NISE Net Online Workshop

Deepening and Extending Family Engagement and Learning Through Interactive Exhibits and Facilitated Hands-on Activities

Tuesday, October 23, 2018

Welcome!

Today's presenters are:

- **Ali Jackson,** Sciencenter
- **Marta Beyer,** Museum of Science
- **Elizabeth Andanen**, Oregon Museum of Science and Industry

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

Introduce yourself! Type your name, institution, and location into the Chat Box

Questions? Feel free to type your questions into the Chat Box at any time throughout the webinar or use the raise your hand function in the participants list and we'll unmute your microphone.

Today's discussion will be recorded and shared on nisenet.org at: nisenet.org/events/online-workshop

EXPLORE SCIENCE

NSF

NISE
NATIONAL INFORMAL STEM EDUCATION NETWORK

Let's Do Chemistry

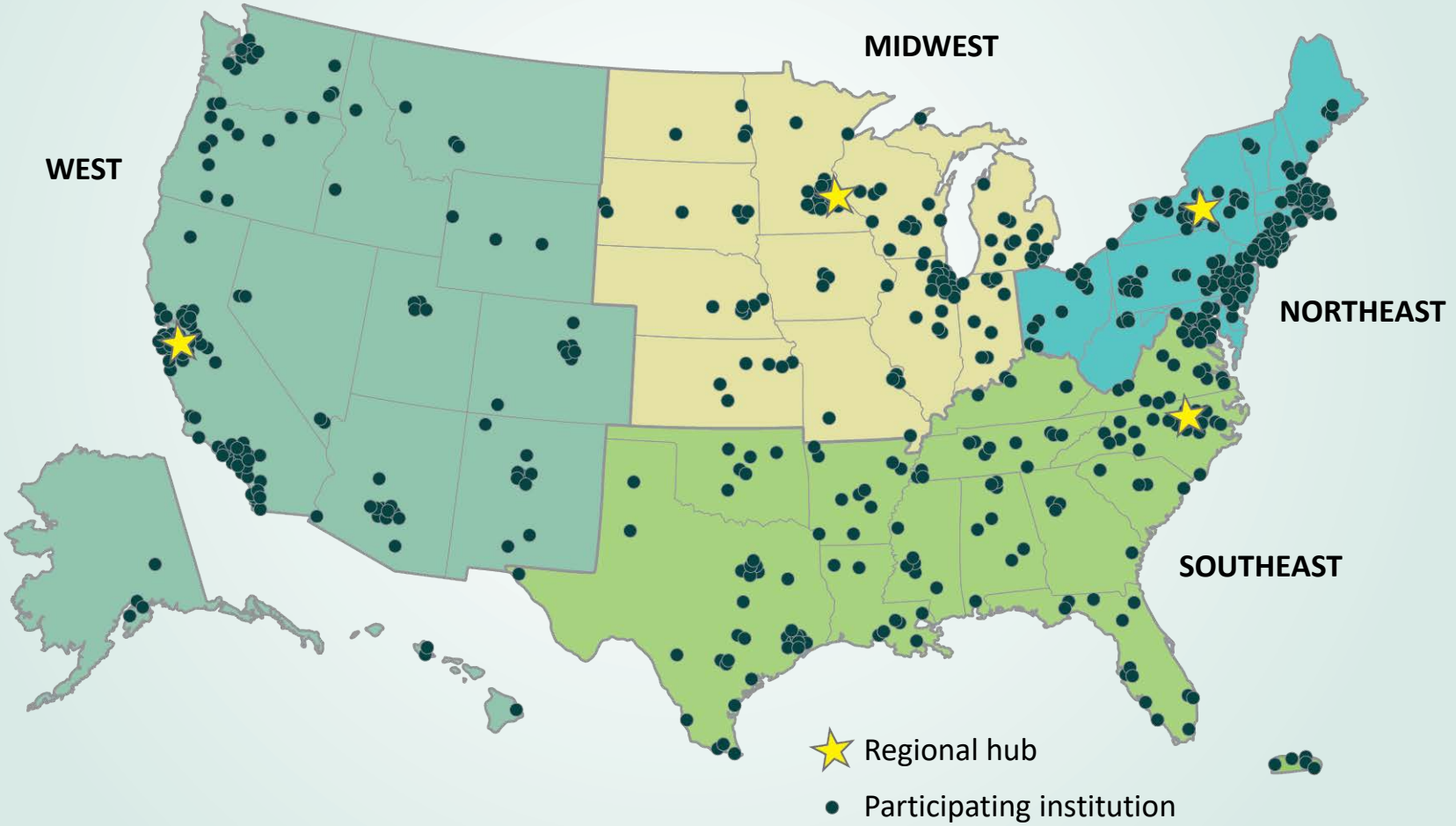
THE NATIONAL INFORMAL STEM EDUCATION NETWORK

is a community of informal educators and scientists

DEDICATED TO

HUNDREDS OF ORGANIZATIONS

participate in NISE Network activities across the United States.



