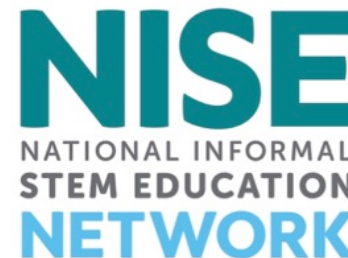


NISE Network Online Workshop

Learn About New Opportunity and How to Apply for the 2018
Explore Science: Let's Do Chemistry Kit

April 10, 2018



Welcome! Today's presenters are:

David Sittenfeld, Museum of Science

Rae Ostman, Arizona State University

Ali Jackson, Sciencenter

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

- **Update your display name.** Include your first and last names, and institution
- **Introduce yourself!** Type your name and institution into the Chat Box
- **Questions?** Feel free to type your questions into the Chat Box at any time throughout the online workshop or use the raise your hand function in the participants list and we'll unmute your microphone

All workshops are recorded and archived online at

<http://www.nisenet.org/event-type/online-workshop>





Let's Do Chemistry

THE NATIONAL INFORMAL STEM EDUCATION NETWORK



is a community
of informal
educators
and scientists

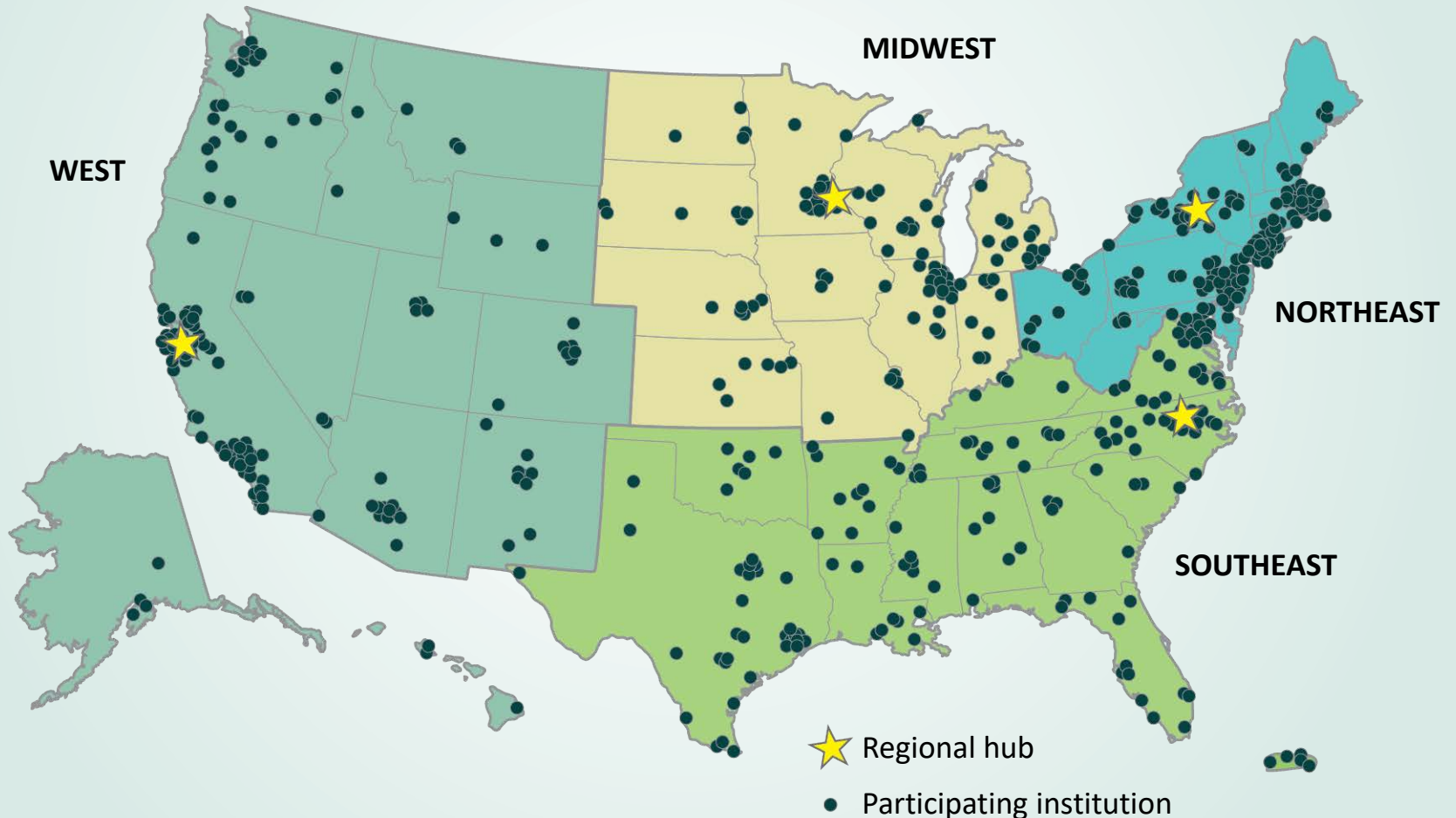
DEDICATED TO

supporting learning about science, technology, engineering, and math (STEM) across the United States.



