Data to the Rescue:
PENGUINS NEED OUR HELP!

for Afterschool Programs and STEM Clubs

FACILITATOR GUIDE

RUTGERS THE STATE UNIVERSITY OF NEW JERSEY
POLAR LITERACY
NSF

Use the story of the penguins to build young learners data and science communication skills in an engaging and fun informal learning environment.

Whether you are part of an afterschool club, hybrid learning program, or even an independent adventurer, we invite you to join our research team!

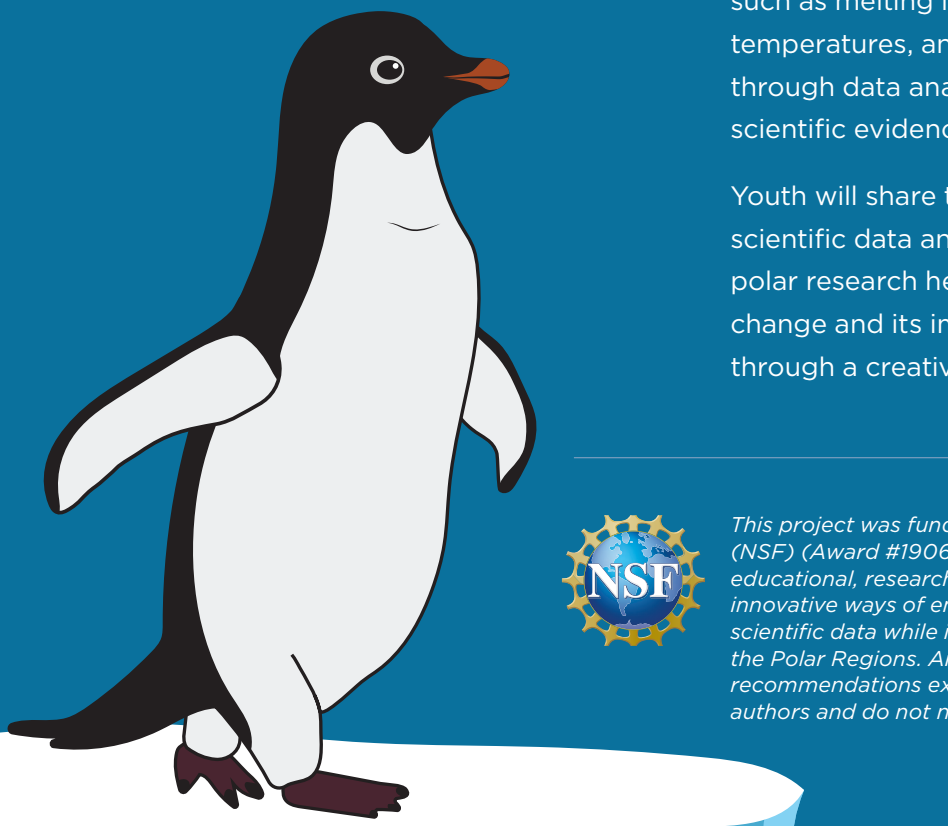
You're invited ... to join a polar expedition.

Although remote from much of human society, the Polar Regions are facing unprecedented change that will have significant consequences for us all. Scientists are studying and documenting the impacts of climate change and how they are unfolding at an accelerated rate in the Polar Regions compared to other areas of the earth.

Youth are invited to join the seabird research team of the Long-Term Ecological Research (LTER) program to explore the penguins at Palmer Station, located on the Western Antarctic Peninsula.

Learn how penguin data is collected and analyzed and help explore the impacts of climate change—such as melting ice sheets, increasing ocean water temperatures, and changing animal populations—through data analysis and interpretation of scientific evidence.

Youth will share their understanding of the scientific data and communicate to others how polar research helps us understand climate change and its impact, both globally and locally, through a creative project called a Data Jam.



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LEARNING OBJECTIVES

This *Data to the Rescue* program focuses on four STEM-related goals.

1. **Youth learn how the Antarctic ecosystem is transforming due to climate change.**
   The Western Antarctic Peninsula is the fastest winter warming place on Earth. This project provides opportunities for youth to fundamentally connect what they learn about the Polar Regions to similar concepts while learning about local impacts and solutions.