NISE NETWORK

Explore Science: Let's Do Chemistry

Design-based research methodology

Positive attitudes: *Interest*, *relevance*, and *self-efficacy*

Design-based research

“Learning about learning chemistry”

DBR: Research methodology that conceives of an intervention; tests it iteratively in a natural setting; and uses the resulting data to improve the intervention and to create new theories and frameworks for learning.

Design-based research

TEAM: NISE Network museum partners and American Chemical Society (ACS)

Design-based research

PROCESS: At the beginning of the project, we had some ideas about designing experiences that would encourage positive attitudes about learning chemistry.

We are testing and refining those ideas by:

- Trying a variety of chemistry activities with visitors
- Studying educator-visitor-activity interactions through videotaping and interviews
- Talking about the data together
- Improving the activities and testing them again

Defining chemistry

for museum audiences

Chemists are scientists that study:

- what everything is made of
- how different materials behave and change
- how materials interact with each other and combine to make new things

Chemistry can help us understand the world around us and solve problems.

Examples of chemistry
for museum audiences

Chemistry can help us answer questions like:

- *What is air made of?*
- *What makes slime stretchy?*
- *What happens if you mix gum and chocolate?*
- *Is our water safe to drink?*

Our Explore Science activities investigate these questions, and many more!

Learning goals
for chemistry activities

Develop positive attitudes toward chemistry as a foundation for lifelong learning:

Interest: “Chemistry is interesting!”

Relevance: “Chemistry is connected to my life!”

Self-efficacy: “I can learn chemistry!”

Interest

"Chemistry is interesting"

INTEREST

…involves both *feeling* and *thinking.*

… is related to what the activity is *about* and how it connects to *everyday life.*

…is encouraged by activities that are *hands-on* and *allow for observation of phenomena*

Relevance

“Chemistry is connected to my life!”

RELEVANCE

…involves both personal *experience* and broader *applications.*

…involves connecting the activity to *everyday life* and showing how chemistry is *used.*

Self-efficacy

“I can learn chemistry!”

SELF-EFFICACY

…is having a sense of *confidence* and *capability* to learn and use chemistry.

…is encouraged by activities that are *easy to do and understand* and that are *hands-on.*

Explore Science:
Let's Do Chemistry

Activities are:

More about…	**Less about…**
Fun	Facts
Confidence	Comprehensive knowledge
Excitement	Equations
Exploring together	Explaining to someone
Concrete connections	Abstract ideas
Guiding and asking	Showing and talking

And **all about chemistry!**

Explore Science:
Let's Do Chemistry

Positive attitudes start here! Lifelong learning will continue at other times and places:

- **Interest** starts *now* but can carry into the *future.*
- **Relevance** starts *here* but can connect to *home, school, work,* and *community.*
- **Self-efficacy** starts with specific *activities* but can extend to *chemistry* more generally.

ChemAttitudes Research Questions

How should hands-on activities, events, and trainings be designed to increase visitors' positive attitudes about interest in, relevance of, and self-efficacy around chemistry?

- How does activity content affect visitor attitudes about chemistry?
- How does activity format affect visitor attitudes about chemistry?
- How does activity facilitation affect visitor attitudes about chemistry?

ChemAttitudes Research Questions

How should hands-on activities, events, and trainings be designed to increase visitors' positive attitudes about interest in, relevance of, and self-efficacy around chemistry?

