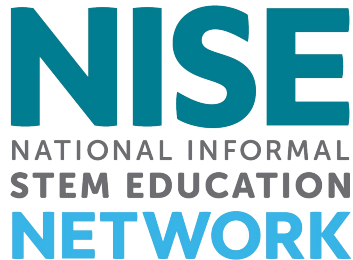


The Village It Takes: Utilizing Community Expertise to Better Engage Audiences

- Catherine McCarthy, Arizona State University
- Ali Jackson Sciencenter, Ithaca, NY
- Erin Wiese-Reichert, Children's Discovery Museum, Normal, IL
- Barbara Knoss, Cape Cod Museum of Natural History, Brewster, MA
- Tara Henderson, Explora, Albuquerque, NM

NISE Network Resources for Finding and Collaborating with STEM experts



Catherine McCarthy

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Arizona State University, Tempe, AZ
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www.nisenet.org

Association of Children's Museums InterActivity Conference - May 2022



Community Collaborations



Working with Experts

Ali Jackson
Sciencenter, Ithaca, NY

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MUSEUM & COMMUNITY PARTNERSHIPS:

Collaboration Guide

For museums working with community youth-serving organizations

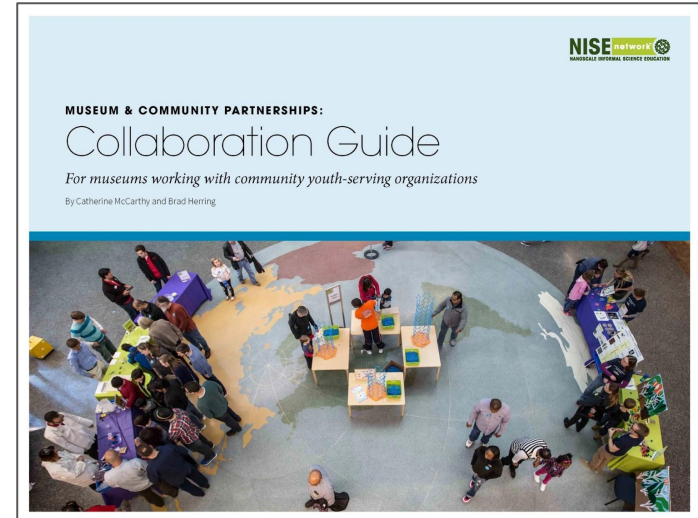
By Catherine McCarthy and Brad Herring



<https://www.nisenet.org/collaboration-guide>

Collaborations Guide Contents

- Why Collaborate
- Levels of Partnerships
- Key Characteristics of Success
- Beginning and Sustaining Collaborations
- Barriers to Success
- Templates: Memorandum of Understanding
- Profiles of National Youth-serving Organizations



