

Assignment Discovery Lesson Plan
Blue Planet: Seas of Life
Tidal Seas

Subject

Ecology

Grade level

6-8

Duration

Two or three class periods

Objectives

Students will

- discuss specific examples of how tides affect the hunting, survival, or breeding behaviors of animals; and
- work in pairs to create their own "Tidal Trivia" game.

Materials

- Computer with Internet access
- Print resources about tides
- Poster board, index cards, other kinds of paper
- Markers
- Glue
- Dice and other materials as needed to create games or game boards

Procedures

1. After watching the episode " Tidal Seas," ask students to define the word "tide." (A tide is the periodic rise and fall in the ocean's surface water level.)
2. Ask students to write one example from the video of how tides affect sea life.
Examples:
 - humpback whale (attracted to areas of strong tides that bring in plankton and fish)
 - sand-bubbler crab (filters sand through its mouth to obtain food during low tide)
 - clam (buries itself in sand during low tide; prey for bears)
 - snail (uses smell to detect dead fish for food when sea retreats during low tide)
 - sand lance (fish that buries itself in the sand during low tide)
 - knot (shorebird that uses its beak to dig in the sand for invertebrates during low tide)
 - flounder (fish that hunts invertebrates that emerge when tide returns)
 - raccoon (mammal that digs for food along shore during extremely low tides)
 - thimble jellyfish (gathers in swarms where tide brings in plankton)

- shark and sting ray (forced into deep water channels when tides are low; wait to resume their hunt when tides are higher)
 - snapper (fish that hides in roots of flooded mangrove forests during high tides for protection from predators)
 - brine shrimp (survives in very salty water, which occurs when tide recedes and water evaporates)
 - Caribbean flamingo (bird that eats brine shrimp that are most abundant near low tides)
 - Christmas Island crab (must coordinate its breeding with the lowest tides, which occur in November. During one of only a few nights when the conditions are right, female crabs head to sea with hundreds of eggs, and must shed them into the ocean for them to develop.)
3. Have students share their examples with the class.
 4. Tell students that they are going to work in pairs to research tides and create their own “tidal trivia” game. They can use any format for their game. For example, they could present questions in categories, along a game board, or in a speed match. In addition to creating a game, students should keep track of their questions and answers on a separate piece of paper; they must cite the sources of the answers.
 5. Before students begin their research, ask students to answer the questions below. They should use the answers to these questions—and other information they find—as the basis for their games. (Answers are in italics.)
 - What causes tides? (*The gravitational pull of the sun and the moon on the Earth. This pull causes the Earth to bulge or lift in the direction of the sun or moon. When this happens, a high tide occurs near the bulge, causing a low tide between the two bulges.*)
 - How often do tides occur? (*In most places, high tides alternate with low tides every six hours.*)
 - In what part of the Earth are tides the weakest? (*near the equator*)
 - What has a stronger influence over tides, the sun or the moon. Why? (*The moon has a stronger influence because it is so much closer to the Earth.*)
 - Where are the largest tides in the world? (*The Bay of Fundy, in Nova Scotia*)
 - What other natural event can affect water level? (*Hurricanes can force tides even higher.*)
 - What is a low tide? (*the lowest point to which water regularly falls on the seashore*)
 - What is a high tide? (*the highest point to which water regularly rises on the seashore*)
 - What is a spring tide? (*the tide that occurs when the moon and the sun are lined up with the Earth, causing the strongest pull on the Earth and thus the highest and lowest tides*)
 - What is a neap tide? (*the tide that occurs when the moon and the sun are at right angles with the Earth; these are the weakest tides*)
 - How often do the highest and lowest tides occur? (*every two weeks*)
 - Are the two high tides that occur during a day always the same height? Explain your answer. (*No, because with respect to the Earth, the angle of the moon —and its gravitational pull—changes.*)

- Are high tides the same day to day? (*No, tidal heights change on a daily basis because of the changing distance between the Earth and the moon.*)
6. Students may use print and Internet resources in their research. The following Web sites may be helpful:
- What Are Tides?
<http://www.ndbc.noaa.gov/educate/tides.shtml>
 - Why Tides?
<http://www.sfgate.com/getoutside/1996/jun/tides.html>
 - Lunar Tides
<http://csep10.phys.utk.edu/astr161/lect/time/tides.html>
 - Tides
<http://www1.pactide.noaa.gov/information.htm>
 - Our Restless Tides (for high school students)
<http://www1.pactide.noaa.gov/tide-explanation.htm>
 - What Causes Tides?
<http://www.EnchantedLearning.com/subjects/ocean/Tides.shtml>
7. When the pairs have finished creating their games, have them think of clever names and then demonstrate their games to the class.
8. Have each pair exchange its game with that of another pair. If more than two players are needed to play a game, have pairs work together.

Evaluation

Use the following three-point rubric to evaluate students' work during this lesson.

3 points: Students were highly engaged in class discussions; shared a detailed example of how tides affect a specific sea animal; conducted thorough research on tides, keeping track of questions and answers and citing where answers were found; and created a clear, engaging game based on several facts from their research.

2 points: Students were engaged in class discussions; shared an example of how tides affect a specific sea animal; conducted adequate research on tides, keeping track of some of the questions and answers and citing where some answers were found; and created a game based on some facts from their research.

1 point: Students were not engaged in class discussions; did not give an example of how tides affect a specific sea animal; conducted minimal research on tides, keeping track of few, if any, questions and answers and neglecting to cite where answers were found; and created a simplistic game based on few, if any, facts from their research.

Vocabulary

equatorial tide

Definition: A tide that occurs twice a month, when the moon is over the equator

Context: Because of the position of the moon, An equatorial tide does not have dramatic highs or lows.

high tide

Definition: The highest point to which water regularly rises on the seashore

Context: High tides occur on Earth's sides that face toward and away from the moon.

low tide

Definition: The lowest point to which water regularly falls on the seashore

Context: Low tides occur at those places on Earth that are not pulled by the moon's gravitational force.

neap tide

Definition: The weakest tides, which occur when the moon and the sun are at right angles with the Earth

Context: Neap tides are weak because the gravitational force of the sun and the moon cancel each other out.

spring tide

Definition: The highest and lowest tides of the month.

Context: Spring tides occur when the moon and the sun are lined up with the Earth, causing the strongest pull on the Earth.

tide

Definition: The twice daily rise and fall of the surface of the ocean

Context: The gravitational pull of the moon and the sun cause tides on the Earth.

Academic Standards

This lesson plan addresses the following standards from the National Science Education Standards:

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

Credit

Joy Brewster, freelance curriculum writer, editor, and consultant