- How does activity content affect visitor attitudes about chemistry?
- How does activity format affect visitor attitudes about chemistry?
- **How does activity facilitation affect visitor attitudes about chemistry?**

Methods Related to Facilitation

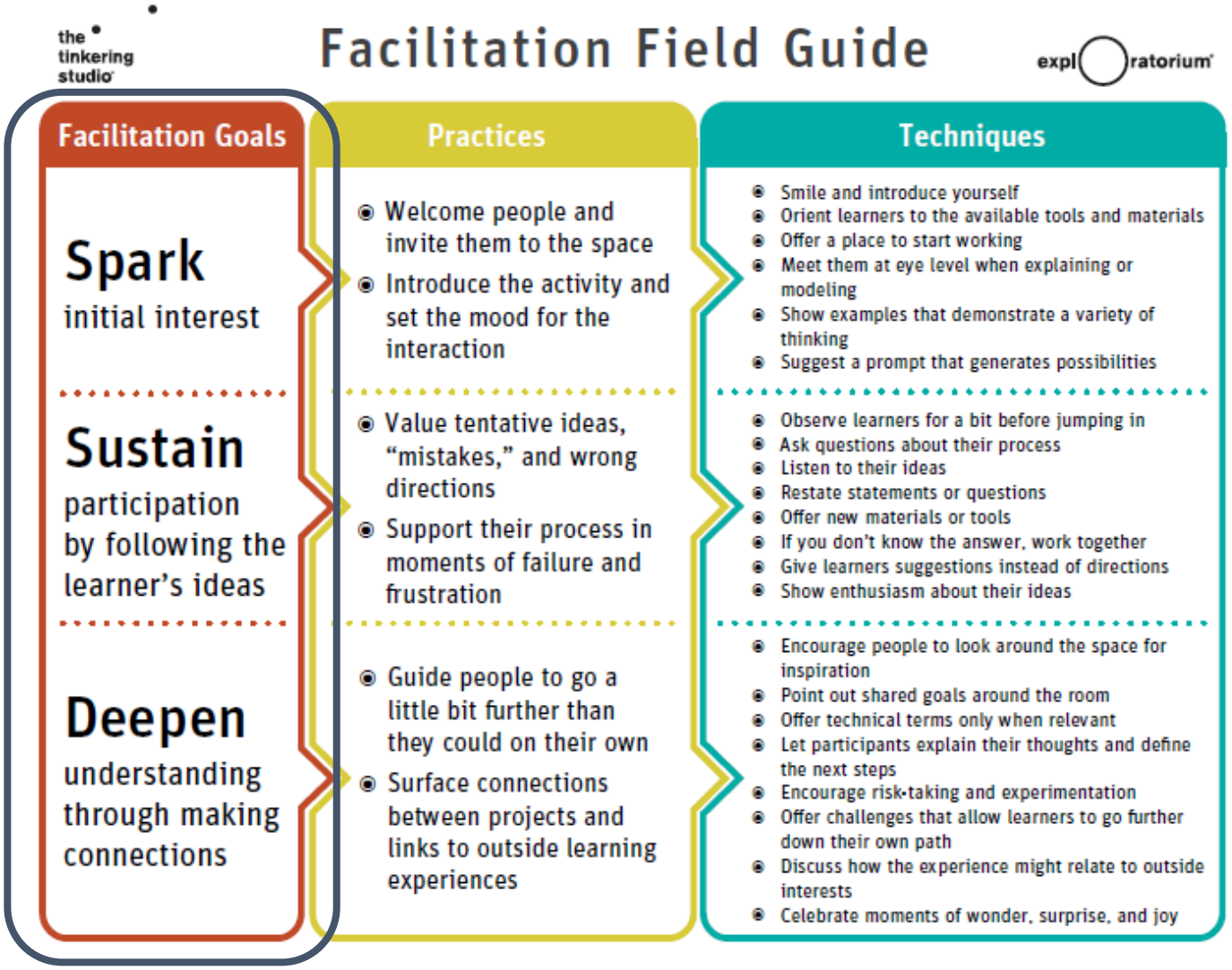
- Collected video and interview data from 44 groups
  - 11 of the 15 activities represented

- Performed qualitative and quantitative analysis

Defining Facilitation Strategies

- Codebook creation
  - Initial conversations with educators
  - Refined list of facilitation techniques
  - Reviewed literature
  - Adapted Exploratorium Learning & Facilitation Frameworks Spark, Sustain, Deepen (Facilitation Field Guide, N.D.)

Adapting a framework



https://tinkering.exploratorium.edu/learning-and-facilitation-frameworks

Facilitation Phases for ChemAttitudes

Spark (Invite Participation) includes techniques that **initiate visitor engagement or participation.**

Sustain (Support Exploration) includes techniques that maintain visitor engagement in the **process of participating in or "moving through" the activity.**

Deepen (Deepen Understanding) includes techniques that **encourage and support meaning-making.**

Spark (Invite Participation)

includes techniques that **initiate visitor engagement or participation.**

[ED]: . . . feeling sick does anyone tell you to take vitamin C or to drink orange juice?
[CF1]: Yeah.
[AF]: Yes.
[Ed]: Yeah, sometimes yeah.
[AF]: I always drink orange juice.
[Ed]: So, we are going to an activity to find out how much vitamin C is in different sorts of fruit juices, ok. And since there's three of you guys, I'm going to have you each test one fruit juice, ok. I'm going to have you share this and then I'm going to get one more.

