THE OCEAN'S TIDES

Topic
Tides, Change

Duration
One session

Vocabulary
gravitational force
neap tides
orbit
rotation
spring tides
tides

STANDARDS

Practices
Planning and Carrying Out Investigations

Core Ideas
Forces and Motion

Crosscutting Concepts
Patterns

OCEAN LITERACY PRINCIPLES

OLP 1, OLP 2

Focus Question

What are the tides?

Overview

Students discuss the definition of tides. Students demonstrate how tides respond to the moon's gravity with a kinesthetic learning activity. Students make inferences as to how the tides might impact life on the rocky shore.

Objectives

Students will be able to:

- Identify what tides are and how they occur
- Dramatize the rise and fall of the tides
- Infer how tides impact life on the rocky shore

Materials Needed

- Two "markers" for each student to stand on (i.e. carpet square, Poly Spot)
- Scientist notebooks (if used in class)

Teacher Preparation

1. Gather two markers for each student that can be stood on like carpet squares or Poly Spots. Avoid using an item that would need to be discarded after use.
2. Reserve a large, open area for the kinesthetic learning activities.
3. Teachers will need easy access to a whiteboard or interactive whiteboard to record student input during the beginning and conclusion of the lesson.

Background

The tides are the steady rise and fall of the ocean water levels. Tides are caused by the gravitational interaction between the earth and the moon. The gravitational force of the moon causes the ocean to bulge out in the direction of the moon. Another bulge occurs on the opposite side of the earth because the earth is also being pulled toward the moon and away from the water on the far side. Since the earth is rotating, two tides occur each day.

Teacher Tips

- Ask your school's physical education teacher if he/she has items that would make good markers to stand on.
- Instead of having your students place the "standing markers," place them where you would prefer them to be before the lesson.

Extension Suggestions

- Have students graph where the tide will be on the day of this lesson, or on the day of their field trip if they are planning to visit the rocky shore (page 50)
- Have a student or adult film the kinesthetic group activity. Have the entire class watch the activity and provide feedback on what went right, what went wrong, and how they could improve the activity.
- Provide each student with a rubber band. Have students use their fingers to demonstrate the rise and fall of the tides, with the rubber band representing the surface of Earth's ocean.

Background (continued)

The gravitational force of the sun also impacts the tides, but because the moon is much closer to the earth, its force has a stronger impact. When the earth, the sun, and the moon are in a line, the tides are strongest. These tides are called "spring tides" and they occur during the full moon and the new moon. The weakest tides, called "neap tides," occur during quarter moons. Neap tides are the result of the gravitational forces of the moon and the sun being perpendicular to each other in regards to the earth's position.

Procedure

Part One

1. Have students turn to a student sitting next to them to review what they learned about waves in the previous lesson.
2. Ask one of each pair of students to relay to the class what they discussed.
3. Inform students that one way waves are formed are the tides.
4. Ask students what they know about tides. Record student input that is factual for all students to see.
5. Ask students why tides would be considered the biggest waves on the planet.
6. Write the definition of tides and the characteristics of tides for all students to see (and record if science notebooks are used).

Part Two

7. Inform students that they are going to act out the rise and fall of the tides.
8. Have students form a circle in a large, open area.
9. If there are an odd number of students, choose one student to represent the moon and have them leave the circle. If there is an even number of students, the teacher will represent the moon.
10. Give each student two markers to stand on. Tell students to take two big steps back and place one marker on the floor/ground. Tell students to take two more big steps back and place their other marker on the ground. Have students return to their original positions.
11. Inform each student that they will have a partner they will copy. Provide each student with a partner that is standing on the opposite side of the circle. Have students identify their partner by saying their name and pointing at their partner.
12. Explain to students that when the moon walks around the edge of the circle (orbiting the earth), that the students, representing the surface of the ocean, will step closer to it because of the moon's gravitational force.

Books

- *And the Tide Comes In . . . Exploring a Georgia Salt Marsh* by Merryl Alber
- *A Day in the Salt Marsh* by Kevin Kurtz

Websites

- Watch a BrainPOP video on tides and take a quiz! (Subscription required.)

Scientist Notebook

- Students can record the definition of tides and how they occur, can draw a diagram showing how tides occur, and can record inferences on how the tides might impact life on the rocky shore.