<https://www.nisenet.org/collaboration-guide>

Collaborations Guide Companion Video

5 minute
Video

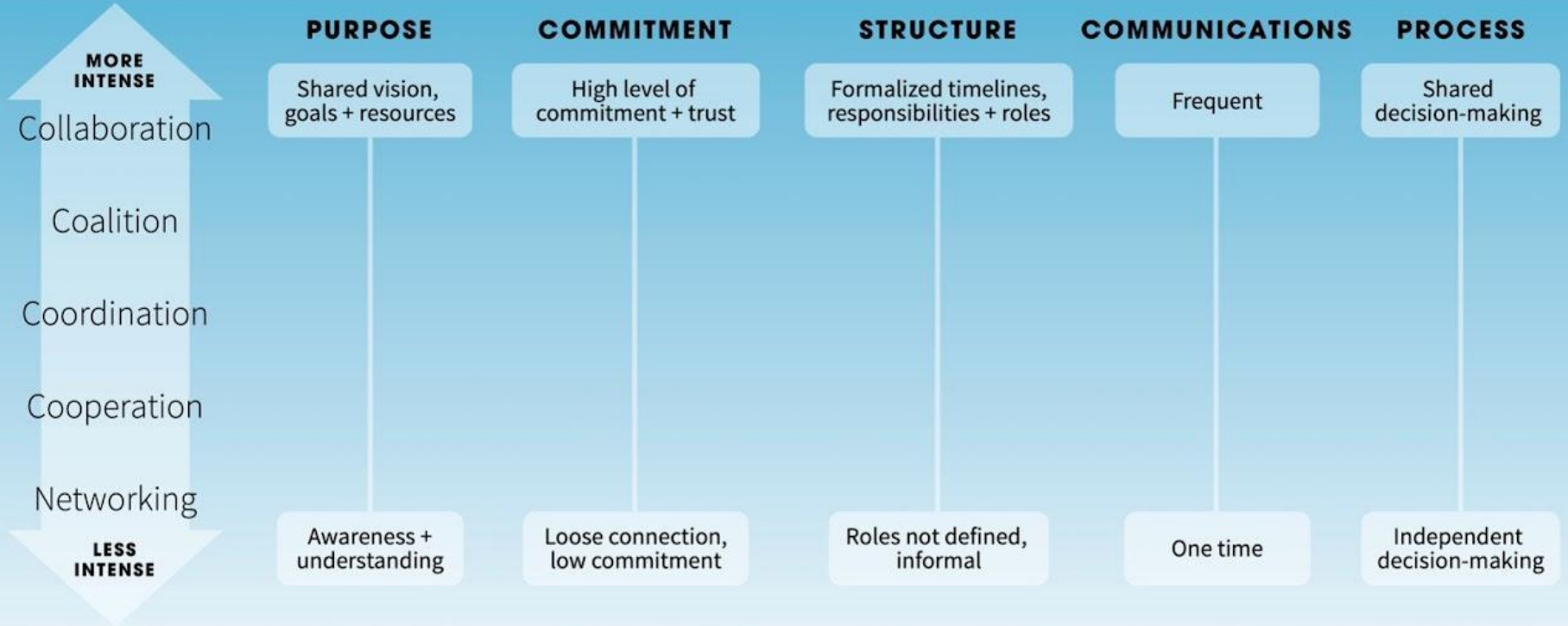


<https://www.nisenet.org/collaboration-guide>

and

<https://vimeo.com/139256428>

Partnership Continuum



Collaborations Tips

Why collaborate?

To achieve something you can't do on your own!

- Be **patient**! Collaboration takes time.
- Get to know each other. Each partner has a lot to learn and a lot to offer.
- **Listen** to your partners and community members



Collaborations Tips

- Be clear about your **goals and expectations**.
- **Communication** is critical,
not everything will go perfectly
so you want to have open communication
- **Share** decision-making
- Stay focused on your goals.
And don't forget to **celebrate your successes!**



Collaborating with STEM Experts





Working with STEM Experts:

A Guide for Educators in Museums
and Other Informal Learning Settings

By Catherine McCarthy and Darrell Porcello

NISE
NATIONAL INFORMAL
STEM EDUCATION
NETWORK

www.nisenet.org

<https://www.nisenet.org/working-with-experts>

Working with STEM Experts Guide

- Why Bring STEM Experts and the Public Together
- Ways to Work with STEM Experts
- How to Prepare Experts to Engage Public Audiences
- Strategies for Finding STEM Experts
- Finding STEM Experts by Subject Area