2. **Youth practice STEM skills, including graph making, analyzing, and interpreting data and asking scientific questions.**
   There is an ever-increasing expectation for workforce competencies in data literacy. By building Explorers' skills in collecting, analyzing, and interpreting large datasets, we encourage them to enter a workforce equipped to benefit society through better decision making (Ridsdale et al., 2015). By encouraging inquiry, we support meaning making and the development of a deeper understanding of the phenomenon of climate change (Langen et al., 2014; Schultheis and Kjelvik, 2020).

Data Skills by Session

DATA TASK	DATA SKILL (Grade Level)	MEETINGS 1 & 2 *investigate the Polar Regions.*	MEETING 3 *Learn how data can be displayed with different types of graphs.*	MEETINGS 4 & 5 *Learn about the sea ice, penguins, and climate change. Practice creating, reading and analyzing line graphs.*	MEETING 6 *Practice asking scientific questions and make connections between data variables.*	MEETING 7 *Discuss the impacts of climate change in Antarctica through the identification of data trends.*	MEETING 8 *Develop a creative project using ratios and share with your community.*
Realm: Get Data							
Connect data, questions, and predictions	Pursue questions to investigate with the available resources. (7-8th)				X		
Realm: Explore Data							
Grasp the attributes/ variables	Consider how two attributes might relate to each other in the context of the dataset (e.g. one influences another, but not the other way around). (7-8th)		X	X		X	
Read graphs & maps	Grasp the structure of and read information from pictographs, box plots, histograms, dot plots (1 dimensional), bar charts, pie charts, line graphs and/or maps. (6th)	X	X	X			
	Recognize that the colors in a graph or map represent attribute values or categories, not actual colors. (7-8th)			X			

DATA TASK	DATA SKILL (Grade Level)	MEETINGS 1 & 2 *investigate the Polar Regions.*	MEETING 3 *Learn how data can be displayed with different types of graphs.*	MEETINGS 4 & 5 *Learn about the sea ice, penguins, and climate change. Practice creating, reading and analyzing line graphs.*	MEETING 6 *Practice asking scientific questions and make connections between data variables.*	MEETING 7 *Discuss the impacts of climate change in Antarctica through the identification of data trends.*	MEETING 8 *Develop a creative project using ratios and share with your community.*
Create graphs & maps	Create graphs and scale axes using interactive technology. (6th)			X			
	Put suitable attributes on the axes for a given question. (7-8th)			X			
Describe visual patterns	Compare and contrast data values represented in a graph (e.g., is more than, less than). (3-5th)			X			
Interpret patterns in context	Describe features or patterns of graphs and maps that say something about a stated question or prediction. (6th)	X	X	X	X	X	X
Realm: Infer Meaning from Data							
	Make a conjecture or write a claim that is based on patterns in data. (6th)	X	X			X	X
Follow through with an action	Consider implications of results in a broader context (self, community, or broader understanding). (6th)					X	X
	Communicate findings in informal oral, written, visual, or kinesthetic presentations to peers. (6th)						X

3. **Youth create a sense of STEM identity by learning from real scientists involved in climate change research.**

   By providing children and parents with the tools to broaden their definitions of scientists—as individuals who are dedicated to science but not to the exclusion of other interests—we help build a vision of science that truly is accessible and for all (Dewitt et al., 2012). Videos from the "Polar Scientist Spotlight" series represent a diversity of young polar researchers. Facilitators can use these videos as virtual mentors and role models for Explorers to build their STEM identities. The related polar scientist cards help students understand the importance of an interdisciplinary team.

4. **Youth experience a sense of belonging among peers and support by adult facilitators who encourage positive emotions and hopeful purpose.**
   This program is designed to help youth thrive! It is important to provide youth with a sense of belonging among peers and support by adult facilitators (Arnold, 2020). Social-emotional learning (SEL) activities such as "What Penguin are You Today?" are central to *Data to the Rescue* and can be found in the "Facilitator Tips" and various activity sections.

What Penguin are You Today? is an example of an SEL activity where learners are encouraged to pick which image they most relate to that day and provide a 1-word or short description of why. For in-person engagement, they can share it out loud to the whole group, in a think-pair-share. For virtual, they can share in the chat box. Facilitators should acknowledge all answers and provide their own response to help build a sense of community and emotional support.