Spark (Invite Participation)

includes techniques that **initiate visitor engagement or participation.**

- **Provide an introduction or activity overview**
- **Give broad directions or modeling for the use of tools**
- **Build rapport with visitors**
- **Learn about visitors' prior experience or understanding of chemistry**
- **Encourage all group members to participate, re-engage when attention wanes**
- **Transition between different portions of an activity or pursing a new goal**
- **Give visitors the option to stop but the encouragement to stay.**

Sustain (Support Exploration)

includes techniques that maintain visitor engagement in the **process of participating in or "moving through" the activity.**

[ED]: I will poke it in there. Now actually does one of you want to push it in? Just push it all the way to the bottom. Tell me if you see anything happening at all. Anybody notice anything?
[CF]: No.
[CM2]: I saw bubbles coming out.
[ED]: You saw bubbles coming out? Excellent.
[CM2]: It means there's still air in there.
[ED]: Ok, so there is air in there, yes.
[CM2]: It means the water doesn't go in because there's air in there.
[ED]: Yes. So the water is not going in there. So, is the paper towel getting wet do you think?
[CM1]: No.
[CM2]: No
[ED]: Alright let's pull it out, and I will dry it out on the outside before we take a look at it. And, who wants to do the inspection? Go for it.

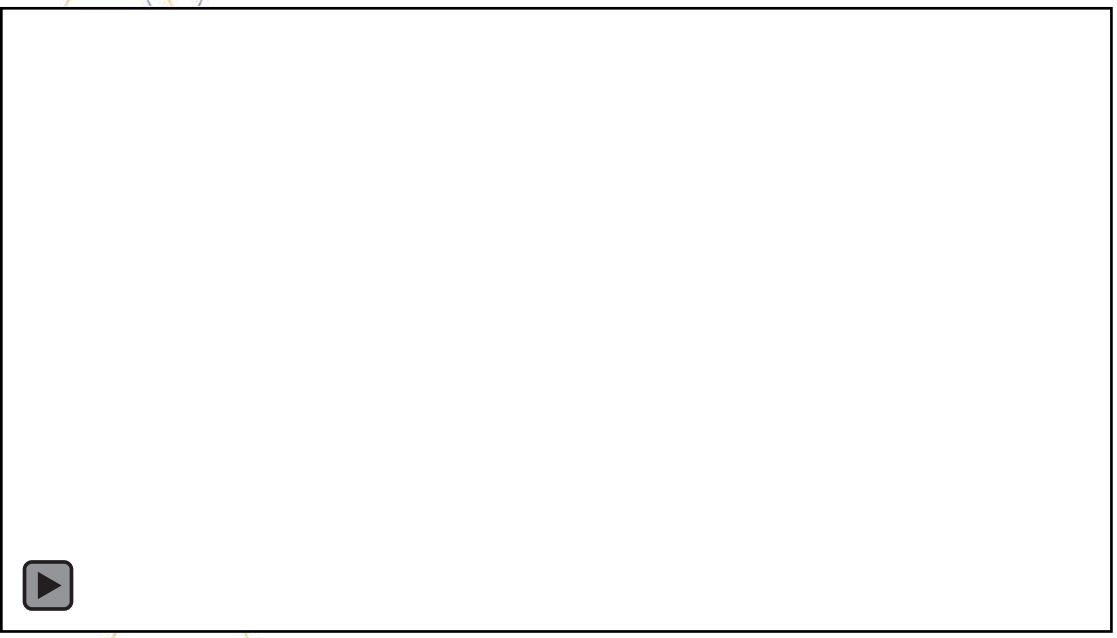
Sustain (Support Exploration)

includes techniques that maintain visitor engagement in the **process of participating in or "moving through" the activity.**

- **Maintain the momentum of the activity**
  - Offer positive reinforcement
  - Provide basic information or vocabulary
  - Provide step-by-step instructions
- **Support visitor inquiry**
  - Ask visitors to make observations
  - Ask visitors to make predictions
  - Encourage iteration and continued experimentation

Deepen (Deepen Understanding)

includes techniques that **encourage and support meaning-making.**



[ED]: Do you think a farmer would think that a pesticide is scary?
[AF2]: No, they know what they're doing, they've studied their pesticides.
[ED]: Studied it.
[AF2]: Mhm.
[ED]: And what does a pesticide allow them to do?
[AF2]: Well, it allows them to farm
[ED]: Yeah, they can sell more of their crop.
[CF]: Yeah.
[ED]: So maybe the farmer might think it's a beneficial thing, but then some people might think it's a scary thing, the consumer maybe might think that I don't want to eat that.

