
Welcome to our professional development program!
PT8
RECONYX

Team Introductions

Mitaali Taskar

Sage Lichtenwalner

Michelle Cusolito

Marissa Staffen

Agenda for today

7 pm Welcome & Orientation (Janice)

- Participants, please introduce yourself in the chat (name, school, grade you teach)
- Introduction to the Long-term Ecological Research Program (LTER) at Palmer Station (TBD)
- Goals and objectives of the program
  - Video teleconferences from Palmer Station (Janice/Mitaali)
  - Video Blog from the decks of the RV Revel (Michelle/Helen/Andi)

7:15 pm Penguins of Palmer - recorded talk from Dr. Megan Cimino (7.5 minutes)

7:25 pm Data to the Rescue: Penguins Need Our Help! Participants, please have your backpack handy for a high-level unboxing and overview of the eight sessions and how the program is arranged.

Spotlight on:

- Session 4: Penguins of Palmer
- Session 5: CODAP 101 and graphing the long-term trend of Chinstraps, Adelie, and Gentoo penguins

7:50 pm Session 6: Questionland overview of QFT (in Padlet) – work through example

8:05 pm Planning breakout groups (2-5), (6-8) and (9-12)

8:30 pm Wrap up and Next steps - Project Website (Sage): Resources including Click to Computer Science training videos; Other resources: Data Nuggets (whales), Data Stories (whales)

Long term research is essential to understanding how ecosystems function and why they change. For over 40 years, the National Science Foundation's LTER Network has gathered critical data, conducted large scale experiments, and developed models to test and challenge our growing understanding. In the following pages, viewers will find stories from many perspectives. Some delve into the science and its implications, while others offer a taste of what it's like to see a site for the first time or to conduct research as a graduate or undergraduate student.

We hope you will enjoy this vicarious road trip around the LTER Network and that it inspires you to learn more about a site near you!

Background and Context

Challenges

Distant and remote

Cannot bring (most) people directly to the Antarctic habitats to build connection and sense of place

Connecting local to global relevance in climate change concepts

Opportunities

Fun and excitement to learn about a far-away place

Engenders a sense of exploration and adventure

Charismatic organisms


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2013 TerraMetrics
Image IBCAO
Google earth

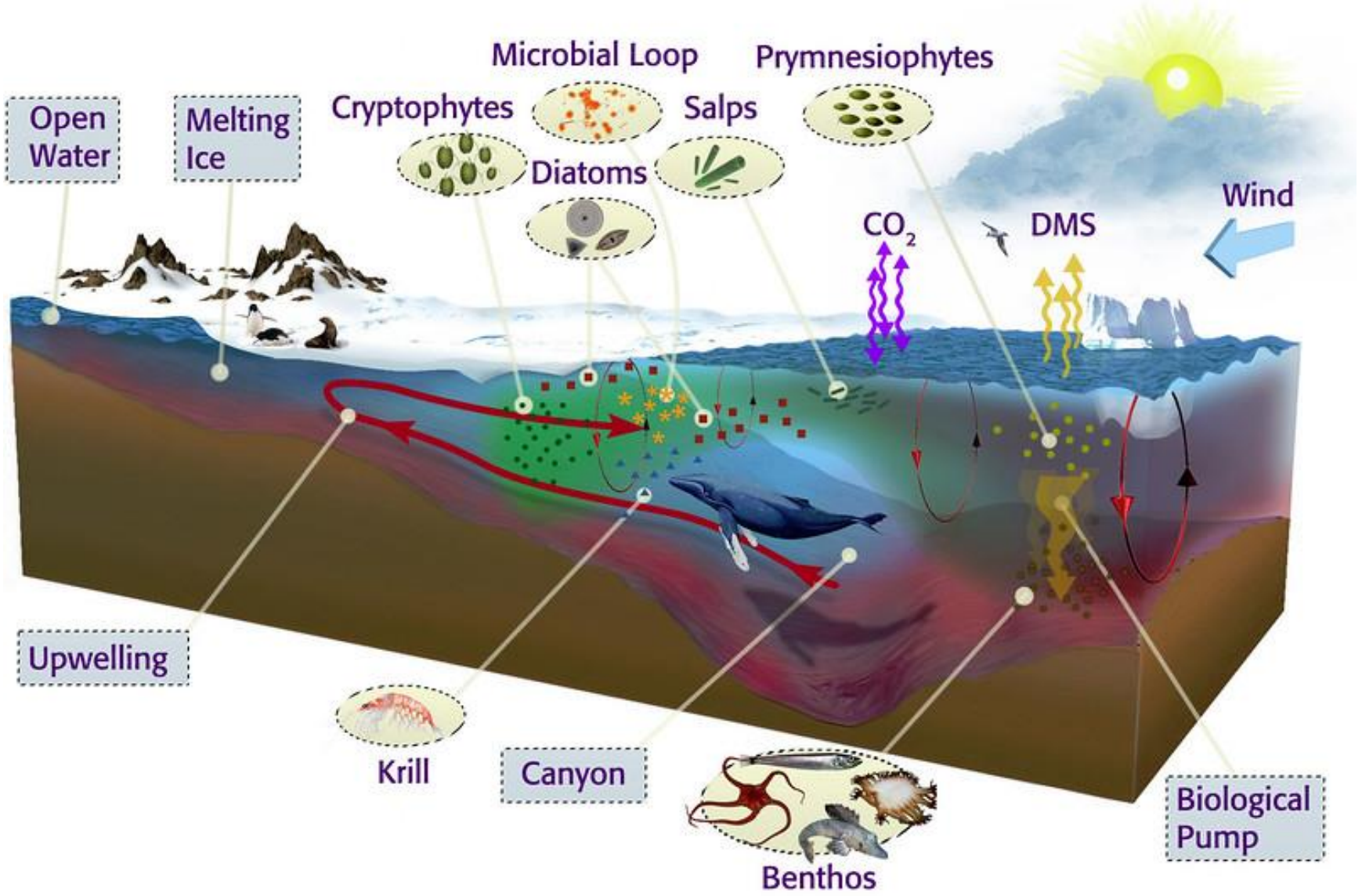
RV REVELLE

LTER – Palmer Station

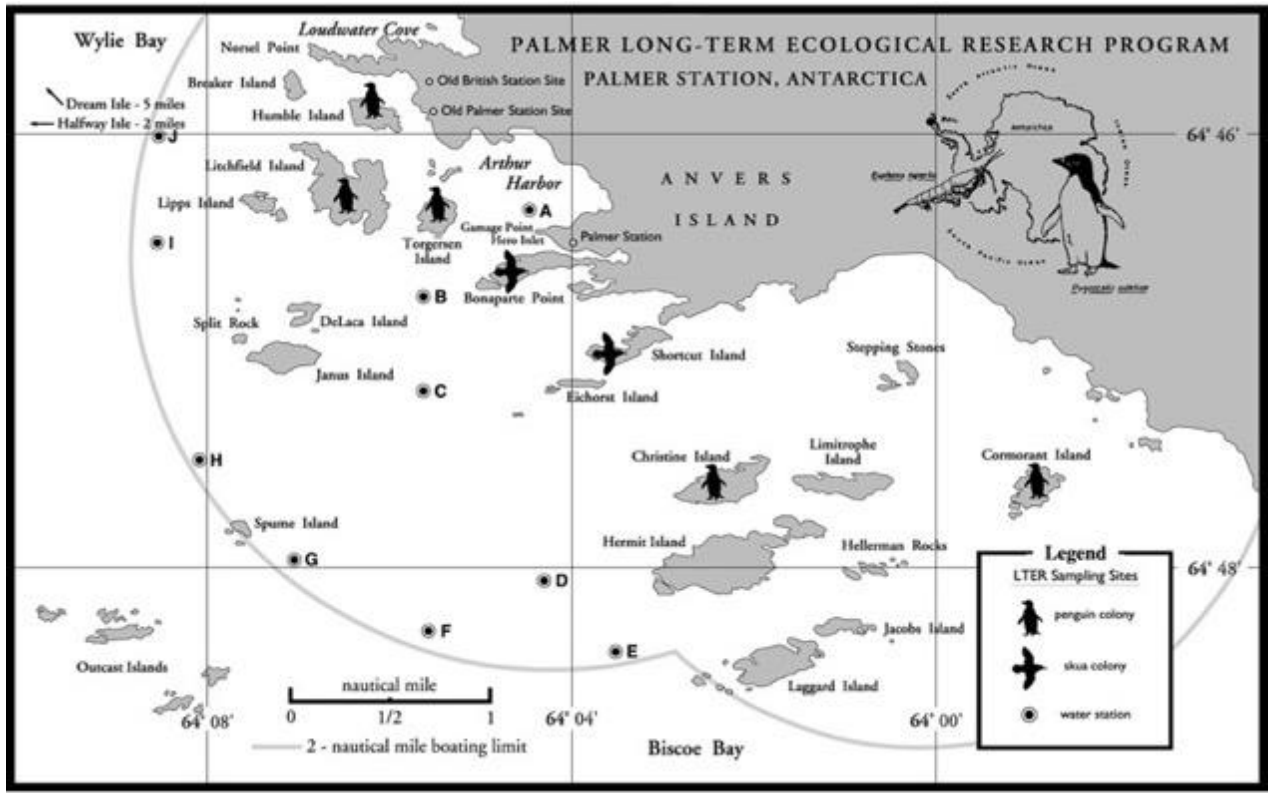
The Antarctic Peninsula region is experiencing the most rapid climate warming on the planet with large and rapid reductions in sea ice cover and corresponding responses at all levels of the food chain.