HOW IT WORKS

The following materials are included in this *Data to the Rescue* kit (12 kids/club):

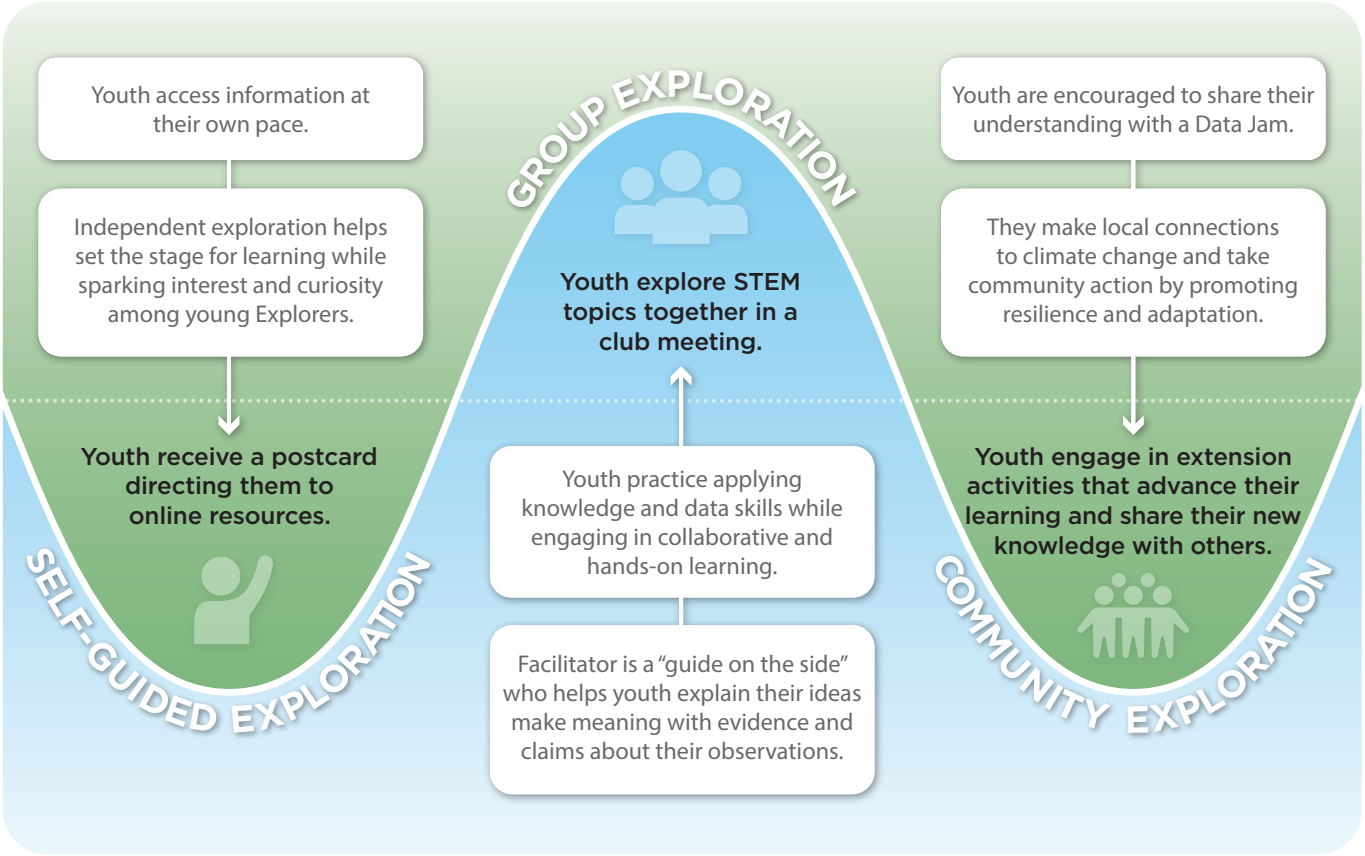
- ✓ Facilitator Guide (1 copy)
- ✓ Research Journal (12 copies)
- ✓ Youth postcards (8 cards, 12 sets)
- ✓ Common Online Data Platform (CODAP) guide and checklist (6 copies)
- ✓ Polar scientist cards (7 cards, 12 sets)
- ✓ Stickers of badges (6 stickers, 12 sets)
- ✓ Online materials:
  - » Program homepage: https://polar-ice.org/data-to-the-rescue-club/
  - » Youth postcards: https://polar-ice.org/data-to-the-rescue-club/postcards/
  - » Facilitator links and resources: https://polar-ice.org/data-to-the-rescue-club/facilitators-guide/

Hybrid Learning Model

Each club meeting in this curriculum includes the following three components.