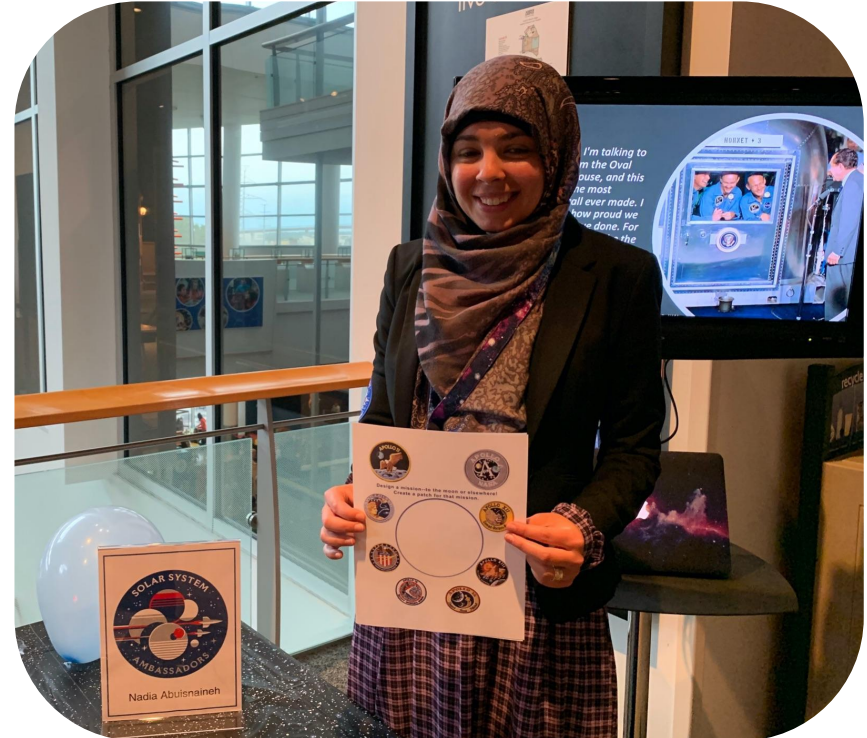


<https://www.nisenet.org/working-with-experts>

Why Bring STEM Experts and the Public Together?

Many reasons for having STEM experts directly engage the public.

- **Content knowledge** about a specific topic
- Experts can offer much more **beyond facts and information**



Why Bring STEM Experts and the Public Together?



10

10 Potential Impacts of Experts Engaging the Public

- 1 Sharing a Passion for Science
- 2 Providing for Mutual Learning
- 3 Understanding that Science is a Human Endeavor
- 4 Increasing the STEM Workforce and Creating Career Pathways
- 5 Greater Representation of Women and Minorities in STEM Careers
- 6 Changing the Face of STEM – Picture a Scientist, Who Do You See?
- 7 STEM Identity and Providing Role Models and Mentors
- 8 STEM Literacy and Creating Lifelong Learners
- 9 More Trust in Science
- 10 Creating Opportunities for Participatory Democracy

Ways to Work with STEM Experts

- **Formats for Public Engagement**

Hands-on Activities, Events, Guest Lectures, Forums, Science Cafés, Mentoring, Festivals . . .

- **Joint Collaborative Projects**

- **Professional Development**

for Staff and Volunteers

- **Liaison Roles**

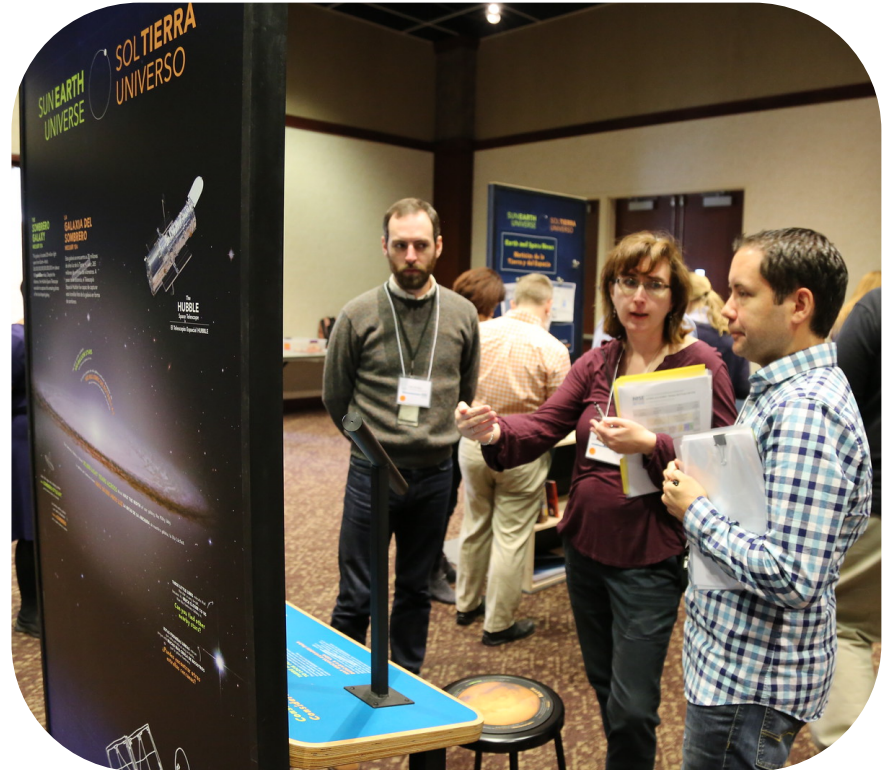
- **Ongoing Advisory Roles**



Ways to Work with STEM Experts

Including Experts in the Development Process

- Brainstorming
- Helping to create content
- Participating in iterative prototyping
- Technical content review