Deepen (Deepen Understanding)

includes techniques that **encourage and support meaning-making.**

- **Foster reflective moments, to help visitors understand why or how something is happening**
- **Support meaning making by encouraging visitors to**
  - apply something they learned during the activity
  - explain why or how something is happening
- **Provide supplemental information to**
  - enhance the visitor's understanding
  - make connections outside the activity

Initial Facilitation Findings

- Facilitators on average spend
  - **15%** of time **inviting participation**
  - **58%** of time **supporting exploration**
  - **22%** of time **deepening understanding**
  - **6%** of the time **other**

- **These techniques don't necessarily happen in a linear structure**

Initial Facilitation Findings

- Positive correlations between strategies that:
  - **Support exploration** and learners **increasing their sense of self-efficacy**
  - **Deepen understanding** and learners **increasing their sense of relevance of chemistry**

- Facilitation strategies are particularly helpful in increasing positive attitudes toward chemistry for participants with **little/no chemistry experiences**

Research Next Steps

- Additional video data analysis

- More data collection
  - Gathering feedback from facilitators at National Chemistry Week 2018

Explore Science:
Let's Do Chemistry

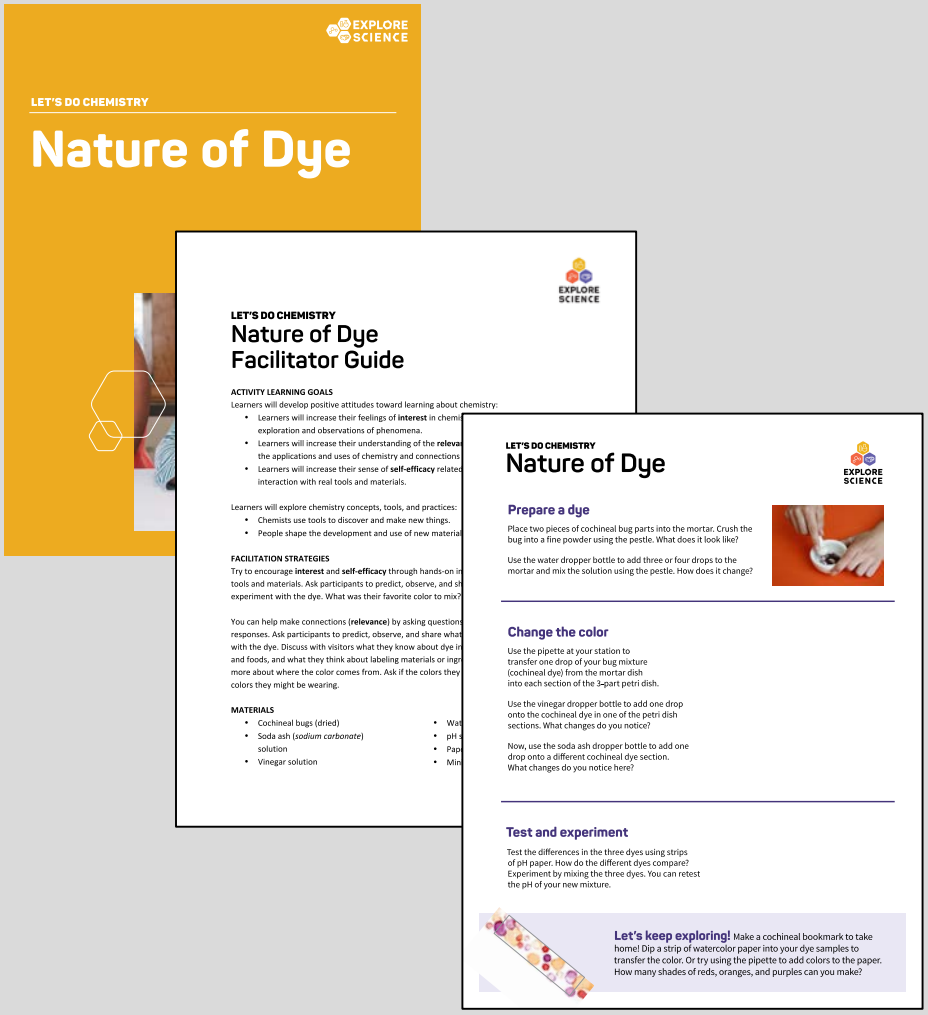
Professional Resources

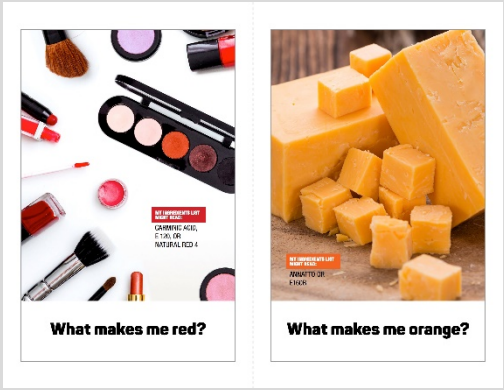
- Open me first
- Guides
- Training resources
- Safety supplies
- American Chemical Society publications

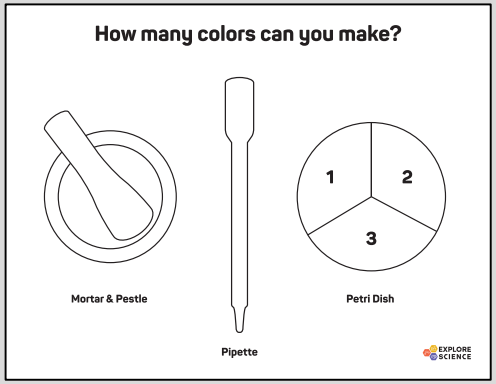
Public engagement materials

- Welcome letter + kit contents
- Event activities
- Longer program
- Posters

Nature of Dye







Ongoing Research

Let's Do Chemistry

Facilitator Email Signup

EXPLORE SCIENCE

Are you age 18 or older and a volunteer or staff member facilitating a hands-on activity?
If so, we would love your feedback.
Please print your name and email below so our evaluators can send you an online survey after the event.

Your participation is completely voluntary and your responses will be confidential.