Preparing for Exploration (Self-guided)	Club Exploration (Group)	Community Exploration
Youth are given postcards from the lead researcher, Dr. Megan Cimino, that direct their online learning about Antarctica. Youth record their work in their Research Journals.	In-person club meetings provide social interaction and collaboration among Explorers. Youth earn a Polar Explorer badge for each club meeting they attend.	Explorers are encouraged to become role models for climate-friendly behaviors and participate in "Local Challenge" projects that extend their learning.

RESEARCH CLUB MODEL



Complementary Materials

The program includes a Research Journal for Explorers that extends the lessons provided in the Facilitator Guide.

Facilitator Guide	Youth Research Journal
Preparing for Exploration (Self-guided): Facilitators open club meetings by reviewing the advance work done by Explorers.	*Preparing for Exploration:* provides space for students to record their ideas from online activities.
Club Exploration (Group): Facilitators guide Explorers through engaging (and fun) STEM activities that build on and enhance online learning.	*Club Exploration:* provides space to record the results of hands-on activities and discussions focused on data literacy and climate change.
Community Exploration: Facilitators lead discussions on the causes of climate change and ways in which Explorers can take action in their communities to address its impact.	*Community Exploration:* includes a "Climate Connection" that ties learning to personal efforts and a "Local Challenge" to engage others.

Club Meetings at a Glance

Through eight club meetings, Explorers will learn about the penguins of the Western Antarctic Peninsula and how climate change is impacting the Polar Regions and our planet.

#1: Let's Pack Our Bags and Go to the Poles Plan the research expedition.
#2: Join the Team! Review scientists' jobs and how they are studying climate change.
#3: Dive into Data Learn basic data skills to support the science mission.
#4: Penguins Need Our Help! Identify species of penguins and analyze habitat maps.
#5: Penguins of Palmer Explore population data of penguin populations.
#6: Questionland Generate questions about what is happening to the penguins.
#7: Exploring Ice as Habitat Learn about sea ice and how to analyze and explain change**s.**
#8: Communicate Science with a Data Jam Demonstrate understanding through a creative project called a Data Jam.

Note, if you are viewing the PDF digitally, you can click on the blue links in the document.

SCAN TO GET LINKS TO ALL VIDEOS AND ONLINE CONTENT NEEDED TO HELP CONDUCT YOUR CLUB MEETINGS.

SCAN TO ACCESS THE ONLINE YOUTH POSTCARDS FOR EACH MEETING.

ACTIVITY POSTCARDS

Prepare your Explorers for the expedition! Youth are given post cards from the lead researcher, Dr. Megan Cimino, that directs their on-line learning.

SCAN TO ACCESS THE ONLINE YOUTH POSTCARDS

CLUB MEETING 1

Let's Pack Our Bags and Go to the Poles

Preparing for Exploration: 15 minutes

- Distribute Postcard #1.
- Explorers complete the online activities, plus pages 2–5 of the Research Journal, in advance of the first club meeting.

Club Exploration: 35 minutes

- The focus is to get youth participants excited about their trip to the Polar Regions.
- Encourage discussion on what Explorers hope to discover about Antarctica.
- At the end of the group meeting, distribute Postcard #2 in preparation for your next scheduled meeting.

Community Exploration: 10 minutes

- Explorers watch videos from the "Polar Scientist Spotlight" series to understand the range of skills and tools used by researchers.
- Lead a discussion on the causes and impacts of climate change in your community.
- Help students brainstorm ways to make a positive change.

Objectives

Explorers will:

- Help the scientist team pack and prepare for the expedition; and
- Understand the roles of various scientists and their tools.

Data Skills

- This session provides background information and does not develop any specific data skills.

Materials

- Three different-color packets of sticky notes
- Colorful markers

SCAN FOR FACILITATOR RESOURCES AND WEB LINKS FOR MEETING 1.

SCAN FOR PRE-MEETING POSTCARD FOR SELF-GUIDED YOUTH EXPLORATION.