

Lesson 7: Revising Testable Questions



Materials

- Computer and internet access for each group
- Large pieces of paper from the lesson before containing information on the data
- The student-developed testable questions from Lessons 5 and 6
- One piece of white computer paper per group
- 4-5 post-its per student (depending on how many groups created)
- Markers

Overview

Students will work in groups to revise their testable question developed in Lesson 5 based on the data they have available. Students will then get feedback from other students on their revised testable question.

Motivating Question: What influences biological hotspots at the Palmer Deep Canyon in Antarctica? How can we use testable questions to address this?

Take Home Message

- Students will recognize what data is needed to answer their testable question.
- Students will revise their testable question based upon the data that is available to them.

Engage: Introduction to revising testable questions <ul style="list-style-type: none"> • The students will review what a testable question is. • The students will then revise the sample testable question from Lessons 5 and 6 based upon the data available 	10 minutes
Explore: Revise students questions <ul style="list-style-type: none"> • Each group will revise their question based upon the data available • Using Post-It notes, students will provide feedback to their peers to help refine the revised question. 	20 minutes
Make Sense: Refine the revised question <ul style="list-style-type: none"> • Students will revise their questions based on student feedback to create a final SMART question 	10 minutes
Total:	40 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.

Engage (10 minutes)

- Use the “L7 Revising Testable Questions” PowerPoint. All points below can be found in the slides.
- Review what a testable question is.
- Show the SMART version of the question “How does the average daily water temperature in Palmer Deep change over a year?”
 - Ask students what data do we need to answer this question? Answer: water temperature data from the Palmer Deep for a full year.
 - Do we have all the data? No
- If we do not have the data we have three options:
 - Conduct more field research
 - Find another source of data
 - Revise the question
- Have students revise the question based on the data that is available. Have some students share how they would revise the question.

Explore (20 minutes)

- Students should be back into the same groups that worked together to devise the testable questions during Lesson 5.
- Each group should review the testable question they created and answer the following questions. Students can also review the data sets provided or the summary of the data sets that were created in Lesson 6.
 - What data do they need to answer the question?
 - Do they have the all data they need to answer the question?
 - What data is missing? Can data be found from another source?
- Based on the answers to the above questions. Each group should write a revised testable question on a sheet of printer paper with a marker and place it around the room with the tape. This revised testable question should take into account the data available to answer it.
- After all questions are posted, students move around the room (gallery walk) writing feedback to their peers on post-it notes. The post-it notes can be placed around the question.

Make Sense (10 minutes)

- After the gallery walk, students return to their revised testable question and read the feedback that they were given.
- Students can then further revise the question based on the feedback

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

Polar 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.