How to Prepare Experts to Engage Public Audiences

- **Strategies**

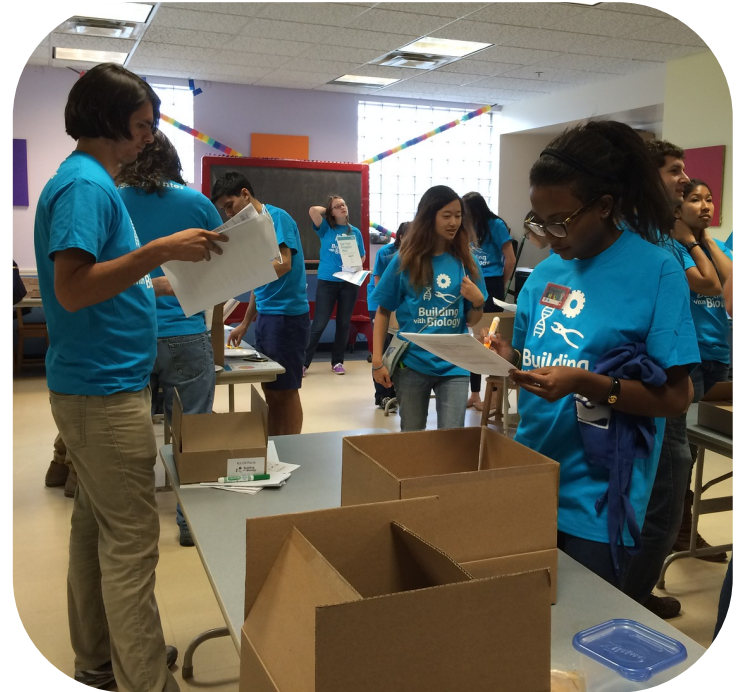
- Start with existing hands-on activities and training materials

- **Tips Sheets**

- Planning Guest Presentations
- Guest Speakers
- Leading Hands-On Activities

- **Annotated List of Resources**

<https://www.nisenet.org/catalog/tips-sheets-engaging-public-audiences>



Strategies for Finding STEM Experts

- STEM Professional Societies
- Diversity-Serving Professional Societies
- Colleges and Universities
- Student Groups
- Local, State, and Federal Agencies
- Local Industry Professionals
- Affinity Groups
- Indigenous Ways of Knowing



Finding STEM Experts by Subject Area

- Chemistry and Physics
- Space and Earth Science
- Environmental Sciences
- Agriculture
- Biology and Biomedical Sciences
- Neuroscience
- Engineering, Technology
- Computer Science, Math, Statistics
- Incorporating STEM into Arts and Cultural Celebrations
- Indigenous Ways of Knowing



Space and Earth Science

Please also see the section focused on environmental sciences.

Colleges and Universities

- You may find experts at a local college in astronomy, astrophysics, physics, planetary science, geology, meteorology, aeronautical engineering, mechanical engineering, and other Earth science programs.
- **NASA Space Grant Consortium**
Seek out the NASA Space Grant Consortium program in your state. The Space Grant Consortium is a national network of colleges and universities that has locations in all 50 states, the District of Columbia, and Puerto Rico.
https://www.nasa.gov/stem/spacegrant/home/Space_Grant_Consortium_Websites.html

Student Groups

- Local colleges and high schools may have student clubs or interest groups, especially for astronomy.