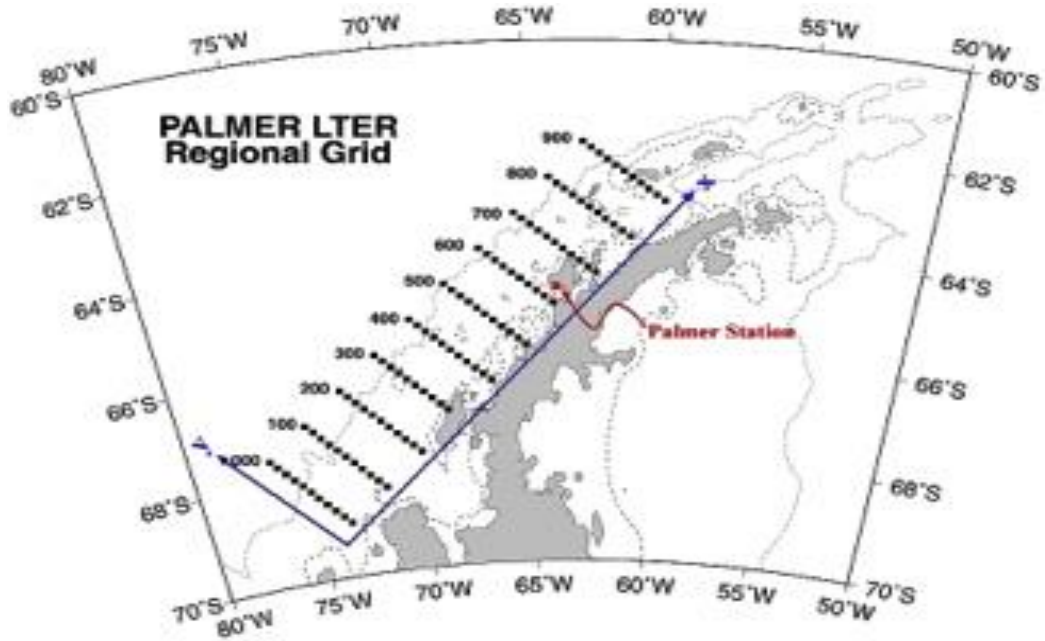

GWR (Garage, Warehouse & Recreation)
Storerooms, lounge, gym, dorms
Live call is happening
right here!
Terra Lab
(science observations)
Bio building
(labs, kitchen, dorm
Boathouse
and boat ra

Scientists are studying a potential shift from a polar ecosystem to a sub polar ecosystem due to a warming climate

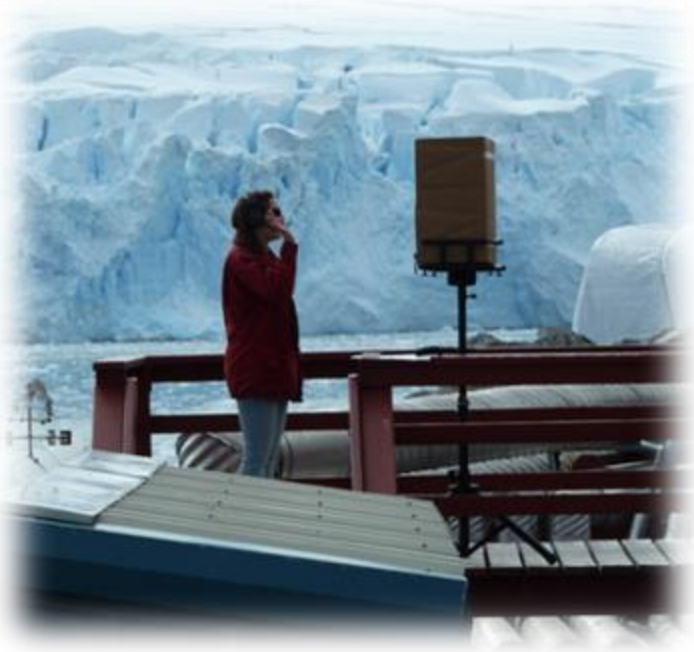


Palmer Station
Antarctica LTER





Timeline



November 2025

Announcement to schools

December 2025

Professional Development for Teachers

Curriculum is available

January 2026

Curriculum is implemented

February – March 2026

Student questions are collected and vetted -- VTCs take place and are archived on website

PROGRAM OBJECTIVES

- **Ability to practice asking scientific questions**: Educators noted the importance of getting students to develop and ask scientific questions. Students were generally interested in questions posed by their peers from their schools and from other schools.

"As a class, we spent time examining types of questions and quality of questions. We read previously submitted questions and evaluated where on Blooms Taxonomy did that question fall- comprehension to an analysis. This seemed to be the first encounter my students had with the idea of question types. They were engaged and extremely thoughtful about the quality of their questions".

- **Increase understanding and awareness of Polar Regions**: Educators noted that students were interested to learn more about Antarctica. Students were able to learn more about the Antarctic food web from the smallest microbes to the largest whales.

"We are currently investigating microbes in class and our curriculum standards tend to focus more on the "bad" microbes than all of the "good" microbes in our world. The broadcast allowed my students to learn more about how microbes are studied and about some of the related careers available".

- **Ability to meet a practicing scientist**: Many educators noted that it was important for students to have the opportunity to meet and talk to a real scientist.

  - *"Students had a chance to meet a real scientist and hear about their work and everyday life. They left very excited. I heard sentences start with "I wonder if...." "What would you study..." and just a general sense of excitement".*

  - *"It was helpful to see a female scientist and allow female students to see themselves with her and both scientists were engaging but it was also hard to actually see them to allow students to see themselves in the scientists".*

Video Blog from RV Revelle

STUDENT LEARNING OBJECTIVES

Students will KNOW (cognitive goals)

- **Ice is important because organisms (plants, animals, humans) depend on it for habitat (food source, shelter, etc.)**
- **Climate change is affecting the amount of ice at the poles. This has local and global impacts.**
- **Scientists collect data over many years to study the changes in ice and how that is impacting local things like food webs and global things like sea level rise.**
- Data can be analyzed by asking questions. Data "tells a story" (is interpreted).

STUDENT LEARNING OBJECTIVES

- **Students will FEEL (affective goals)**
- Excited about the process of discovery in science
- A sense of what it feels like to be in Antarctica.
- A greater sense of self-efficacy regarding data

- **Students will DO (behavioral goals)**
- Notice the changes over time in their own local area
- Participate in another science program

https://polar-ice.org

Featured Adventure: Data to the Rescue

Pack your bags and head off to the Western Antarctic Peninsula with Dr. Megan Cimino. Use data to understand how the Adélie penguin population is changing with the climate. Get creative and communicate science with a Data Jam!

