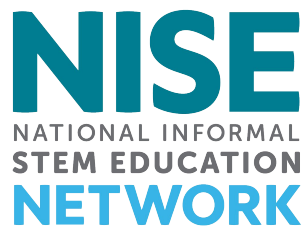



# Earth & Space Project-Based Professional Learning Community



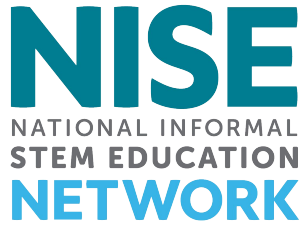
## April Concurrent Session B2

### Welcome!

As we wait to get started with today's online session:

- **Wave!** Please turn on your camera if you can
- **Rename your Zoom!** Please rename your Zoom window with your name and organization
- **Questions?** Feel free to type any questions you have into the chat
-  **Recording?** Portions of this meeting will be recorded

# Earth & Space Project-Based Professional Learning Community



## COLLABORATING WITH INDIGENOUS COMMUNITIES

- **Lauren Butcher**, Explora Science Center and Children's Museum, Albuquerque, NM
- **Kristine Heinen**, South Dakota Discovery Center, Pierre, SD
- **Suzanne Phillips**, Challenger Learning Center of Alaska, Kenai, AK
- **Ben Muhlestein**, Canyon Country Discovery Center, Monticello, UT

# NM, Albuquerque

## Explora Science Center and Children's Museum

---

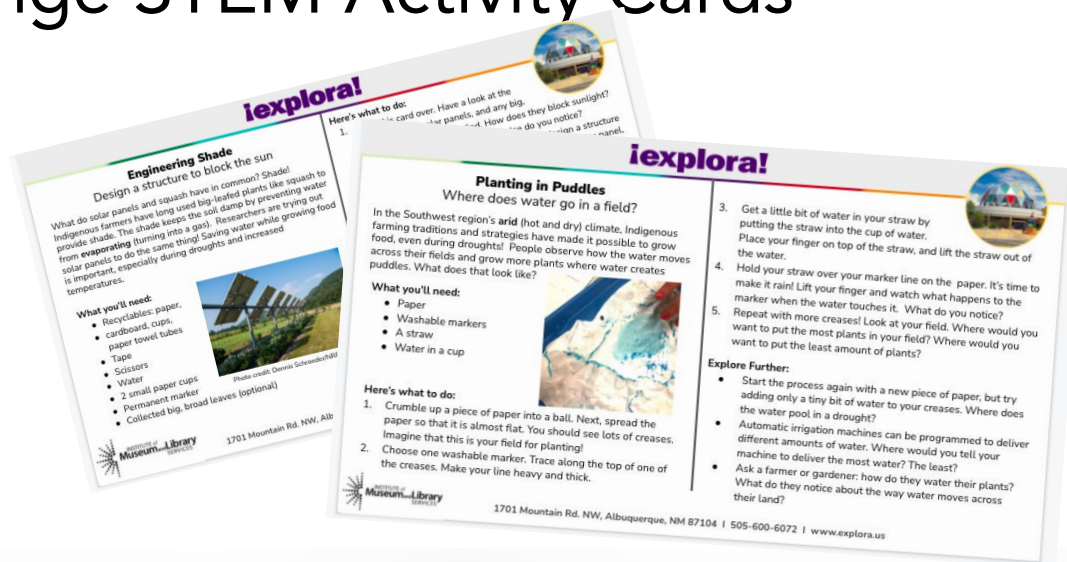
Lauren Butcher

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



# explora!

## Climate Change STEM Activity Cards







## 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



# 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

### Design a structure to block the sun

What do solar panels and squash have in common? Shade! Indigenous farmers have long used big-leafed 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 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 does 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






# iexplora!



## 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?


In the Southwest region's **arid** (hot and dry) climate, Indigenous farming traditions and strategies have made it possible to grow food, even during droughts! People observe how the water moves 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:**

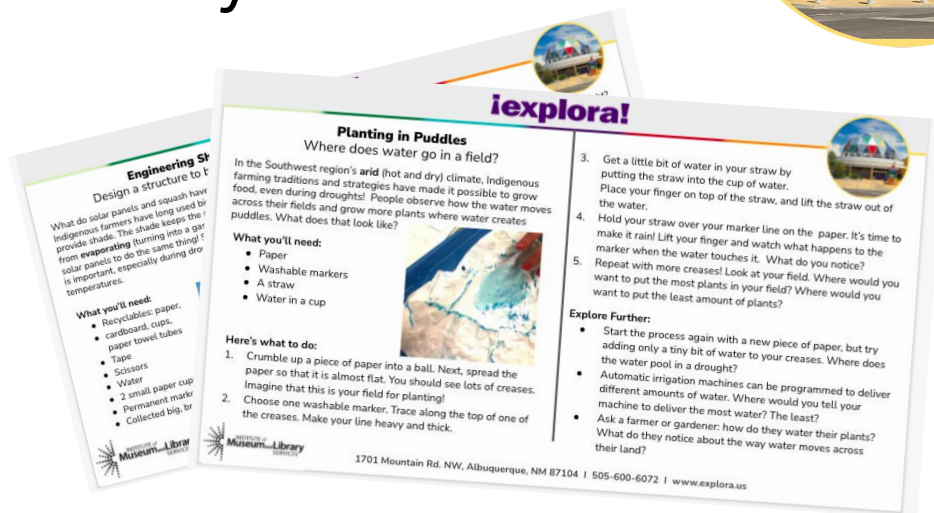
- Start the process again with a new piece of paper, but try adding only a tiny bit of water to your creases. Where does the water pool in a drought?
- Automatic irrigation machines can be programmed to deliver different amounts of water. Where would you tell your machine to deliver the most water? The 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](http://www.explora.us)



