication practices

- New partnerships, grant opportunities, and professional directions

- Growth in institutional capacity

SRI Education

RQ3: How do partnerships build capacity?

Example

Children's Museum that partnered with a University

- Began with NanoDays, then expanded to summer and afterschool programs, field trip program, etc.

- Relied on partners for science expertise

- Partnership has led to additional grants, including NISE Net mini grants and a state grant

- Modeled other activities based on NISE Net

- Have made connections that they continue to rely on for support

SRI Education

Thank you to the NISE Network and the hundreds of contributors!!

SRI Education

Research questions

- What does organizational change look like in a variety of informal education organizations as a result of their participation in a loosely-organized network?

- Which factors facilitate or hinder organizational change?

Focus of today's presentation

- Highlight different types of partnerships leading to organizational change

- Present factors that facilitated and hindered these partnerships

Study background

Our definition of organizational change

- Changes related to
  - How participants in NISE Net partner organizations do their work over time
  - How new and revised practices, goals, and values become part of the ongoing life of the organization

NISE
network

Study background

Our definition of organizational change

- Changes related to
    - How participants in NISE Net partner organizations do their work over time
    - How new and revised practices, goals, and values become part of the ongoing life of the organization

Data Collection:

- Longitudinal study of six NISE Net partner museums
- Two site visits: interviewed staff and observed meetings

Data Analysis:

- Identification of themes at individual sites and across cases
    - Data reduction: Summaries, debriefs, team discussions
    - Coding: based on conceptual framework and inductive themes

Partnerships

Our definition of partnerships

- Ongoing relationships with someone outside of the museum
- Designing or delivering programs, creating exhibits, or collaborating in other ways around nano
- Working with scientists from universities or industry

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Not all of our museums had partnerships

- For ones that did, the partnerships looked very different from each other and often changed over time

NISE network

Partnerships

Our definition of partnerships

- Ongoing relationship with someone outside of the museum
- Designing or delivering programs, creating exhibits, or collaborating in other ways around nano
- Working with scientists from universities or industry

Not all of our museums had partnerships

- For ones that did, the partnerships looked very different from each other and often changed over time

NISE Net had a role in all of these partnerships

- However, NISE Net's level of involvement varied

Partnerships leading to change

New partnerships are *representations of change* and sometimes *lead to other changes* in the museums