Your email will not be used or distributed in any way except to send you a link to the survey.

Name	Email Address

REVEAL

Responsive Museum Facilitation

A Video-Based Reflection Guide for Engaging with Families at Interactive Exhibits

Elizabeth Andanen
Turbine Hall Assistant Manager
Oregon Museum of Science and Industry

OMSI Everyday Encounters with Science
TERC
OSU Oregon State University
NSF

REVEAL: Researching the Value of Educator Actions for Learning

Goals:

- Better understand how facilitation works in unstructured interactions at interactive exhibits.
- Build a theoretical model of facilitation; test the impact of facilitation on the museum floor.
- Focus on families and math – but results generalizable beyond this content area and social setting.

Responsive Museum Facilitation

Filmed unstaged interactions with families with trained facilitators who either facilitated naturally or only greeted families

Goals for facilitators:

- Mathematical discourse
- Intergenerational communication
- Visitor satisfaction

Responsive facilitation made a difference, compared to a "greeting" condition

- A primary impact of facilitation was a significant increase in the amount of time the family spends at the exhibit.
- Increased engagement time was associated with higher levels of math reasoning, general satisfaction, and intergenerational communication
- Independent of engagement time, there was a small decrease in intergenerational communication with facilitation.
- Effect of facilitation differed by exhibit and educator.

Responsive museum facilitation: video-based professional development

- Written as a guide for a staff member to lead a group of facilitators

- Continuously reinforces four major threads that were fundamental to the REVEAL facilitation approach:
  - Understanding and empathizing with our visitors and working to appreciate their perspectives;
  - Treating others as they want to be treated, not just how we would want to be treated ourselves;
  - Balancing the educational goals of facilitators with the needs and interests of visitors; and
  - Engaging in ongoing self-reflection and learning.