HUNDREDS OF ORGANIZATIONS

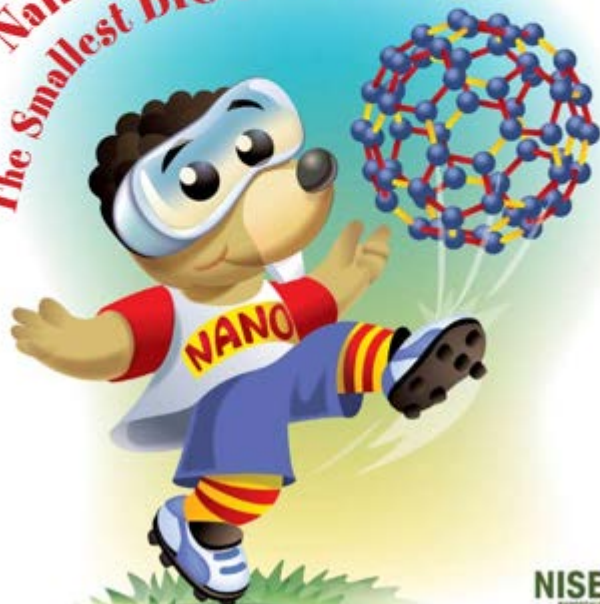
participate in NISE Network activities across the United States.



Celebrating Chemistry

National Chemistry Week American Chemical Society

**Nanotechnology:
The Smallest BIG Idea in Science**



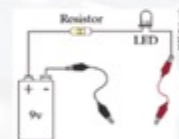
Exploring Materials-Graphene

By NISE Network and Robert deGroot

SAFETY! Safety glasses required
 No food or drink in the area

Graphene is a single layer of carbon atoms arranged in a honeycomb pattern. Graphene is only one atom thick — that's a fraction of a nanometer! (A nanometer is a billionth of a meter.) In the field of nanotechnology, scientists and engineers make new, nano-sized materials and devices. Graphene has a lot of potential in nanotechnology because of its useful properties: it's flexible, super-strong, nearly transparent, and conducts electricity. Computer chip manufacturers are developing circuits from graphene, by modifying it to make it a semiconductor. One day, graphene could be used to make see-through, bendable electronic displays, and tiny, fast computer chips.

Do not short-circuit batteries. When the positive (+) and negative (-) terminals of a battery are in contact with each other, the battery can become short-circuited. This can lead to venting or an explosion. This is avoided in the activity by inserting the resistor in the circuit. Never use a plain wire to connect the + and - terminals directly.