Professional Societies

- Your community may have members of professional societies in related topics, for example:
 - **American Astronomical Society (AAS)** maintains a directory of members that can be searched by city and state as well as specialization:
<https://aas.org/directory>

AAS also has an Astronomy Ambassador program for hands-on science:

<https://aas.org/education/roster-aas-astronomy-ambassadors>

- **American Geophysical Union (AGU)** sections are organized by specialization rather than geographically:
<https://www.agu.org>
AGU Thriving Earth Exchange promotes community collaborations to solve local challenges related to natural resources, climate change, and natural hazards:
<https://thrivingearthexchange.org/projects/>

Affinity Groups

- **The Solar System Ambassadors Program (SSA)**
This is a STEM public engagement program designed to work with motivated volunteers across the nation. These volunteers communicate the excitement of NASA's space exploration missions and information about recent discoveries to people in their local communities. As of 2021, there are more than 1,000 ambassadors in all 50 states, Washington DC and U.S. territories, military bases, and consulates overseas. Volunteer ambassadors bring the excitement of space to the public. Ambassadors are space enthusiasts from various walks of life who are interested in providing greater service and inspiration to the community at large.
<https://solarsystem.nasa.gov/ssa/>
- **The Night Sky Network**
This is a nationwide coalition of amateur astronomy clubs bringing the science, technology, and inspiration of NASA's missions to the general public. Night Sky Network members share their time and telescopes to provide unique astronomy experiences at science museums, observatories, classrooms, and outdoors under the night sky.
<https://nightsky.jpl.nasa.gov>

Thank You



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Multiple NISE Network projects contributed towards the content included in the Working with STEM Experts guide:

*This guide is based on work supported by the **National Science Foundation** under Award Numbers 0532536, and 0940143, DRL 1421179, and DRL 1612482. Any opinions, findings, conclusions, or recommendations expressed in this guide are those of the authors and do not necessarily reflect the views of the National Science Foundation.*

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Growing STEAM Potential through the Power of Play

An Early Childhood approach to STEAM based learning and
collaboration.

Our Project Model

- Museum in Motion
 - Classroom Lesson
 - Professional Development / Classroom Resources
 - Family Engagement Kit
- Family Nights with Partner Organizations
- Field Trips
- Private Family Night at CDM

Our Program Partners / Experts

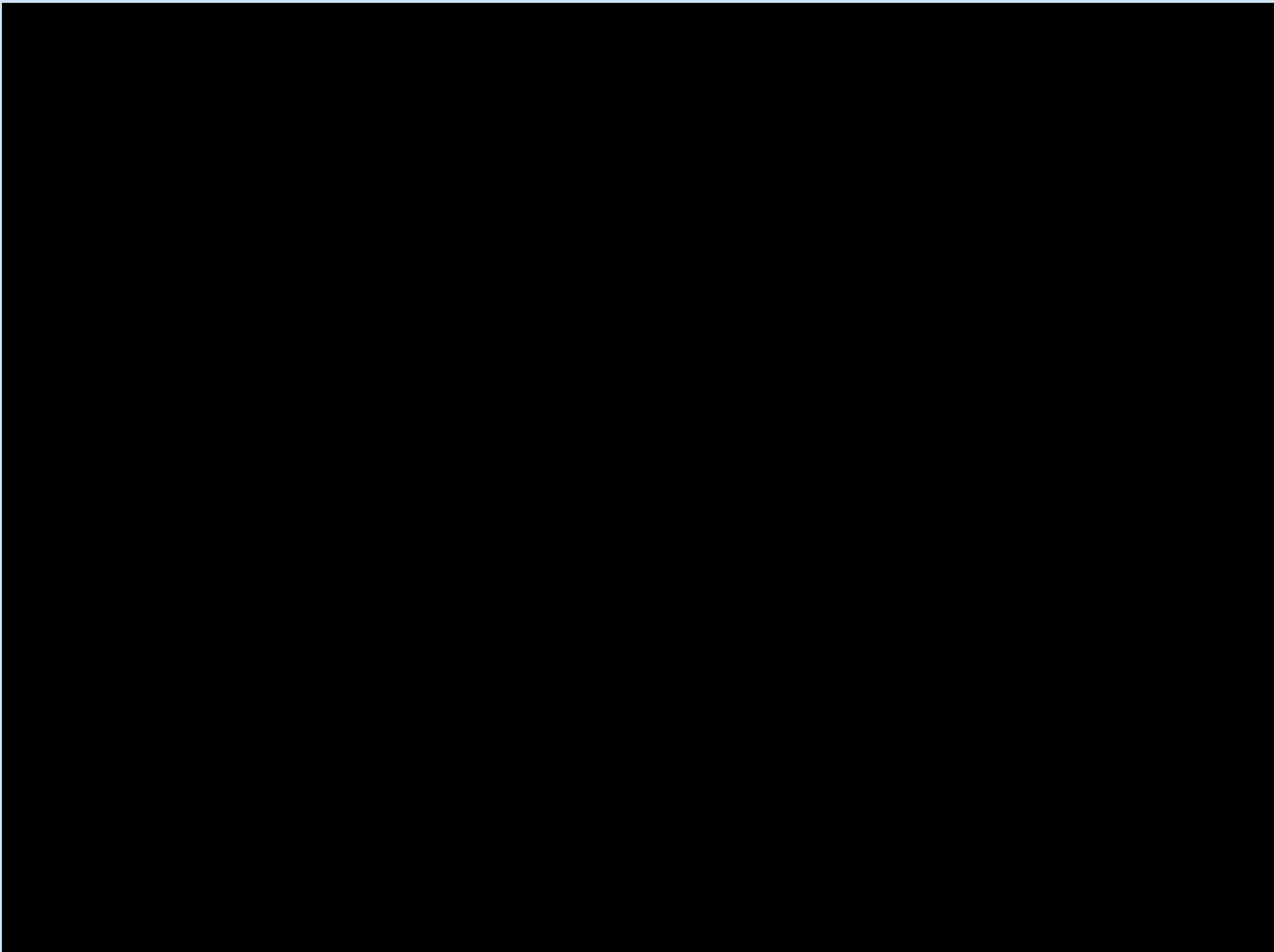
- Local Head Start
- Local School District Early Learning program
- Local childcare center
- Illinois State University & Illinois Wesleyan University