Five modules in the series

- Module 1: Understanding the Family Context
- Module 2: Supporting Intergenerational Communication
- Module 3: Encouraging Exploration and Inquiry
- Module 4: Negotiating Family and Facilitator Goals
- Module 5: Recognizing Expectations and Shared Understandings

Intergenerational communication = the time that family members of different ages spend interacting and talking with each other (rather than with a facilitator)

We know:

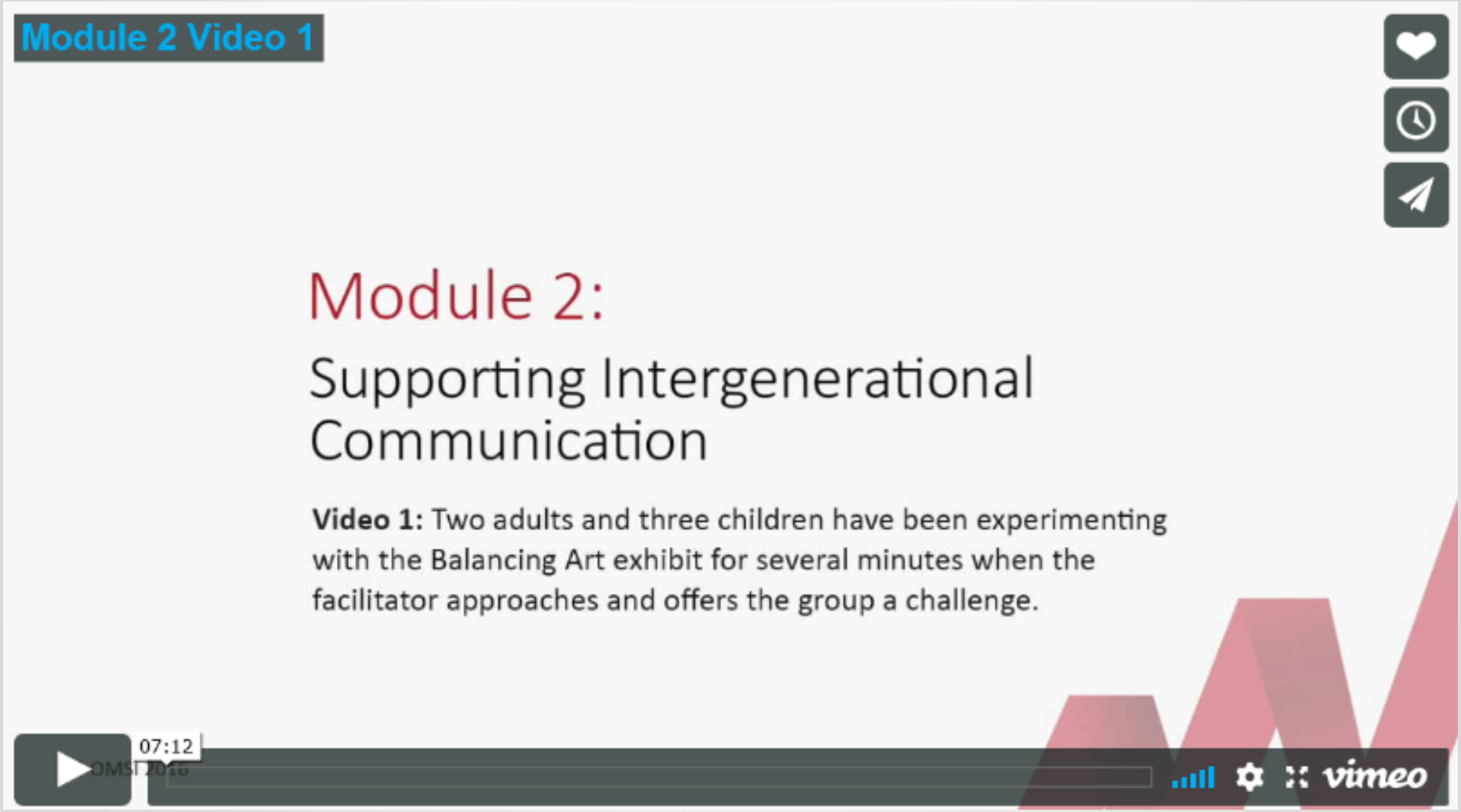
- Families are a central audience for informal learning institutions
- Families are highly effective at learning together and making meaning around different situations and topics
- If adults and children participate together, they are more likely to think and talk about experience after they leave the museum

How can facilitators interact with families without negatively impacting the intergenerational communication?

Reflect on your prior experiences:

1) In families and multigenerational groups, how do people of different ages usually interact with exhibits at your institution? Are there roles that particular family members tend to take on?

2) Which group members (e.g., adults or kids) do you usually focus on when facilitating with families? Why?


Module 2 Video 1
Module 2:
Supporting Intergenerational Communication
Video 1: Two adults and three children have been experimenting with the Balancing Art exhibit for several minutes when the facilitator approaches and offers the group a challenge.
07:12
vimeo

Video reflection

1) What did you notice happening in this video segment? What evidence did you see of intergenerational communication between adults and children?