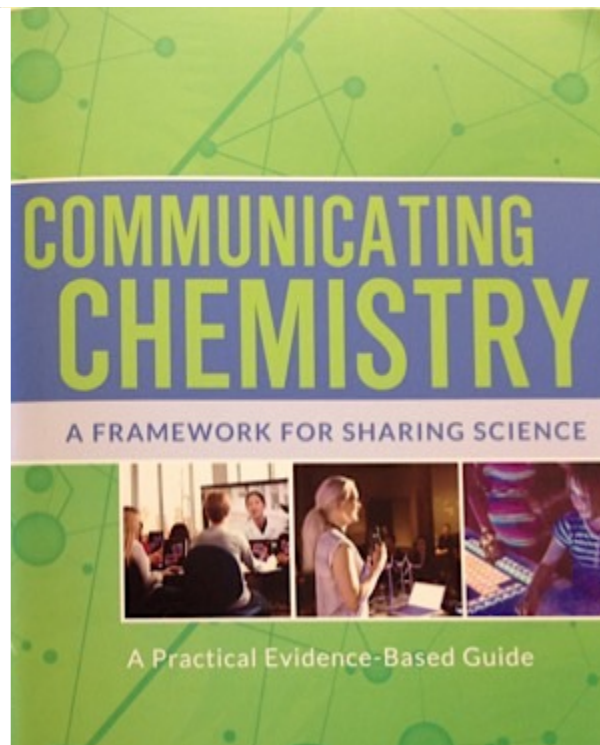
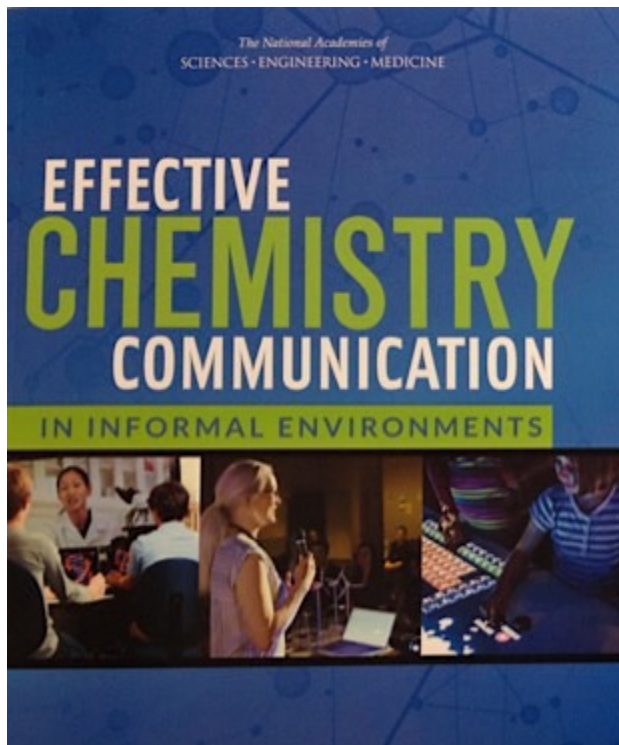
Procedures:

1. Make the battery and bulb circuit (see diagram). Have your adult partner help you assemble the apparatus.
2. Kids, lay down some graphite! (Graphite is the real name for pencil "lead.") Use the pencil to draw and color in a thick, dark box on the piece of paper. Make it several inches long and around half an inch wide.
Tip: Make the box as dark as you can — try not to let any patches of paper show through.
3. Touch the two insulated wire leads to the graphite box. Watch the bulb—what happens? Record the distance between the two leads and record your observation in the table. Now try moving the leads closer together and further apart. What differences do you notice? Record your results in the observation section.
4. Draw some other heavy dark paths that are not straight and check them with your battery apparatus. Record your results in your observation.

Materials:

- Pencil (#2)
- Paper
- 5mm LED bulb
- 9 volt battery
- 9 volt snap connectors
- 330 ohm resistor
- Two insulated wire leads

Note: Battery and bulb circuit materials can be purchased from www.radioshack.com (LED bulb #278-021, 9v battery #5030849, battery connectors #270-324, resistor #271-1113, insulated leads #278-1156).



The National Academy of Science published a report on 2016 about Effective Chemistry Communication and a related practical guide

“Chemists and experts in empirical approaches to science communication, informal learning, and chemistry education should collaborate to study chemistry communication in informal settings. Research should focus on.... public perception and understanding of chemistry....”

“NSF should support (such) research...through programs such as the AISL program.”

Public attitudes to chemistry

The first national, in-depth study on how the UK public thinks and feels about chemistry, chemists and chemicals

