Lesson 6: Exploring the Data

Materials

- Computer with internet connection (1 per group for a total of 6)
- 6 Large sheets of paper
- Markers

Overview

Students will break into groups and familiarize themselves with polar data collected by the scientists. Students will then use the data to answer simple questions.

Motivating Question: **What influences biological hotspots at the Palmer Deep Canyon in Antarctica? What data do scientists collect to answer this question?**

Take Home Message

- Students will recognize that scientists use a variety of data to answer scientific questions.
- Students will familiarize themselves with the scientific data available to them from the project.

Engage: Review testable questions and introduce data • Students will review how they generated testable questions • Students will look at the sample question and determine what data is needed to answer the question	5 minutes
Explore: Explore data sets • Students will break into 6 groups. Each group will explore a data set and report back to the group about what is in each data set.	20 minutes
Make Sense: Use data to answer simple questions • Student will be given 3 simple questions that they need to use the data to answer • At the end of class they will answer the question “Do we have the data to answer our Sample question”	20 minutes
Total:	**45 minutes**

Audience

- Middle and high school

Preparation

- Teachers should familiarize themselves with the data sets. A slideshow has also been created for the teacher and should be reviewed.
- Data sets are posted on the SWARM website. Based on student computers, prepare a method for sharing the data with the students.

Engage (5 minutes)

- See the “L6 Exploring the Data” PowerPoint. All points below can be found in the slides

- Review with the students how we arrive at a testable question
    - Show the beginning sample question “How does water temperature change over time?”
    - Review SMART means
    - Show the revised sample question “How does the average daily water temperature in Palmer Deep change over a year?”
    - Be engaging!
- Ask students what data do we need to answer this question?
    - Tell students we need to review the available data to see if we have the data required to answer this question

Explore (20 minutes)

- Break students into 6 groups. Each group will get a set of data to look at. There will also be an accompanying video that goes over the data set.
    - Penguin Data (File: 2015_Palmer_Penguins_Draft)
    - HF Radar Data (File: OI_PLDP_2015_02_01_1100_Draft)
    - Glider Data 00-10 meters (columns B through F) (File: 2015_Palmer_Glider_0-10m_Draft)
    - Glider Data 00-10 meters (columns G through K) (File: 2015_Palmer_Glider_0-10m_Draft)
    - Glider Data 80-90 meters (columns B through F) (File: 2015_Palmer_Glider_80-90m_Draft)
    - Glider Data 80-90 meters (columns G through K) (File: 2015_Palmer_Glider_80-90m_Draft)
- Each group should look through the data and answer these questions on a large sheet of paper.
    - How was this data collected?
    - What data was collected? (Make sure to include what the data is as well as the units if there are any)
    - What is the date range for the data collected?
    - About how many data points were collected each day?
    - Any other interesting information about the data they would like to share.
    - Bonus for high school: How could you graph this information?
- Large sheets of paper can be placed around the room so that each group can present their data set.

Make Sense (20 minutes)

- The groups will use the data to answer 3 simple questions. For each question the groups should think about what data set or sets are needed to answer each question.
    - What was the average water temperature on January 1, 2015 in Palmer Deep at 0-10 meter depth?
    - What was the difference between the salinity at 0-10 meters and 80-90 meters in the Palmer Deep on February 1, 2015?
    - How many male penguins were tracked on January 11, 2015?

- Closing: The teacher should put up the sample revised question ""How does the average daily water temperature in Palmer Deep change over a year?" and ask the class, "Do we have the data needed to answer the question?" Answer: No, we do not.

Additional Information

NGSS Standards

Middle School

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

High School

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Polar Literacy Principles Addressed

Principle #2: Ice is the dominant feature of the Polar Regions.
Polar Principle #4 - The Polar Regions have productive food webs.
Polar Principle #7 - New technologies, sensors and tools— as well as new applications of existing technologies—are expanding scientists' abilities to study the land, ice, ocean, atmosphere and living creatures of the Polar Regions.

Ocean Literacy Principles Addressed

Ocean Literacy Principle #5: The ocean supports a great diversity of life and ecosystems.

Climate Literacy Principles Addressed

Climate Literacy Principle #3: Life on Earth depends on, is shaped by, and affects climate.