Procedure (continued)

13. Explain to students that when the moon is two students away from them, they are to step onto the first marker closest to the circle. Explain to students that when the moon is directly behind them, they are to step onto the marker furthest away from the circle. Partners should be copying each other's actions because the moon's gravity pulls both the ocean and the earth, causing bulges on opposite sides of the earth. (See diagram on page 49.)
14. Have the person designated as the moon walk slowly around the circle. Have "the moon" revolve around the earth multiple times.
15. Have students pause the demonstration of the rise and fall of the tides to do the following:
    a. Assess how they are doing and how they can improve
    b. Discuss how they are demonstrating the rise and fall of the tides
    c. Identify the differences between their demonstration and what really happens (they are not demonstrating the rotation of the earth or the Sun's gravitational force on the ocean).

Wrap-up

- Ask students to reflect on their kinesthetic learning activity.
- Ask students to define tides and how they are caused.
- Ask students to make inferences as to what impact the tides could have on living organisms at the rocky shore (students can record in science notebooks if applicable).

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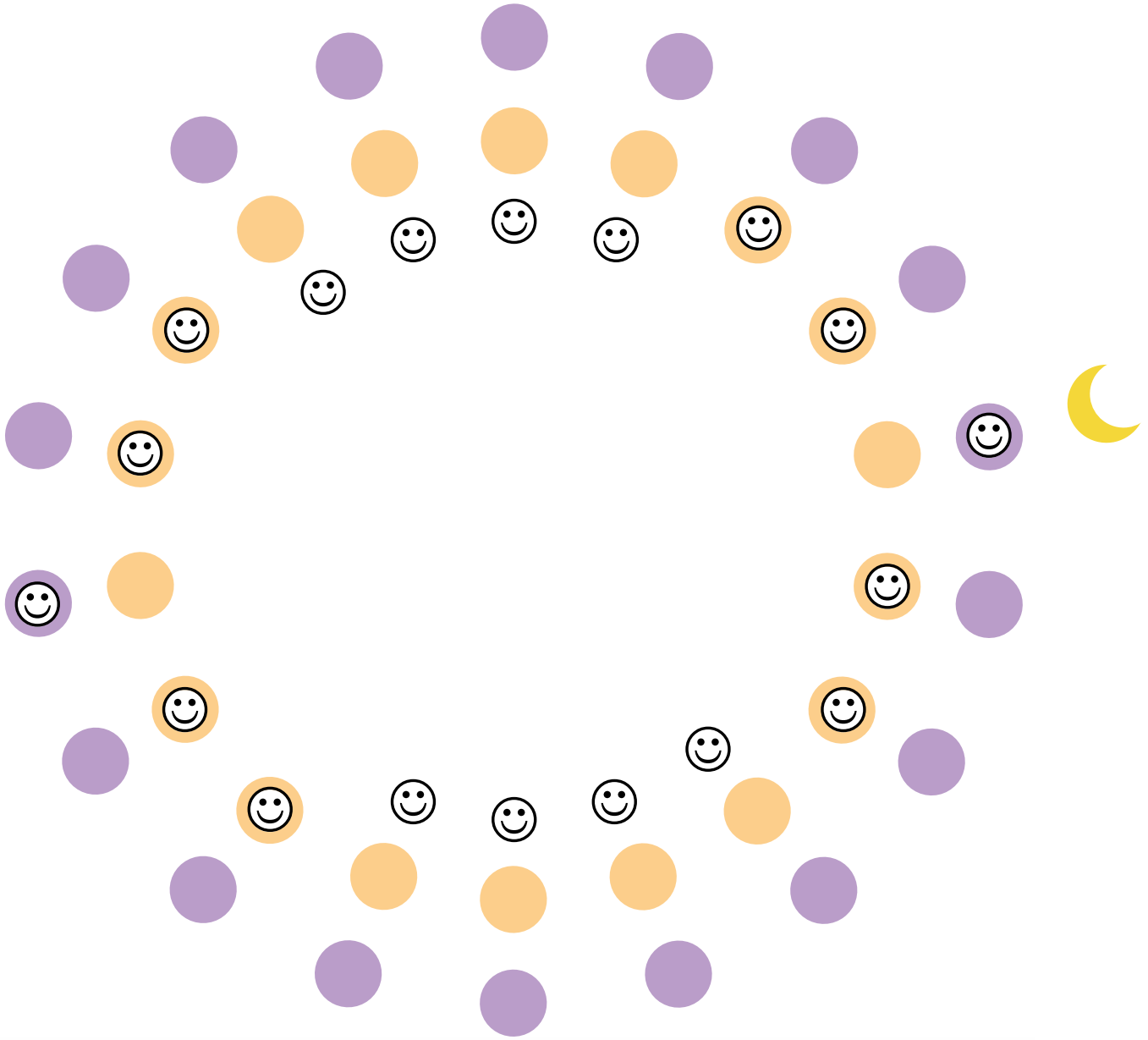
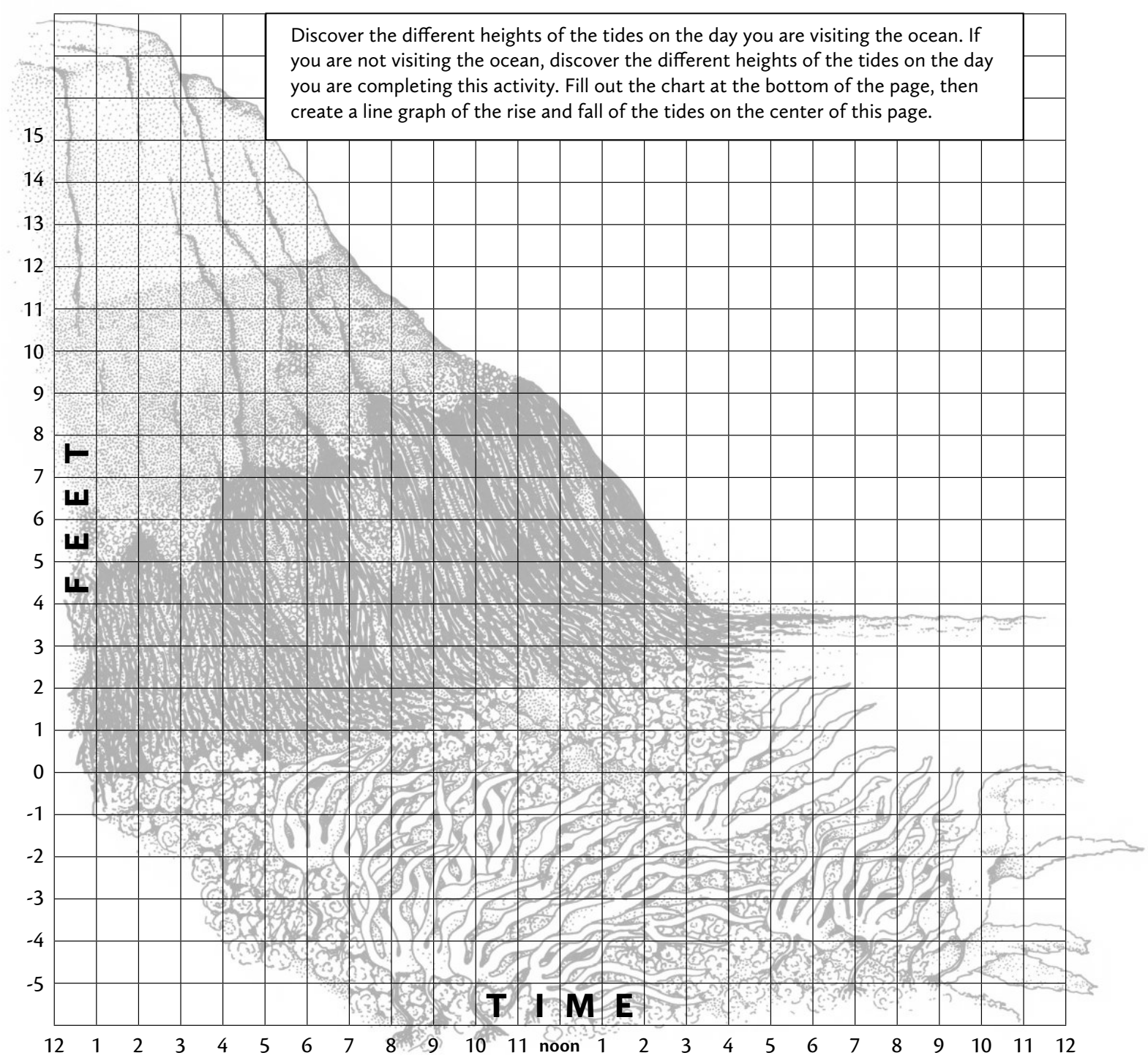


THE OCEAN'S TIDES

Discover the different heights of the tides on the day you are visiting the ocean. If you are not visiting the ocean, discover the different heights of the tides on the day you are completing this activity. Fill out the chart at the bottom of the page, then create a line graph of the rise and fall of the tides on the center of this page.



Time of Day	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM
Height of Tide													