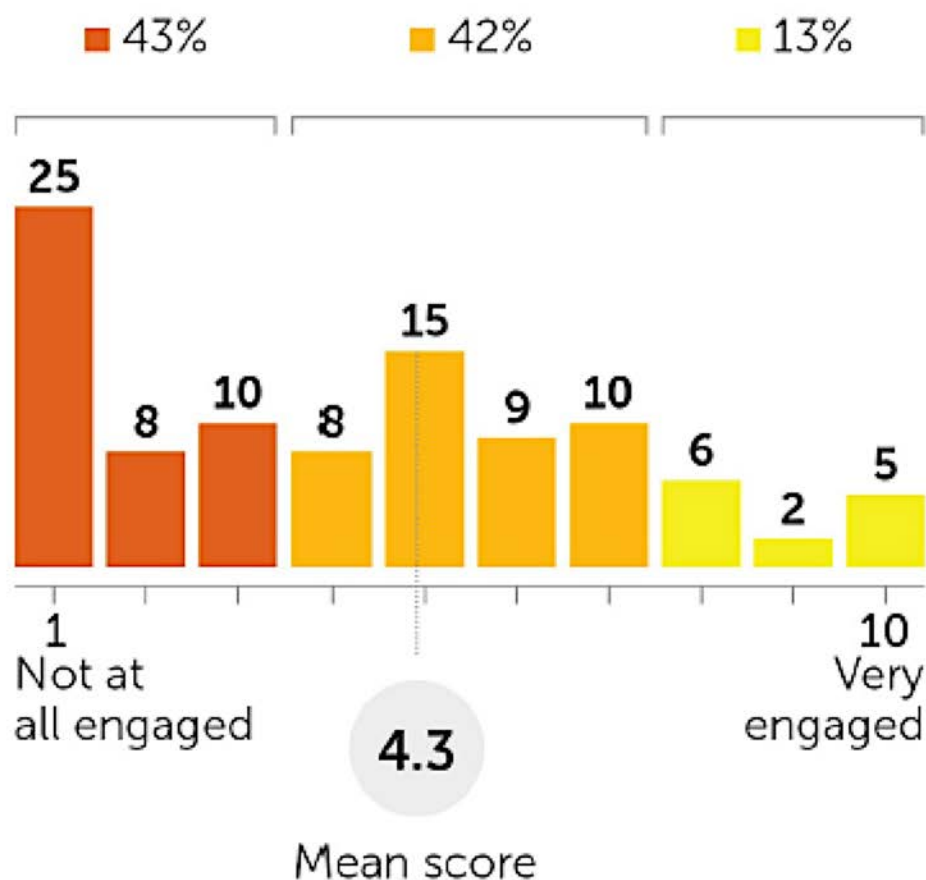
Chemophobia,
a chemists'
construct



A positive
future for
#chemperceptions



Figure 2.2: Engagement/interest in chemistry (%)



Q.4A How engaged or interested are you with chemistry? Base: All respondents (2,104 UK adults 16+)

Table 2.11: Comparative characteristics of chemistry and science

Chemistry	Science
	<p>Welcoming, friendly</p> <p>"I think it's more sociable in the science room...I think it will have more sociable people"</p>
	<p>Fun</p>
	<p>Active, discovery, exploration</p>
	<p>Applied to the world</p>
	<p>Busy, excitement, buzz</p>
	<p>Open to non-experts</p> <p>"you don't have to have a science brain to understand what's going on"</p>
	<p>Accessible to everyone</p>
	<p>Visual, demonstrable</p>



Table 2.11: Comparative characteristics of chemistry and science

Chemistry	Science
Intimidating, hard to understand, would feel ignored "You wouldn't dare to touch anything"	Welcoming, friendly "I think it's more sociable in the science room...I think it will have more sociable people"
Serious	Fun
Methodical, repetitive work	Active, discovery, exploration
Chemistry not involved in the end product	Applied to the world
Quiet, silence, concentration	Busy, excitement, buzz
Inaccessible, hard "I feel we can relate to science a little bit more, surrounded by animals, plants, whereas in the chemistry room they're doing experiments, you need to be someone of a certain profession or qualified"	Open to non-experts "you don't have to have a science brain to understand what's going on"
Work going on in the background, 'behind closed doors'; hidden or secretive	Accessible to everyone
Microscopic, can't easily see what's going on	Visual, demonstrable



Learning about learning chemistry

- The **ChemAttitudes** project aims to have a strategic impact on publics' attitudes toward chemistry, specifically, their
 - **interest** in chemistry,
 - understanding and perception of its **relevance**, and
 - feelings of **self-efficacy** with respect to it.



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?



Research questions

How do content, program format, and facilitation techniques for **hands-on activities** impact visitor attitudes about chemistry?



Research questions

How do **trainings for facilitation** of hands-on activities impact visitor attitudes about chemistry?



Project deliverables

Learning framework for increasing I/R/S in informal STEM settings

250 Explore Science: Let's Do Chemistry dissemination kits*, containing

Hands-on activities

Professional development materials

* All materials also **publicly available for free download** on nisenet.org.

Creating the Explore Science kit

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

GOAL: To create generalizable knowledge about how to design hands-on activities that promote positive attitudes about learning chemistry.



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...

Fun

Confidence

Excitement

Exploring together

Concrete connections

Guiding and asking

Less about...

Facts

Comprehensive knowledge

Equations

Explaining to someone

Abstract ideas

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.



Explore Science: Let's Do Chemistry



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
- National Chemistry Week/ event activities
- Longer program
- Posters



Professional resources and safety supplies

Open me first

- Welcome letter and kit contents
- Press release, photo release
- Tattoos
- USB with digital versions of all NISE Net resources

Guides

- Research to Practice guide
- Safety guide
- Event planning and promotional guide
- National Chemistry Week planning guide

Training resources

- Slideshow overview
- Gum and Chocolate activity
- Atoms to Atoms activity
- Questions improv game guide
- Facilitation skills video

Safety supplies

- Goggles, goggle wipes
- Gloves

ACS books

- WonderScience
- Inquiry in Action



Learning Goals

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!”