Benefits to Collaboration

- Growth of STEAM based learning in our community.
- Teacher Engagement and Empowerment
- Access to at-risk families
- Gaining trust with families
- University student help and experience

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explora!

Climate Change STEM Activity Cards

STEM Activity Cards on Climate Science which focus on how Traditional Ecological Knowledge and Practices address the effects of climate change



The image displays two overlapping STEM activity cards from Explora!. The top card is titled "Engineering Shade" and focuses on designing a structure to block the sun. It includes a list of materials like recycled paper, cardboard, and tape, and a list of instructions for building a shade structure. The bottom card is titled "Planting in Puddles" and discusses water management in arid climates. It includes a list of materials like paper, markers, and straw, and a list of instructions for creating a field with puddles. Both cards feature the Explora! logo and contact information for the museum.

Engineering Shade
Design a structure to block the sun
What do solar panels and squash have in common? Shade! Indigenous farmers have long used big-leaved plants like squash to provide shade. The shade keeps the soil damp by preventing water from evaporating (turning into a gas). Researchers are trying out solar panels to do the same thing! Saving water while growing food is important, especially during droughts and increased temperatures.

What you'll need:

- Recyclables: paper, cardboard, cups, paper towel tubes
- Tape
- Scissors
- Water
- 2 small paper cups
- Permanent marker
- Collected big, broad leaves (optional)

Photo credit: Dennis Schwabach

1701 Mountain Rd. NW, Alb

Planting in Puddles
Where does water go in a field?
In the Southwest region's arid (hot and dry) climate, Indigenous farming traditions and strategies have made it possible to grow across their fields and grow more plants where water creates puddles. What does that look like?

What you'll need:

- Paper
- Washable markers
- A straw
- Water in a cup

Here's what to do:

1. Crumble up a piece of paper into a ball. Next, spread the paper so that it is almost flat. You should see lots of creases. Imagine that this is your field for planting!
2. Choose one washable marker. Trace along the top of one of the creases. Make your line heavy and thick.

3. Get a little bit of water in your straw by putting the straw into the cup of water. Place your finger on top of the straw, and lift the straw out of the water.

4. Hold your straw over your marker line on the paper. It's time to make it rain! Lift your finger and watch what happens to the marker when the water touches it. What do you notice?