## Climate Change STEM Activity Cards

Lauren Butcher  
lbutcher@explora.us



# SD, Pierre

## South Dakota Discovery Center



Kristine Heinen

**PROJECT DESCRIPTION:** We are revamping our curriculum kits by creating up to date and relevant science curriculum for teachers to implement in the classroom. These kits will give students engaging lessons while bridging knowledge from other school subjects.





# Collaborating with Indigenous Communities

- Reach out to community/school leaders.
- Listen to the needs of the community.
  - Be prepared for those needs to change.
- Involve your partners from the beginning.
- Get other parts of the community involved.
  - Ask if there are other interested community members that want to get involved. Examples include: artists, students, chiefs, historians, authors, ect.



# Lessons learned from PLC

Listening to other projects was extremely helpful in thinking outside the box.

Steps involved in developing professional community partnerships.

Overall learning about the informal education community.



# AK, Kenai Challenger Learning Center of Alaska

NAME(S): Suzanne Phillips



PROJECT DESCRIPTION: We plan to update our existing and incredibly popular Robotics program with new equipment, new challenges and to fully integrate an introduction to coding to the program.

# Coding and Robotics

We decided to pursue a coding focus to our robotics program as a result of conversations with Homeschool groups who have identified this as a curriculum gap/want for their families.

- We have done 3 Homeschool MiniCamps with groups here on the Kenai Peninsula.
- We have completed one one-day program with a Migrant Students program.
- We are planning a Coding camp this summer for our local students as well as two other sites on the Kenai Peninsula.
- We will be integrating some of the coding/robotics into an Aerial Robotics program with Nenana Schools, a residential school for indigenous students in the Alaskan interior.





# Engaging Indigenous Populations

- Although we did not specifically focus on indigenous populations with the development of this program, we have worked with Native Corporations to develop other programs over the years. Most recently:
  - We have begun development on a drone training program at the request of the Tyonek Native Corporation to train their youth and young adults to attain their Part 107 Drone Pilot license and become proficient in flying and programming drones for survey flights on their tribal lands.
  - Currently we are working closely with the Salamatof Native Tribe here in Kenai to develop a Food Security program through another NISENet grant with a NASA TEAM II grant.

# Engaging Indigenous Populations

After over 22 years of working with indigenous communities in remote locations in Alaska, we have found a few specific points of importance.

- Involve the elders/leaders at the very start of development to ensure that the program will truly meet needs they have identified and be relevant to their community.
- Tapping into their vast knowledge of elders and community members is invaluable to the success of the program.
  - Integral to the development of the program itself
  - Integrates a strong respect for traditions and culture as they relate to the science
  - Essential to achieving 'buy-in' from the community elders/families.
- It is important to not be a 'one-touch' program. To have a lasting impact in these communities we must establish a relationship and that requires multiple visits/exposures.

# UT, Monticello

## Canyon Country Discovery Center

NAME(S): Ben Muhlestein

PROJECT DESCRIPTION: To bring stargazing events to local underserved communities. These events will have Earth and Space activities before stargazing with our telescopes.



# Session Resources

## Additional Resources

- NISE Network Museum & Community Partnerships: Collaboration Guide  
<https://www.nisenet.org/collaboration-guide>
- Indigenous Ways of Knowing section in the NISE Network Working with STEM Experts: A Guide for Educators in Museums and Other Informal Learning Settings  
<https://www.nisenet.org/working-with-experts>
- SEISE DEAI Tools: Culturally Responsive Programs; Developing & Using Land Acknowledgements  
<https://drive.google.com/file/d/1jZZOYHYIE3y9zt8lqcasfjnbLLZzLxYN/view?usp=sharing>
- Reflections and Ideas about Collaboration with Integrity by the Roots of Wisdom Project Team [https://omsi.edu/exhibitions/row/docs/ROW\\_LegacyDoc.pdf](https://omsi.edu/exhibitions/row/docs/ROW_LegacyDoc.pdf)



# Thank You