Start your Penguin Adventure

Facilitator Guide

Educators and club leaders can download the Data to the Rescue facilitator guide. It includes instructions on how to incorporate these adventures into your classes or informal club activities.

Download the Guide

Other Polar Scientist Adventures

Check out our additional Polar Scientist Adventures to learn more about science in the Arctic and Antarctic regions. You'll meet the young scientists who work there and the tools they use. Earn a digital Polar Explorer badge for each adventure your complete!

- Ice Moves
- Glaciers in Greenland
- Ancient Antarctica
- Fire in the Arctic
- People in the Arctic
- Streams in the Dry Valleys
- Lakes in the Dry Valleys

Please help us improve! Find our feedback form at the bottom of pages and share how our site impacts your work.

Making Data Engaging

Explore these links to resources designed to help out-of-school learning programs build data literacy skills in ways that are fun and engaging for young people.

Communicating Data with the Data Jam activity from Data to the Rescue
Learn how to help youth share their learning through a Data Jam.
Start Learning

Asking Questions with the Questionland activity from Data to the Rescue
Learn how to help youth ask questions of the data they are investigating.
Start Learning

Exploring and Interpreting data with Penguins of Palmer activity from Data to the Rescue
Learn how to use CODAP to develop graphing and analytical skills.
Start Learning

Exploring Numeracy with Diving into Data activity from Data to the Rescue
Learn how to spark curiosity about the role of data in real-world problem-solving.
Start Learning

Orienting to Data with Diving into Data activity from Data to the Rescue
Learn how to help youth visualize and interpret data through hands-on learning.
Start Learning

Building a Team with socio-emotional learning activities from Data to the Rescue
Learn how to help youth regulate their emotions and communicate their feelings as they learn something new.
Start Learning

Data Clubs
Youth learn how to use simple tools for visualizing and analyzing data on topics they care about.
Start Learning

Data to the Rescue: Penguins Need Our Help!
Youth will figure out what is happening to penguin species on the Western Antarctic Peninsula.
Start Learning

Building Insights Through Observations
Youth learn to use NOAA's Science On a Sphere to create visualizations using geospatial data.
Start Learning

Want to learn more about how to integrate data skills into your program?

Explore ways to integrate data skills into your program, empowering educators to teach children age-appropriate skills with ease.

Learn More

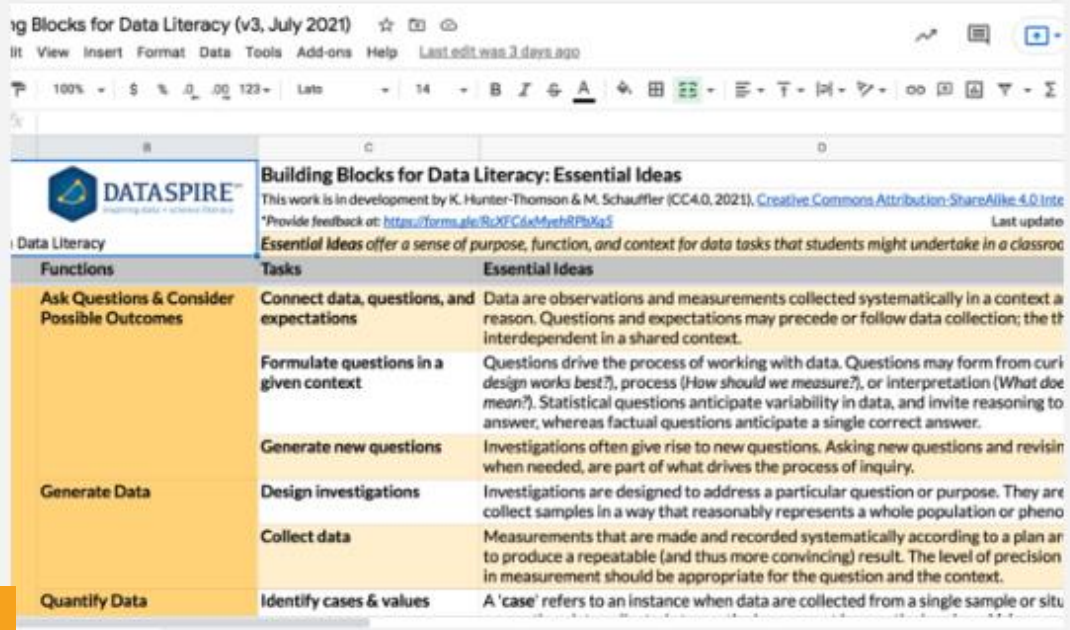
https://click2computerscience.org/data-literacy/making-data-engaging/

Building Data Literacy Skills

BUILDING BLOCKS OF DATA LITERACY

In September 2021 we launched the "Building Blocks for Data Literacy" project.

The Building Blocks for Data Literacy Table is designed as a reference and discussion-starter for teachers and other educators as we all explore how to engage K-12 students with data. It is a draft — an ongoing work in progress that will evolve with input from readers.