5. Repeat with more creases! Look at your field. Where would you want to put the most plants in your field? Where would you want to put the least amount of plants?

Explore Further:

- Start the process again with a new piece of paper, but try adding only a tiny bit of water to your creases. Where does the water pool in a drought?
- Automatic irrigation machines can be programmed to deliver different amounts of water. Where would you tell your machine to deliver the most water? The least?
- Ask a farmer or gardener: how do they water their plants? What do they notice about the way water moves across their land?

1701 Mountain Rd. NW, Albuquerque, NM 87104 | 505-600-6072 | www.explora.us



Waffle Garden Design

How can you grow food with less water?

Indigenous farming traditions and strategies have made it possible to grow food in the Southwest region's **arid** (hot and dry) climate for a very long time, even during droughts! Navajo, Zuni, Zia, and Laguna peoples **conserve** (save) water by using a "waffle" garden. How does this method work?



Photo credit: Library of Congress

What you'll need:

- Some ground to dig in
- Gravel or mulch or sand
- Water

Here's what to do:

1. Remove plants, twigs, and rocks from an area about the size of your hands side-by-side with your fingers spread wide.
2. Use your finger to draw a square in the cleared area. Dig down about 3 to 4 inches inside the square.
3. Use the soil you remove to make walls along the edges. Add a little water to make the soil stick together.

4. Put some gravel, mulch, or sand in the bottom of your square. Repeat to make a grid.
5. Carefully pour water into the inside of your walls. What do you notice? Where does the water go? How much can you add?
6. Check underneath your gravel, mulch, or sand a little later. Is it still wet? What about the next day?

Explore Further:

- Experiment with the height of the walls and depth of the inside square. What happens to the water inside?
- Try different **soil compositions** (proportion of sand, clay, and humus). What builds the sturdiest walls?
- Explore different amounts of gravel, mulch, or sand. Does the water stay in the ground longer with deeper layers on top?
- Ask a farmer or gardener: How do they conserve water and keep moisture in the soil?
- Do you have a drought in the area where you live? What are ways you can conserve water?

Read: Visit the library and check out *It's Our Garden: From Seeds to Harvest in a School Garden* by George Ancona

iexplora!

Strategies and Approaches for Inclusion and Relevance



explora!



Kirk Bemis, hydrologist for Zuni Water Resources

Photo credit:

<https://features.weather.com/praying-for-rain/>



Zuni. Photo credit: ashiwi.org



Engineering Shade

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- Tape
- Scissors
- Water
- 2 small paper cups
- Permanent marker
- Collected big, broad leaves (optional)



Photo credit: Dennis Schroeder/NREL

Here's what to do:

1. Flip this card over. Have a look at the squash plant, solar panels, and any big, broad leaves you might find. How do they block sunlight? What makes them strong? What else do you notice?
2. Use your recyclables, tape, and scissors to design a structure to block the sun. Are you inspired by the leaf, the solar panel, or a combination of both?
3. Time to test it out! Take your paper cups and fill them up with the same amount of water. Use the marker to mark how high the water is.
4. Find a sunny spot for your testing. Place one cup of water underneath your shade structure. Put the other cup of water nearby.
5. Check your cups over the course of a couple days. Use your marker to draw a line where the water is in both cups. What do you notice? Was your design successful?

Explore Further:

- Improve your design! Does your structure provide shade all day, or just during a part of it?
- Ask a farmer or gardener: do they grow plants to shade others? What other plants are grown together and why?



Resources for Best Practices and Strategies

Click images for links



New Hand to Hand: Children's Museums and Climate Change





Changes and Lessons Learned from PLC

- Adapted existing NISE Net activity: Paper Mountains
- Opportunities for joint implementation

iexplora!

Planting in Puddles

Where does water go in a field?

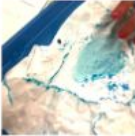
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Questions and Discussion



Questions and Discussion

- Now that you have heard the presenters, what else do **you** want to know?
- There are many different kinds of expertise - recognizing all kinds of expertise, what **kind of experts** already working with?
- What other community experts would you want to engage?
- What aspects of **working with experts** do you need help with?
- **Share advice** for maintaining and deepening connections.
- Share a strategy or technique **you have found successful**.
- Other resources for find experts