Three examples of partnerships leading to organizational change

1. Partnerships that had a big influence for a short time but no longer exist

2. Partnerships that created long-lasting products for the museum

3. Partnerships that lasted several years and were expected to continue

Facilitating Factors

1. Alignment of goals
2. Regularly occurring events
3. Limited time commitment
4. Mutually beneficial work

Factors Facilitating Partnerships

1. **Alignment of goals**

2. **Regularly occurring events**

3. **Short time commitment**

4. **Mutually beneficial work**

Factors Facilitating Partnerships

1. Alignment of goals

Partner Goals

- Fulfill NSF "broader impacts" requirements

- Communicate research to the public

- Reach a large public audience

- Increase recognition of their university/company

Museum Goals

- Provide educational, interactive, and fun experiences

- Connect to community organizations and local schools

- Broaden audiences

- Have new and changing exhibits/offerings

- Become more STEM-focused

Factors Facilitating Partnerships

Creating and offering educational experiences

Partner Goals

- Fulfill NSF "broader impacts" requirements

- Communicate research to the public

- Reach a large public audience

- Increase recognition of their university/company

Museum Goals

- Provide educational, interactive, and fun experiences

- Connect to community organizations and local schools

- Broaden audiences

- Have new and changing exhibits/offerings

- Become more STEM-focused

NISE network

Factors Facilitating Partnerships

Reaching specific audiences

Partner Goals

- Fulfill NSF "broader impacts" requirements

- Communicate research to the public

- Reach a large public audience

- Increase recognition of their university/company

Museum Goals

- Provide educational, interactive, and fun experiences

- Connect to community organizations and local schools

- Broaden audiences

- Have new and changing exhibits/offerings

- Become more STEM-focused

Factors Facilitating Partnerships

Communicating STEM topics

Partner Goals

- Fulfill NSF "broader impacts" requirements

- **Communicate research to the public**

- Reach a large public audience

- Increase recognition of their university/company

Museum Goals

- Provide educational, interactive, and fun experiences

- Connect to community organizations and local schools

- Broaden audiences

- Have new and changing exhibits/offerings

- Become more STEM-focused

NISE network

Factors Facilitating Partnerships

1. Aligning goals

2. **Regularly occurring events**

3. Short time commitment

4. Mutually beneficial work

Factors Facilitating Partnerships

2. Regularly occurring events

"By having a specific weekend… that creates a nice time point that forces us to reconnect each year."

(Scientist Partner)

Factors Facilitating Partnerships

1. **Aligning goals**

2. **Regularly occurring event**

3. **Short time commitment**

4. **Mutually beneficial work**

Factors Facilitating Partnerships

3. Short time commitment

"…as long as it's not a full week of students in my facilities here then I can certainly host people for half a day, it's not that much effort."

(Scientist Partner)

Factors Facilitating Partnerships

1. **Aligning goals**

2. **Regularly occurring event**

3. **Short time commitment**

4. **Mutually beneficial work**

Factors Facilitating Partnerships

4. Mutually beneficial work: Partnering around NanoDays

Benefits to Partner

- Scientists and students gain communication skills by helping facilitate an event

- Scientists and students able to share their work

Benefits to Museum

- Museum gains knowledgeable facilitators

- Museum is able to connect public to scientists in community

Factors Facilitating Partnerships

4. Mutually beneficial work: Co-development of a nano exhibition

Benefits to Partner

- Scientist able to accomplish broader impacts requirement from NSF

Benefits to Museum

- Museum got a new permanent exhibition

Hindering Factors

1. Communication difficulties
2. Staff changes

Factors Hindering Partnerships

1. **Communication difficulties**

2. **Staff changes**

Factors Hindering Partnerships

1. Communication difficulties: Trouble connecting to the right person

Scientist Partner

"…when the new director came in I called him a couple times, and left messages and [I didn't get a response]."

Museum staff member

"We tried to contact [the scientist] and just could not get ahold of her."

NISE network

Factors Hindering Partnerships

1. Communication difficulties: Looking forward

"I think [the current communication with the museum] is adequate... They could provide more... regular periodic communication via email."

(Scientist Partner)

"[A sustained partnership] requires periodic meetings."

(Scientist Partner)

Factors Hindering Partnerships

1. **Communication difficulties**

2. **Staff changes**

Factors Hindering Partnerships

2. Staff changes

- Staff turnover leading to one partnership ending

- Staff changes stalling a partnership

Factors Hindering Partnerships

2. Staff changes: Looking forward

"Now I have to say, if [the museum contact] disappears, there isn't an obvious next person for me to connect to... if she were to depart... I would lose my strong connection there."

(Scientist Partner)

Partnerships leading to change

Our three examples of partnerships leading to organizational change had a mix of these factors

	Ex 1: Big influence for short time	Ex 2: Created long-lasting products	Ex 3: Lasted several years, expected to continue
Facilitating Factors			
Aligning goals	X	X	X
Regularly occurring events	X		X
Short time commitment	X		X
Mutually beneficial work	X	X	X
Hindering Factors			
Communication difficulties	X		
Staff changes	X		X

Conclusions

- NISE Net has played a role in some museum-scientist partnerships that have led to organizational change

- Partnerships that led to organizational change can have a mix of facilitating and hindering factors

Next Steps for Analysis

Looking at other ways NISE Net may have led to organizational change through:

- Products (mini-exhibition, NanoDays kit, etc.)

- Gatherings (Regional Meetings, Nano & Society Workshop, etc.)

Similar to partnerships, identifying factors that facilitate and hinder these organizational changes

Thank you!

Marta Beyer (mbeyer@mos.org); Stephanie Iacovelli (siacovelli@mos.org);
Steven Guberman (sguberman@smm.org)

Questions & Discussion