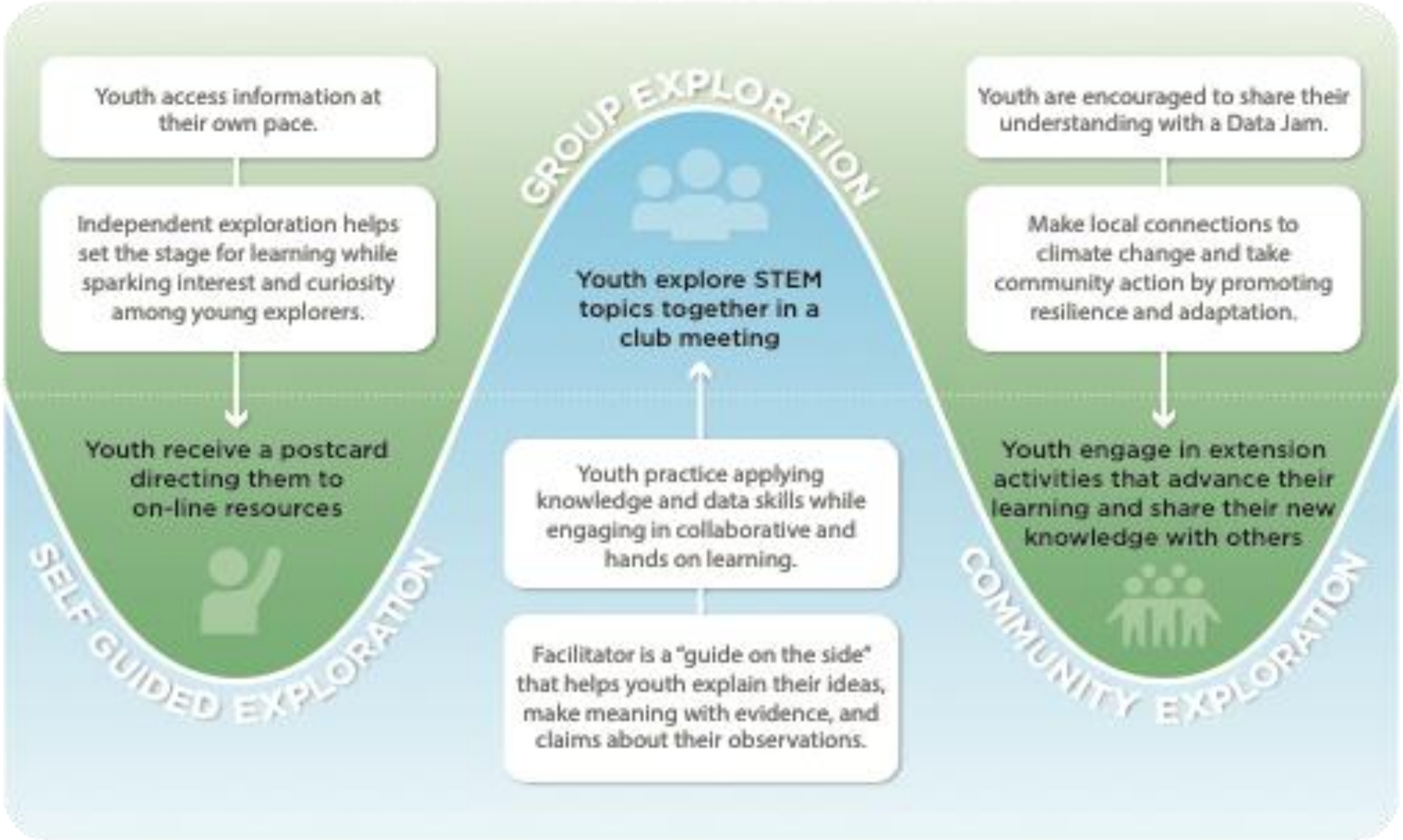


https://dataspire.org/building-blocks-for-data-literacy

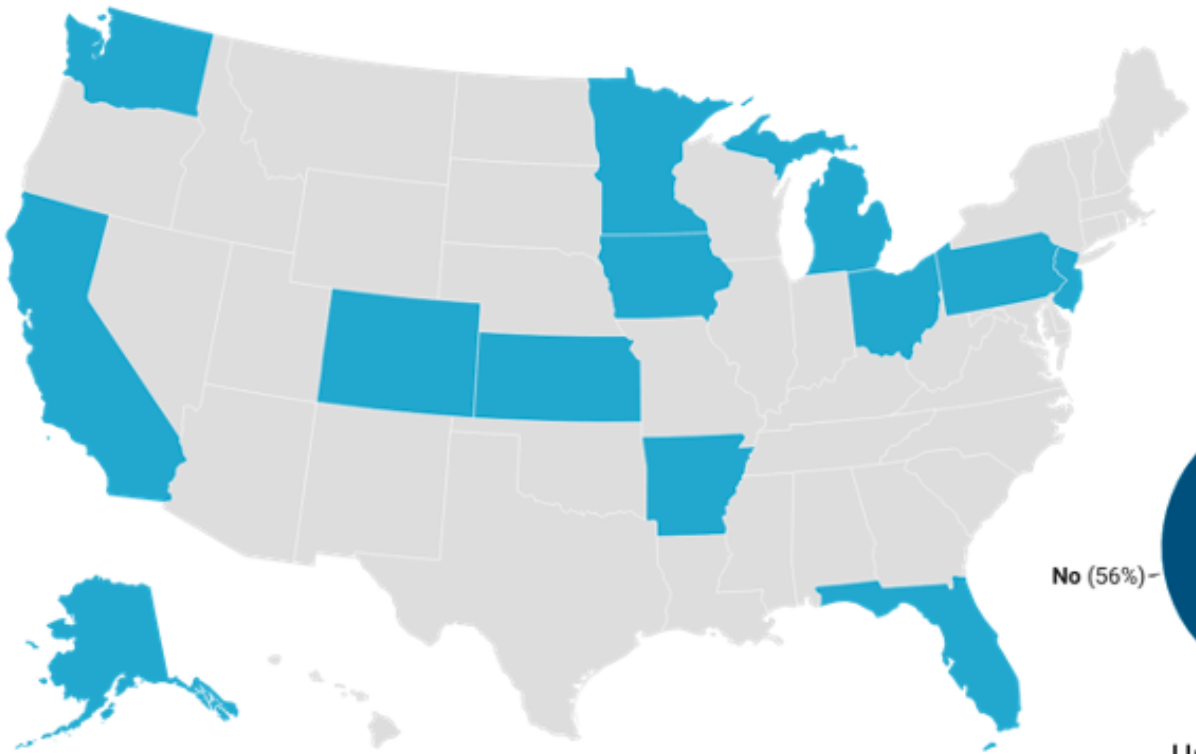
An **introduction** of the project and resource can be found here: https://tinyurl.com/bbdl-intro

The **resource** can be accessed here: https://kristin-hunter-thomson.mykajabi.com/pl/2147577048

RESEARCH CLUB MODEL



From summer 2020 to spring 2023



Programs in 13 States

Underrepresented
Minority Participation

Polar CAP Project Programs

Includes virtual and in-person programs from summer 2020 to spring 2023

State	Programs	Participants
Alaska	2	77
Arkansas	1	30
California	1	32
Colorado	1	11
Florida	1	20
Iowa	1	13
Kansas	1	18
Michigan	1	23
Minnesota	1	89
New Jersey	18	856
Ohio	14	281
Pennsylvania	2	75
Washington	2	46
Total	**46**	**1,571**

For more information visit http://polar-ice.org

CLUB MEETING 1

Let's Pack Our Bags and Go to the Poles

SCAN TO ACCESS THE ONLINE YOUTH POSTCARDS

Dear Explorers:

My name is Dr. Megan Cimino. I would like to welcome you to our research team. I need your help to learn more about the penguins at Palmer Station in Antarctica. To prepare, we are going to identify different species of penguins; analyze data; ask scientific questions; make a hypothesis about how climate change is impacting the penguin populations; and finally communicate about our work through something called a Data Jam. First, we have to get ready for our research expedition by packing our research equipment and personal items. It takes a lot of planning to

Postcard 3: Dive Into Data!

Postcard 4: Penguins Need Our Help!

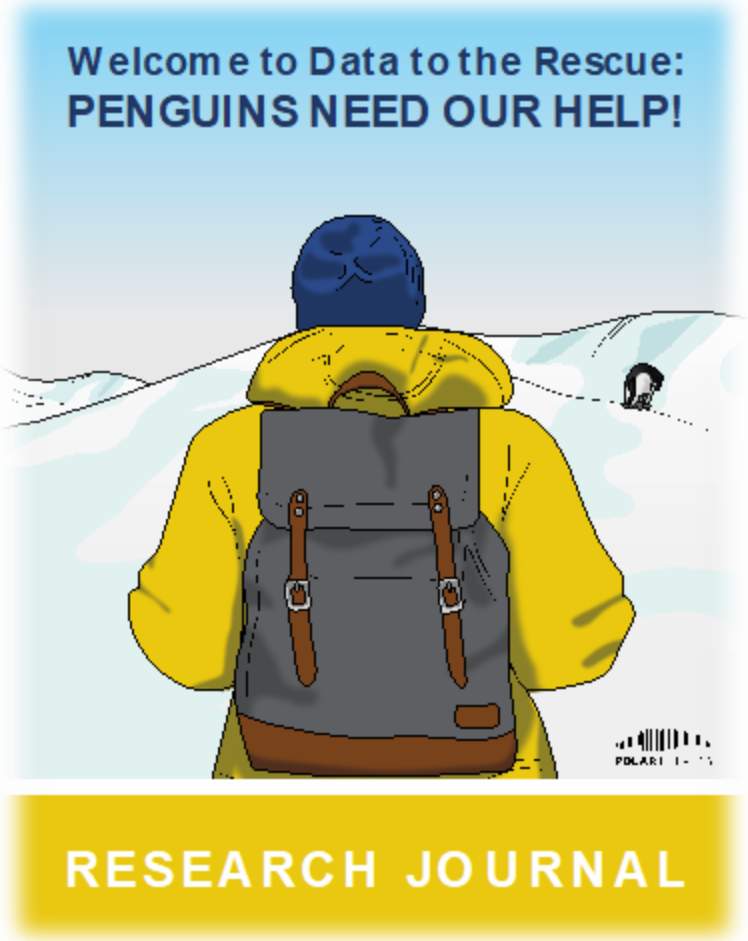
Postcard 5: Penguins of Palmer

Postcard 6: Questionland

Postcard 7: Exploring Ice

Postcard 8: Data Jam

Club meeting 1 & 2
Let's pack our bags & Join the Team



Postcard 1 – Pack Your Bags

Dear Explorer:

Welcome to our research team! In preparation for our Antarctic Adventure, complete the following tasks:

- ✓ **Pack your bags:** Drag and drop the items into the three categories: "Items for Living", "Tools for Science", and "Luxury and Mental Wellness."
- ✓ **Packing list:** Choose three items from the list to pack and explain why.
- ✓ **Choose a science tool and watch the video.** Write down in your journal which scientist used it, and how it is helpful.

Please bring your journal to the research team meeting. Thank you and I look forward to seeing you soon.

Sincerely,

Dr. Megan Cimino and the research team

Club Meeting 3 - Digging into Data
Club Meeting 4- Penguins Need Us!

