Learning Activity:

The Case of the Missing Sea Turtle

Activity Type	Scientific investigation
Focus Areas	Science, language arts
Time Required	20–30 minutes

Overview

In this activity, students become junior scientific investigators who try to solve the mystery of the missing sea turtle. You will provide them with clues, and they must use sequencing skills to place the clues in order. The sequence of clues will lead them to solve the mystery while also learning about the effects of climate change.

Objective

At the completion of the activity, students should be able to:

- Gain familiarity with the process of scientific investigation and sequencing.
- Define climate change and its causes.
- Explain the effects climate change has on oceans and sea turtles.

Next Generation Science Standards

- 3-L-S4-3 Biological Evolution: Unity and Diversity
  - Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- 4-ESS3-1 Earth and Human Activity
  - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Subject and Standards

Common Core Standards: English Language Arts

- RI. 3.3: Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
- RI. 4.4: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.

Materials Needed

Teacher preparation: scissors and climate change clues—printed, separated, and placed into a bag (one bag of clues per student or group of students)

Per student or group of students:

- Writing utensil
- Sequencing sheet (see handouts at the end of this activity)
- Glue stick
- Prepared bag of clues

Vocabulary

- **Climate change:** Earth's increase in temperature attributed directly or indirectly to human activity that alters the global atmosphere
- **Coral bleaching:** a stress response triggered by high water temperatures that causes coral colors to fade to white and can lead to coral death
- **Fossil fuels:** formed from fossilized remains of prehistoric organisms (most common are coal, oil, and natural gas) and are burned to generate energy; the biggest drivers of climate change
- **Greenhouse gases:** examples are water vapor, carbon dioxide, methane, and nitrous oxide; they absorb some of the sun's heat energy and trap it in the atmosphere, making Earth warmer
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter

Activity Procedure

Part 1: Introduction and Preparation

- Before beginning the activity, prepare enough bags of clues to have one set per student or group of students. Print out and cut apart the clues (at the end of this activity), and shuffle a complete set in each bag. Each bag will contain the following clues:
  - Humans add greenhouse gases to the atmosphere by burning fossil fuels and clearing forests.
  - Once in the atmosphere, greenhouse gases act like a blanket and trap heat from the sun.
  - Because the heat is trapped, Earth becomes hotter.
  - When Earth gets hotter, so do the oceans.
  - Certain areas of the ocean, like coral reefs, are very sensitive to this increase in water temperature.
  - Algae that live in coral (and are a source of food for coral) don't like it when the water gets too warm.
  - The algae leave the coral.
  - Without algae for food, coral become bleached and unhealthy, and can die.
  - Marine animals (like sea sponges and sea anemones) that live on coral reefs now don't have a healthy habitat, so they also can become unhealthy or will leave in search of a new habitat.
  - Sea turtles, which come to coral reefs looking for food like sea sponges, find nothing good to eat, so they leave as well.
- Students should have a basic understanding of sequencing prior to the start of this activity. For a quick review, ask them to describe their morning routine, step by step, as if they were creating a detailed to-do list, in order of first to last. Discuss with the students the fact that many scientists use sequences when doing their research. Scientists gather evidence, just like detectives, and use it in determining a sequence of events to explain something in nature.
- Using the "Threats Sea Turtles Face" section of the Sea Turtle Educator's Resource Guide, along with the vocabulary definitions provided on page 2, discuss with the students the causes of climate change and its effects on sea turtles and their ocean habitats.
  - Climate change has been linked not only to causing an increase in ocean temperature (which leads to the weakening of corals and other marine habitats), but also to causing rises in sea level and in ocean acidity, which threaten many marine food supplies.

Part 2: Activity

- Distribute one bag of clues per student or group of students. Each student or group should also have a copy of the sequencing sheet handout (included at the end of this activity), a writing utensil, and a glue stick.
- Explain to the students that they are going to become scientists investigating a mystery and drawing a conclusion by placing clues in sequential order. Here's the situation they are investigating: The class goes to visit a coral reef where a sea turtle friend likes to spend time looking for food. However, when they get there, he is nowhere to be found. In fact, hardly any marine animals are there. The coral reef that was once healthy and full of life is now abandoned. As scientists, the students' job is to discover what made the marine life leave the coral reef.
- Students will then have to empty their bag of clues on their desks and attempt to place them in sequential order to solve the mystery of the missing sea turtle.
- Once they feel confident in the order of clues, students should glue the strips of paper in sequence on their lab sheets. Remind them to glue the steps only when they are sure of the right sequential order.