2) What did the facilitator try to do to involve the adults in the activity and encourage them to interact with the children?

3) How were these strategies more or less successful?

4) Was there anything the facilitator did that might have inhibited interactions between adults and children?

REVEAL

Professional Development and Publications

https://external-wiki.terc.edu/display/Reveal

Elizabeth Andanen

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Questions?

Upcoming Online Workshops

Extending Your Earth & Space Science Exhibits - Free Multimedia Resources from NASA's Universe of Learning, NASA's Eyes, and the NISE Network

Tuesday, November 27, 2018
2pm-3pm Eastern / 11am-12pm Pacific

Learn more at nisenet.org/events

NISE NETWORK
ONLINE WORKSHOPS

Annual Partner Survey – Coming Soon

When: Email invitations in November

Why: In order to learn more about your experiences in the NISE Network and with presenting Earth and space science content we want to hear from partners:

- Across a diversity of roles, institution types, geographical regions, and levels of Network involvement
- Whether or not you completed last year's survey
- Even if others at your organization have participated

Who: Contact Marta Beyer at mbeyer@mos.org with any questions

EXPLORE SCIENCE
Earth & Space

Applications Now Open!

Explore Science: Earth & Space 2019 toolkit applications

are due November 1, 2018

http://www.nisenet.org/earthspacekit-apply

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NORTHEAST

Ali Jackson - Sciencenter, Ithaca, NY

Northeast: NY, VT, NH, ME, RI, CT, and MA

Mid-Atlantic: PA, NJ, MD, DC, DE, OH, and WV

SOUTHEAST

Brad Herring - Museum of Life and Science, Durham, NC

Southeast: VA, NC, SC, KY, TN, LA, MS, AL, GA, FL, and Puerto Rico

South: TX, AR, and OK

MIDWEST

Christina Leavell - Science Museum of Minnesota, St. Paul, MN

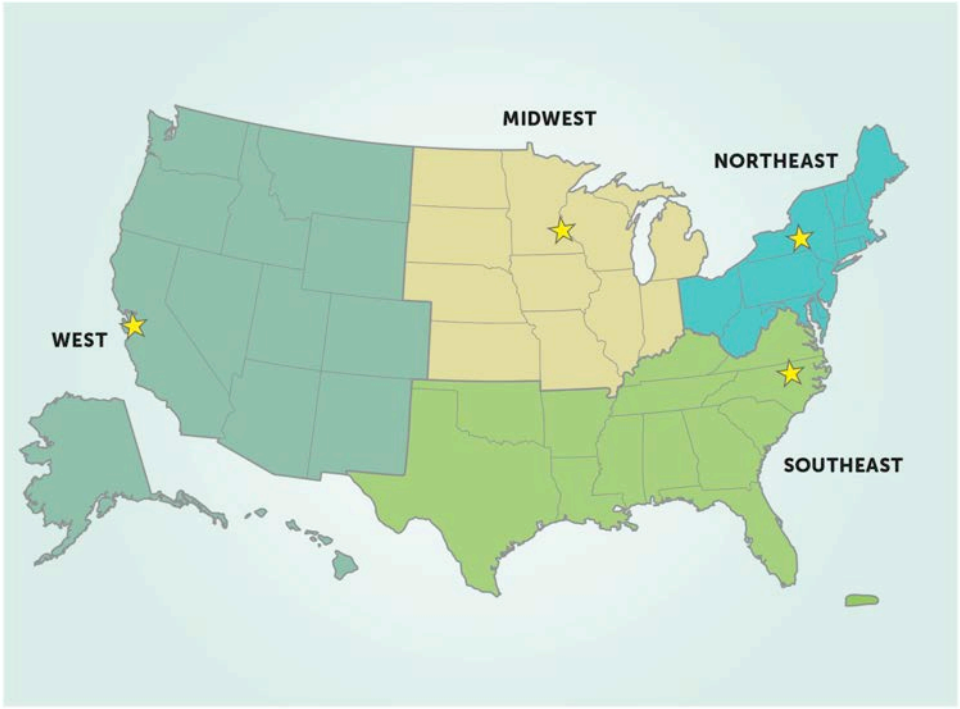
ND, SD, NE, KS, MN, IA, MO, WI, IL, MI, and IN

WEST

Frank Kusiak - UC Berkeley Lawrence Hall of Science, Berkeley, CA

Southwest: CA, NV, AZ, and HI

West AK, WA, OR, ID, MT, WY, CO, UT, and NM



Thank You

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