Postcard 5: Penguins of Palmer

Postcard 6: Questionland

Postcard 7: Exploring Ice

Postcard 8: Data Jam

Let's Play a Card Game

One important way to analyze data is to look at graphs and interpret (figure out) what they mean. We are going to practice interpreting data by playing a card game below where you look at the graph and create a story that explains it.

The first side of the card has a graph. A graph has both an X (horizontal) and y (vertical) axis. For example, in graph #1 the X axis is "Person's Age" and the Y axis is "Movies a person likes."

Think of a quick short story (a few sentences) that explains the relationship the graph is showing. Have fun with it! Just make sure it accurately represents the graph. Then turn the card and reveal our explanation. There are six cards total.

3. Let's identify our study subjects... Penguins!

Now that we know which penguin you are, let's learn about the three types of penguins that live in the area of Palmer Station in the next activity below.

Match the penguin picture to the description to learn about three species of penguin.

The bird has an entirely black head and mostly black bill.	The bird has a black band around its face that looks like a chinstrap.	The bird's bill is orange and there is a white patch on its head.

Scientist Spotlight

MEGAN CIMINO

Welcome to Data to the Rescue:
PENGUINS NEED OUR HELP!

RESEARCH JOURNAL

Community Exploration: CLIMATE CONNECTION

Be an influencer! Help your neighbors, family, and friends understand climate change. Here are some more things you can do.

Reduce Food Miles

Food takes a lot of energy to grow and transport. It is estimated that food travels up to 1,500 miles from farms to our homes. This adds to climate change and pollution issues.

- **Get food that doesn't travel too far—one great way is to grow your own food.**
- **Encourage your family to buy from local farmers markets or farms near you when possible.**
- **Look at your food labels and choose food produced locally.**
- **Avoid buying excess food you may not eat. Throwing away food is wasting the food and all the energy that was used to grow, package, store, and transport it.**

YOUR LOCAL CHALLENGE:

Look up the location of your closest farmers market. If possible do some grocery shopping there.

Congratulations!

You have earned your FOURTH badge.

A

B

C

Which **Adelie**

are you today and why?

D

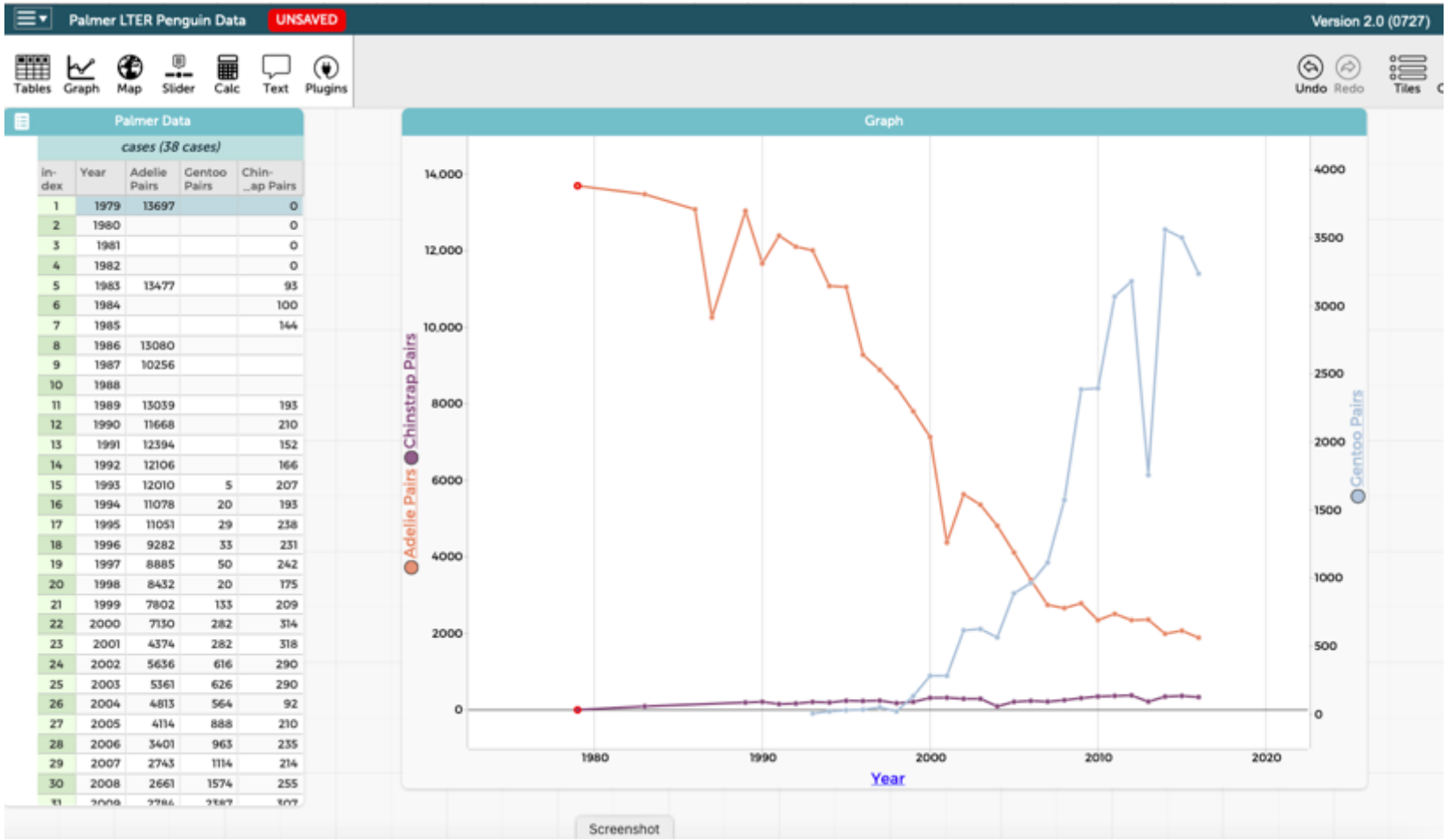
Club Meeting 5 – Penguins of Palmer

Postcard 3: Dive Into Data!

Postcard 4: Penguins Need Our Help!

Postcard 7: Exploring Ice

Postcard 8: Data Jam



Using CODAP- Common Online Data Analysis Platform

Club Meeting 6- Questionland

ACTIVITY 3: CHECK IN WITH DR. CIMINO

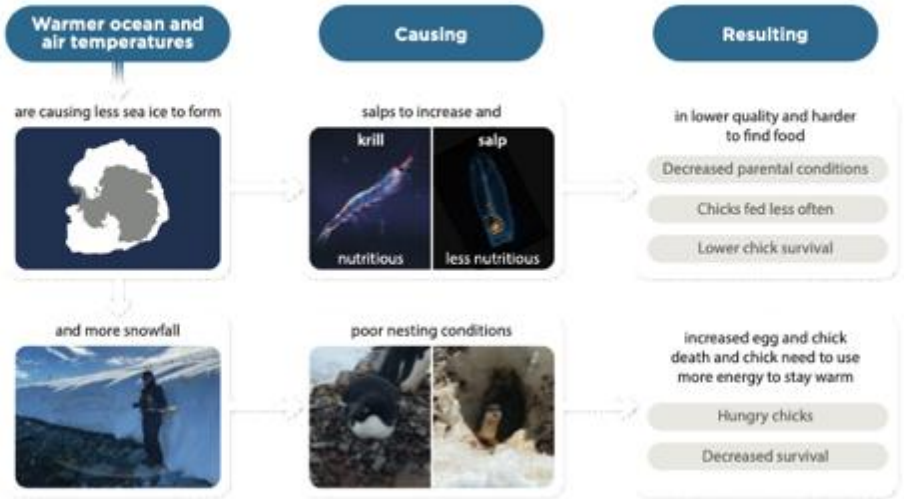
(10 minutes)

1. Play the call-to-action video for the group and remind Explorers that Dr. Cimino's research is focused on:
   - Landscape, or the amount of ice coverage;
   - Ocean conditions, including temperature and salinity; and
   - Amount of prey (krill, salps, and fish) available.
2. Ask the group what they think might be the reason for the Adélie population decrease, Gentoo population increase, and no change in the Chinstrap population. Encourage a group discussion.