Chemistry Makes Scents



- Multi-sensory
- Building with models
- Take home



Molecules in Motion



- Great connections to the NCW (Chemistry is Out of This World!) and other disciplines
- No consumables



Sublimation Bubbles



- Observation of beautiful and real phenomena
- States of matter (connection to curriculum)
- Tested for safety!



Application, implementation, and reporting

- Kit applications are now open
<http://www.nisenet.org/chemistry-apply>
- Application deadline **June 1**
- Awards announced in July
- Kits delivered in September
- *NCW: Chemistry Is Out of this World!* October 21-27
- 250+ public events between October and December
- Facilitator Surveys for summative evaluation
- Event reports due **December 15**

GET INVOLVED

Learn more and access online digital library:

nisenet.org

Monthly newsletter
nisenet.org/newsletter

Social networking:
nisenet.org/social



Stay Connected

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

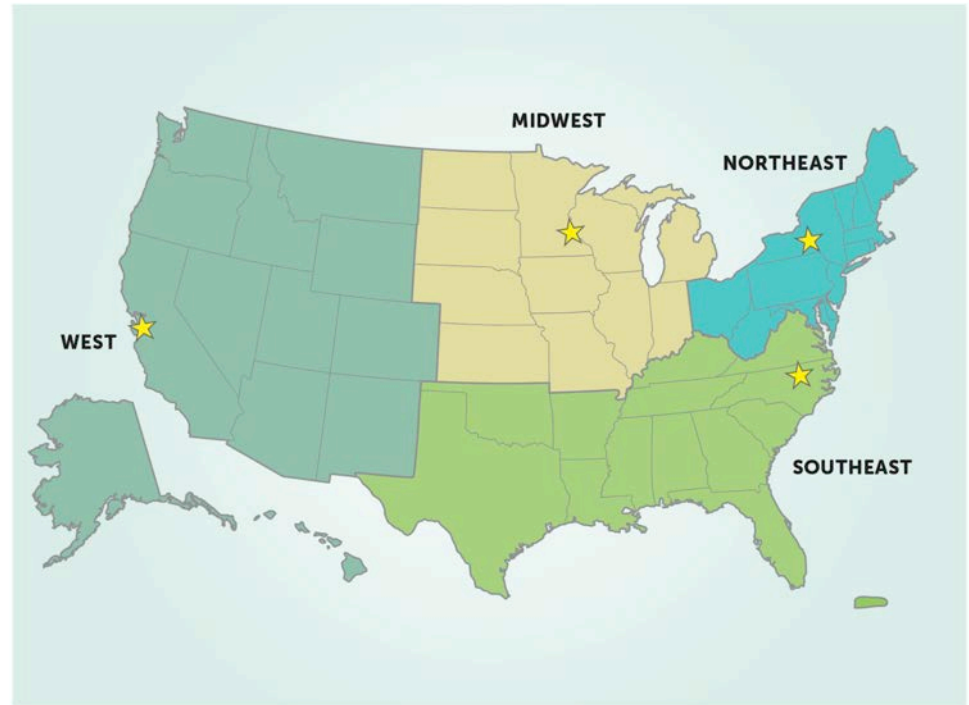
MIDWEST – Christina Leavell - Science Museum of Minnesota, St. Paul, MN

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 + Questions



NISE NATIONAL INFORMAL
STEM EDUCATION
NETWORK


EXPLORE SCIENCE
Let's Do Chemistry

 **ACS**
Chemistry for Life®

Questions

1. Share current plans or thoughts for your Explore Science: Let's Do Chemistry events?
2. Discuss ways you might use the materials throughout the year, and in particular during the 2018 National Chemistry Week (October 21-27, Theme: Chemistry is Out of This World!).
3. What questions do you have for the project team about the activities or materials in the kit?

Upcoming Online Workshops



Changing the Conversation About Climate

Tuesday, May 1, 2018

2pm-3pm Eastern/ 11am-12pm Pacific

Museum Community Partnerships – Afterschool Programs: Advocating, Collaborating, and Bringing Earth and Space Content to Out-of-school Time

Tuesday, May 22, 2018

2pm-3pm Eastern/ 11am-12pm Pacific

Be Prepared: Safety Tips and Reminders for Museums Running Public Events, Including National Chemistry Week and Earth and Space Events

Tuesday, June 12, 2018

2pm-3pm Eastern/ 11am-12pm Pacific

<http://www.nisenet.org/events>

Thank You



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