PROJECT O*CEANOLOGY*

Seal Data Analysis
Teaching Notes

Overview

This lesson is designed to complement Project Oceanology's "Seal Watch" boat trip, although it can also be used as a stand-alone lesson. It can take place in the Project Oceanology computer lab immediately before or after a trip, or in the classroom after students have returned home.

Teaching Notes

Engage: Video of seals swimming underwater at Hungry Point.

- *Did this video change your perspective on the seals?*
- *How is their behavior different above the water and below the water?*
- *What are they doing and why when they are in the water? When they are hauled out?*
- *What kind of factors might affect how many seals we see on any given trip?*

Explore:

Divide students into small groups (2-4) and assign each group a research question. Hand out the appropriate dataset, and ask them to investigate their assigned question by making a graph on large paper with markers:

a. How has the seal population in Fishers Island Sound changed over time?

b. How does the seal population in Fishers Island Sound change over the course of a year?

c. How does air temperature affect the number of seals observed?

d. How does water temperature affect the number of seals observed?

e. How does wind speed affect the number of seals observed?

f. How does time of tide affect the number of seals observed?

g. How does location affect the number of seals observed?

h.

Explain: What is a graph? Students present their graph and explain what it shows. For this first round, focus on the challenge of making the graph. Students should explain their decision making process for the following:

i. What type of graph did you choose to make (line graph, bar graph, etc), and why?

j. How did you decide what variable should go on each axis of the graph, and why?

k. What scale did you choose for each axis, and why?

l. Are there any changes you can think of for your graph that would make it more effective?

Optional: Dive deeper into what makes a good graph using the 'bar graphs and line graphs' activity.

Elaborate: Students revise and improve their graphs. They can do this using a fresh sheet of paper, or on a computer using MS excel or google sheets. Once the graph is made, students should come up with an interpretation for the graph. What have they found, and why? *Educator circulates and helps.*

Evaluate:
Students present their findings to the class again, this time focusing heavily on their scientific findings. Each group should present the graph, explain what it shows, and also give their interpretation of the results. What have they learned about the seal population in Fishers Island Sound?
****See teacher key to graphs for notes on interpretation***

As they listen, students should fill out their **discussion worksheets** as a reference point for discussion afterwards. Then discuss: what are the most important factors affecting the number of seals we see on any given trip? How are all these variables connected? What have we learned as a group about the seal population in Fishers Island Sound? *Questions on reverse of discussion worksheet can be answered as homework, or in class.*

Optional scientific practices rubric for graph presentations:

	Student Skill Level		
Scientific Practices	**Novice**	**Developing**	**Mastery**
Developing & Using Models			
Graph type	Inappropriate graph type, cannot articulate pros and cons of different graph types.	Appropriate graph type, OR can articulate pros and cons of different graph types.	Appropriate graph type, AND can articulate pros and cons of different graph types.
Axes of graph	Axes not clearly labelled, no units, scale poorly chosen to display results	Clearly labelled with units OR scale well-chosen to display results	Clearly labelled with units AND scale well-chosen to display results.
Graph content	Points incorrectly plotted	Points are plotted correctly, but graph difficult to decipher	Points are plotted correctly, results are easy to see from the graph.
Analyzing and Interpreting Data	Cannot articulate what the graph shows; struggles to connect their findings to seal biology and behavior.	Can explain what their graph shows with some prompting. Offers at least some explanation of what the results mean.	Clearly states what their graph shows, in terms of how the variables relate. Interprets results in the context of seal biology and behavior.
Engaging in Argument from Evidence	Does not make effective arguments; does not use evidence from data/graphs.	Makes a coherent argument, but does not connect to evidence in the form of data/graphs.	Makes effective and persuasive arguments. Makes explicit connections to their data and graphs while offering interpretations and explanations