Dr. Cimino's team's current hypotheses are related to less ice and increased amounts of snow/precipitation. We don't expect your Explorers to fully understand the complexities. What is important is that we inspire students to hypothesize and learn how to ask scientific questions. The diagram below shows some of the hypotheses that the team is actively researching. You can use this to help answer questions Explorers may have.

Krill are small marine crustaceans that are a "keystone," or main, source of food for many larger animals. Antarctic krill make up an estimated biomass of around 379,000,000 tonnes, more than half of which is eaten by whales, seals, penguins, seabirds, squid, and fish each year.

Salps are tubular, gelatinous animals found most abundantly in the Southern Ocean (near Antarctica), where they sometimes form enormous swarms in deep water.



Screenshot

Asking Questions Like a Polar Scientist

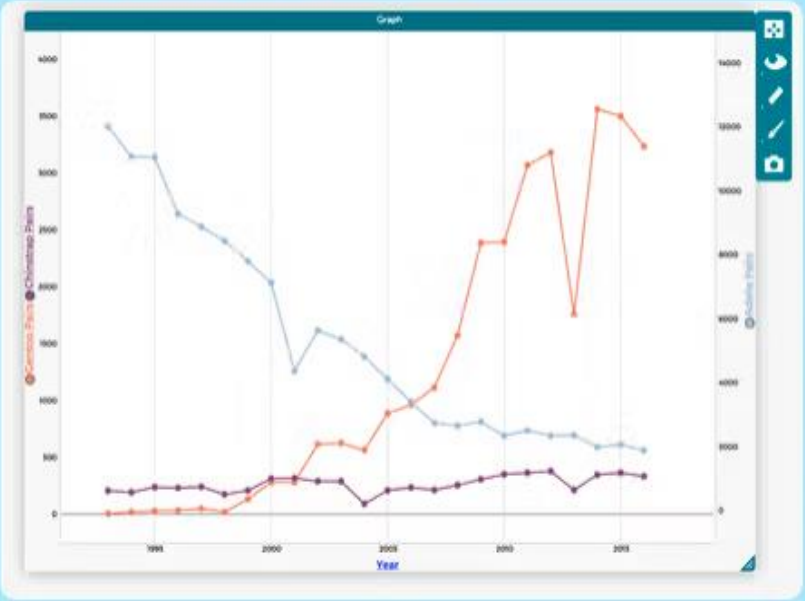
Question Formulation Technique (QFT) from The Right Question Institute

Step 1: Review the rules for asking questions

1. Ask as many questions as you can
2. Do not stop to discuss, judge or answer the questions
3. Write down every question exactly as it first comes to mind
4. Change any statements into a question.

♡ 0 ◯ 0

Step 2: Observe the question focus.



1. List some trends you might like to explain to your audience. What are some things you notice about the data? What questions do you have?

♡ 0 ◯ 0

Step 3: Ask Questions

1. Double click anywhere on this page to post a question.
2. In the **Title** section, type your question exactly as it first comes to mind.
3. In the ***Write Something*** section, type your teacher's name/class.
4. When finished, click again anywhere on this web page to post another question.
5. Read the questions other polar explorers have posted. Feel free to add new, but related questions as "comments" on a question someone else posted.
6. Keep asking questions until time is up.

♡ 1 ◯ 0

https://go.rutgers.edu/6uivxho7

Asking Questions

Postcard 3: Dive Into Data!

Postcard 4: Penguins Need Our Help!

Postcard 5: Penguins of Palmer

Postcard 6: Questionland

Postcard 7: Exploring Ice

Postcard 8: Data Jam

Club Meeting 7 – Ice as Habitat

Explorers will interpret sea ice extent data from the Western Antarctic Peninsula. These data points represent the change in the sea ice extent measured in (km^2) in the sampling area along the peninsula from 1980 to 2020.

	1980	1990	2020
Sea ice extent (km^2) for the "New Palmer Study Area" along the Western Antarctic Peninsula	176, 839 km^2	114,668 km^2	101,659 km^2

Now that we found a data trend, we need to come up with an interesting way to express it. Let your creative energy flow! Can you create an art project that communicates the trend?

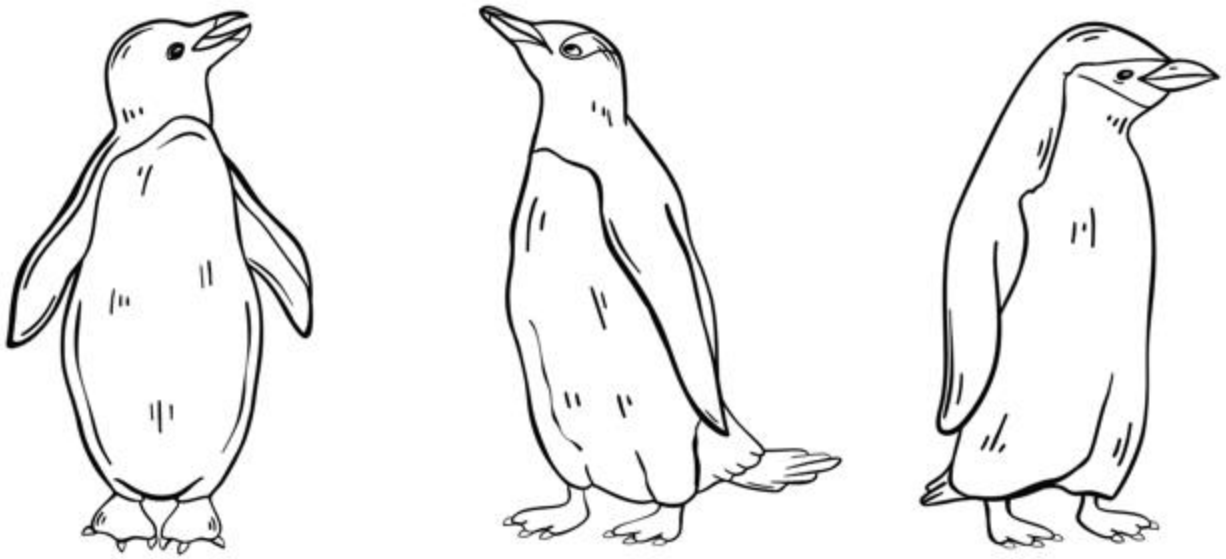
3. Ask Explorers to represent the ice loss by comparing it to the area of a U.S. state. For example, New Jersey (NJ) is about 22,590 km^2. How much of NJ would represent the loss of ice?
   - *1908-2020 the Western Antarctic Peninsula has lost 175,839 – 101,659 = 74,180 km^2 of sea ice extent*
   - *If NJ is 22,590 km^2 in total, that is 74,180 ÷ 22,590 = 3.3 areas the size of NJ!*
   - *Choose another state and represent the area of sea ice loss:*
     - ❑ Oregon
     - ❑ California
     - ❑ Delaware