Part 3: Discussion and Assessment

- Encourage students to explain, in their own words, what caused the animals to leave the reef. They should come to conclusions related to climate change and how the rising sea temperatures affect the health of the coral reef habitat and its inhabitants, including sea turtles.
  - If opinions vary, encourage students to explain how they came to their conclusions. Ask students to discuss how they shared their knowledge and collaborated during the investigation to arrive at the order of their clues.

Extended Learning Options

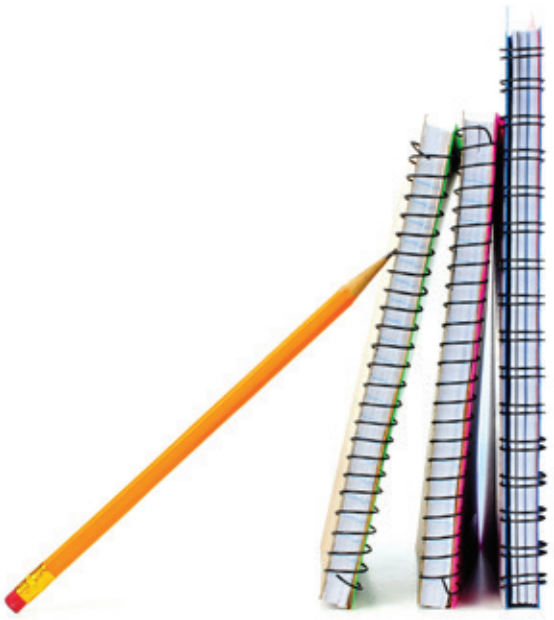
- An optional approach to this activity is to present the task of solving the mystery as a competitive race among teams of students to see which team can arrange the steps in order first. You might also choose to solve the case as a class by printing large versions of the clues and selecting students to arrange them on the board.
- Provide a follow-up assignment that challenges students to research other ways climate change affects and threatens sea turtles.
  - For example, the gender of sea turtles can be affected by the temperature surrounding their nest. Warmer nests produce female hatchlings, and cooler nests produce males. Rising temperatures due to the effects of climate change could result in fewer males, which would upset the gender balance for reproduction. How would having more females than males put the future of sea turtles at risk?
- Start a class fundraiser to protect sea turtles and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at pandanation.org.
- Download the WWF Together app and explore the sea turtle segment. Use these interactive tools to help kids learn more about sea turtles and the threats they face.

Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Video:** Saving Coral Reefs One Fragment at a Time—reviews how climate change is affecting coral reefs and how scientists are working to sustain a future for corals
- **Video:** Adaptation of a Turtle Beach to Climate Change—shows the measures a Costa Rican beach community is taking to prepare for and adapt to climate change
- **Article:** What We Learned About Coral Reefs in 2019—summarizes recent findings on the state of coral reefs and the communities that rely on them
- **Article:** Everything You Need to Know About Coral Bleaching — And How We Can Stop It—summarizes the impacts of coral bleaching and how to help
- **Video:** A Turtle's Eye View of the Great Barrier Reef—shows scenes from the Great Barrier Reef from the perspective of a sea turtle
- **Video:** Why Are Coral Reefs Turning White?—animation that explains coral bleaching

For more fun classroom activities with a focus on wild species and conservation, visit wildclassroom.org.



Name: _____ Date: _____

Climate Change Sequencing

Your class goes to visit a sea turtle friend where he likes to spend time near the coral reef. However, when you get there, the coral reef that was once thriving is now abandoned. Why did everybody leave the coral reef? Put your clues in sequential order to solve the mystery!

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

Climate Change Sequencing Clues

Humans add greenhouse gases to the atmosphere by burning fossil fuels and clearing forests.

Once in the atmosphere, greenhouse gases act like a blanket and trap heat from the sun.

Because the heat is trapped, Earth becomes hotter.

When Earth gets hotter, so do the oceans.

Certain areas of the ocean, like coral reefs, are very sensitive to this increase in water temperature.

Algae that live in coral (and are a source of food for coral) don't like it when the water gets too warm.

The algae leave the corals.

Without algae for food, coral become bleached and unhealthy, and can die.

Marine animals (like sea sponges and sea anemones) that live on coral reefs now don't have a healthy habitat, so they also can become unhealthy or will leave in search of a new habitat.

Sea turtles, which come to coral reefs looking for food like sea sponges, find nothing good to eat, so they leave as well.