Club Meeting 8
Data Jam

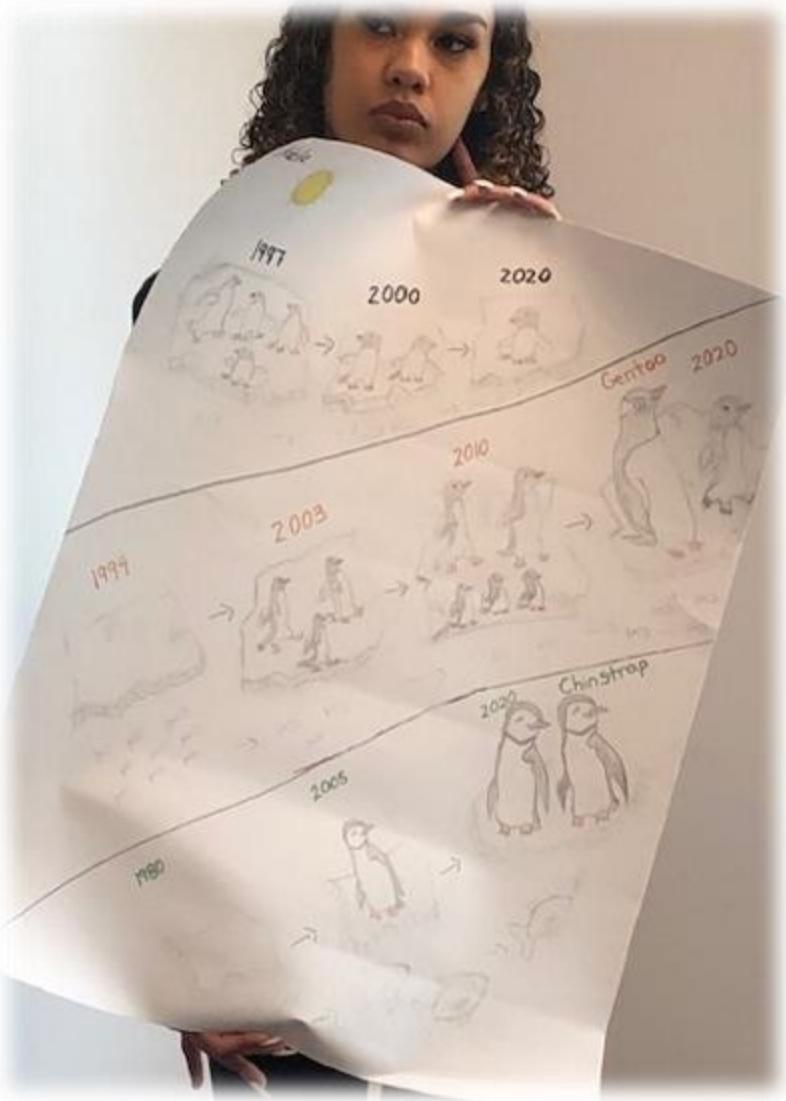
ACTIVITY 2: CREATE A GROUP DATA JAM!

(30 minutes)

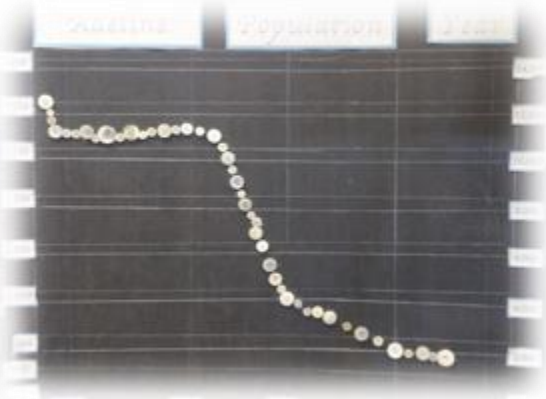
Explorers will work together to create a large mural project explaining the historical change in the penguin populations at Palmer Station.



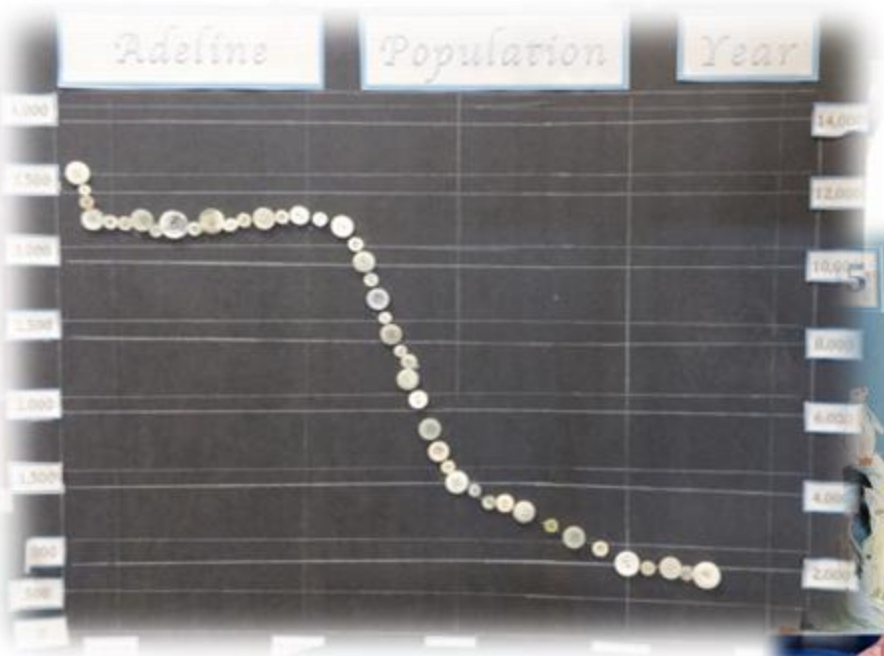
Data Jams


1997
2000
2020
Gentoo
2020
2010
2003
1999
Chinstrap
2005
1980


Adélie
Chinstrap
Gentoo

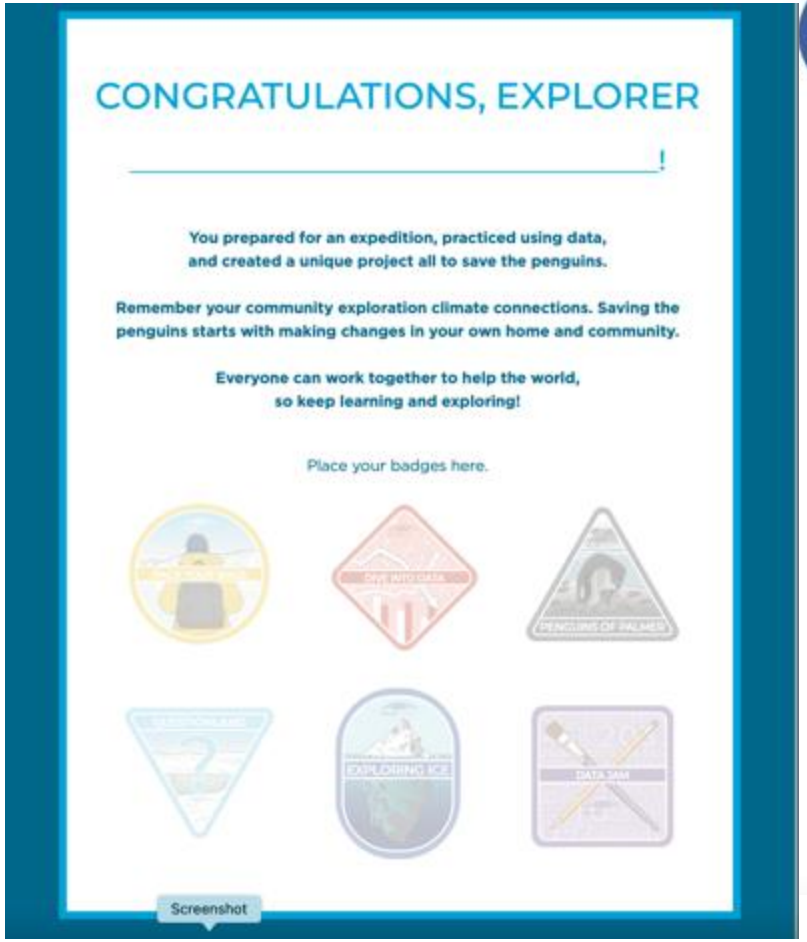


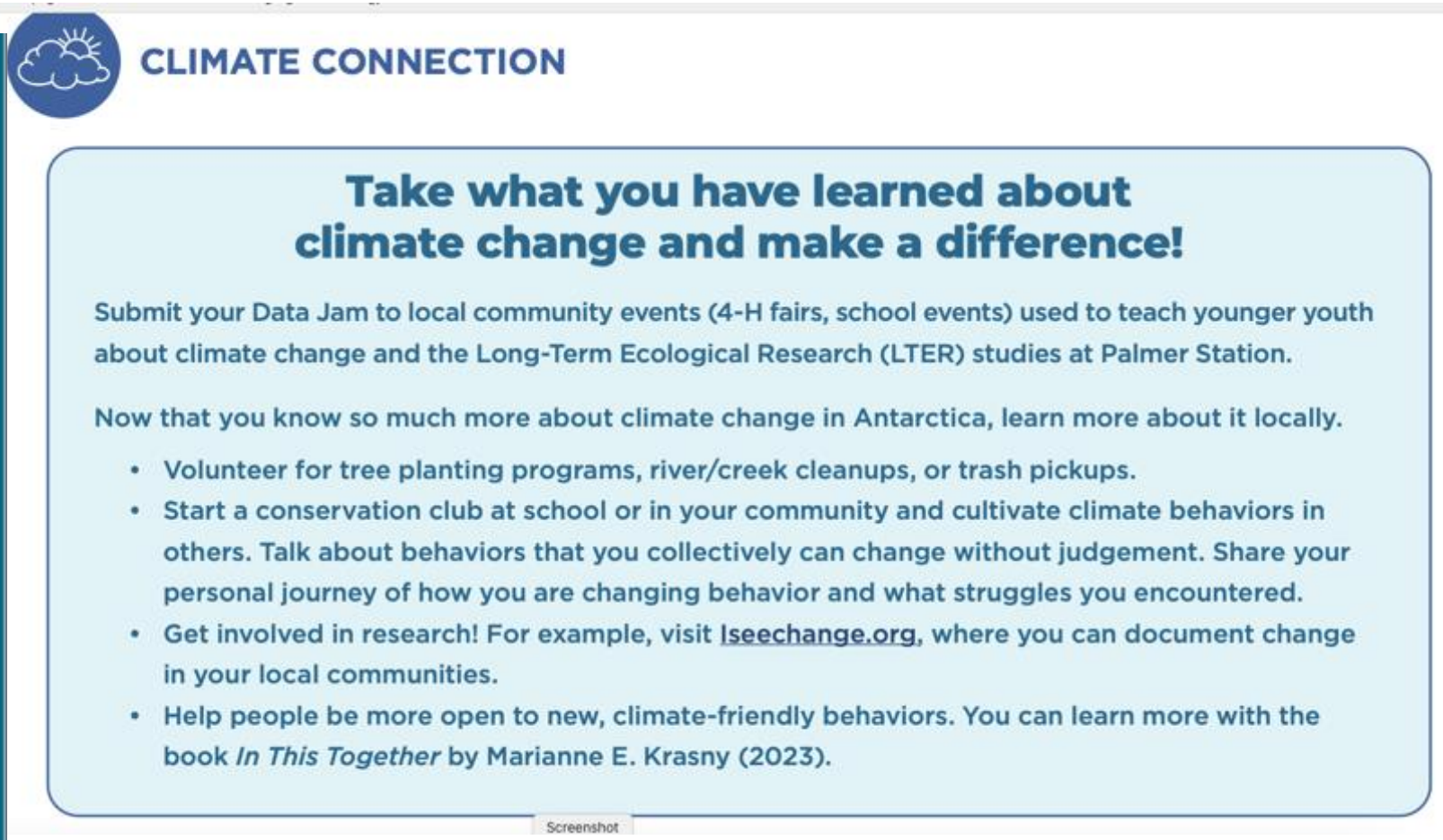
Data Jams Year 2



RUTGERS

Data Jams and Community Connection

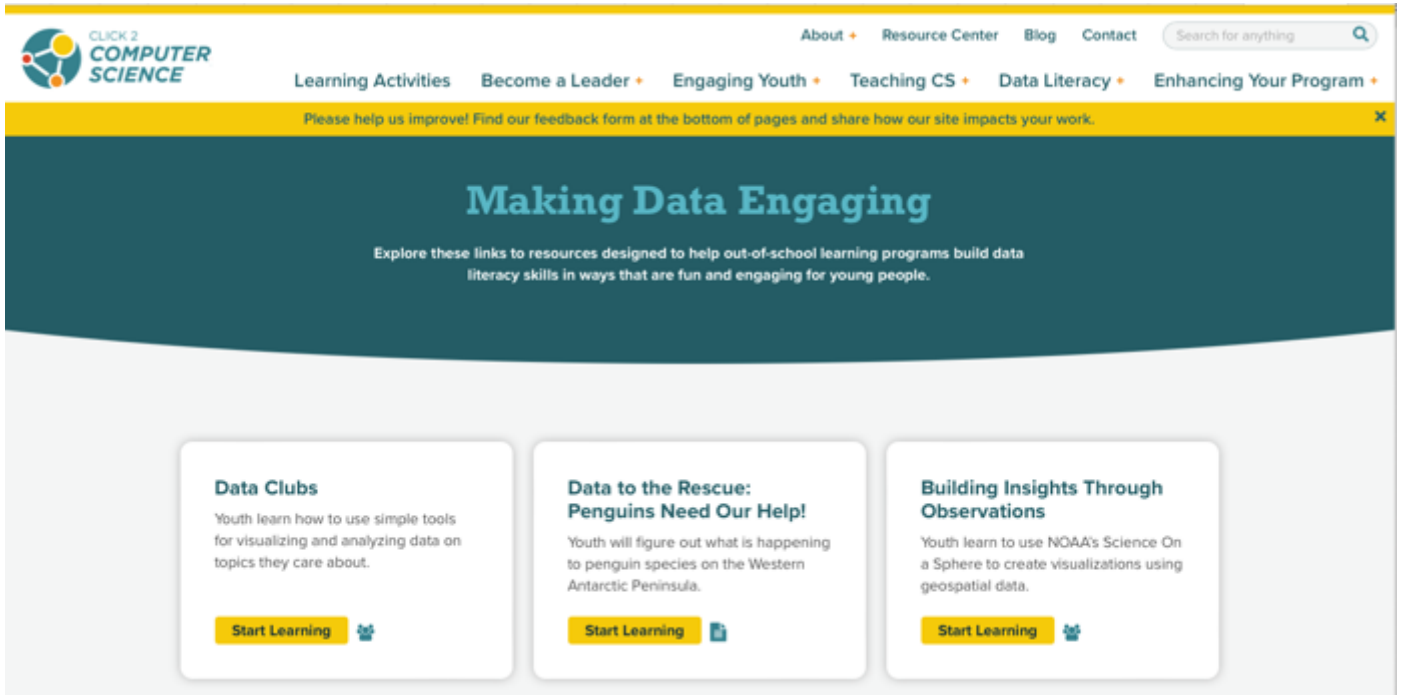




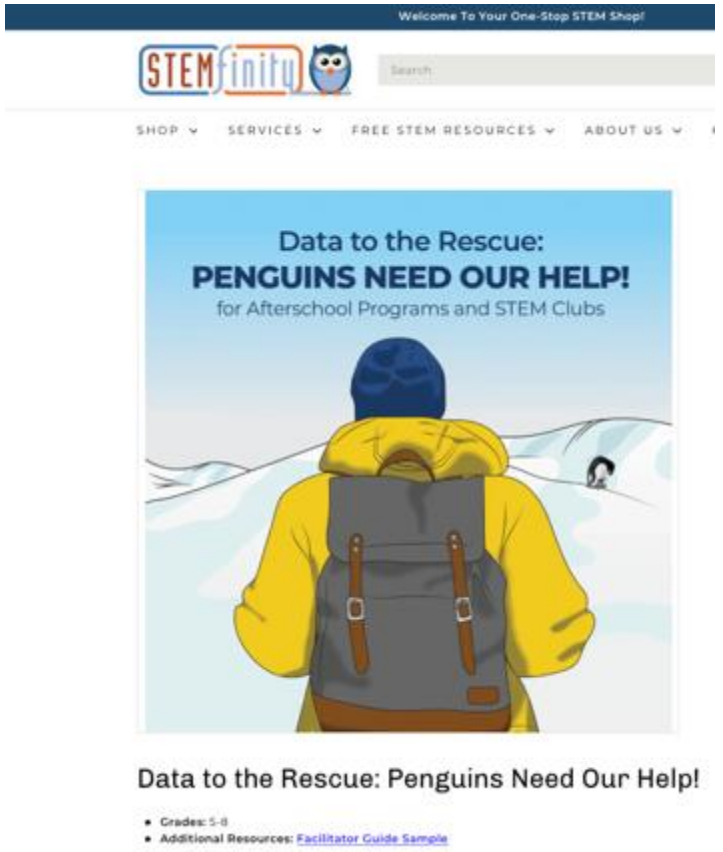
Break Out Groups!

THANK YOU

Contact me for more information:
Janice McDonnell
mcdonnel@marine.rutgers.edu



https://click2computerscience.org



https://stemfinity.com/

Key word data