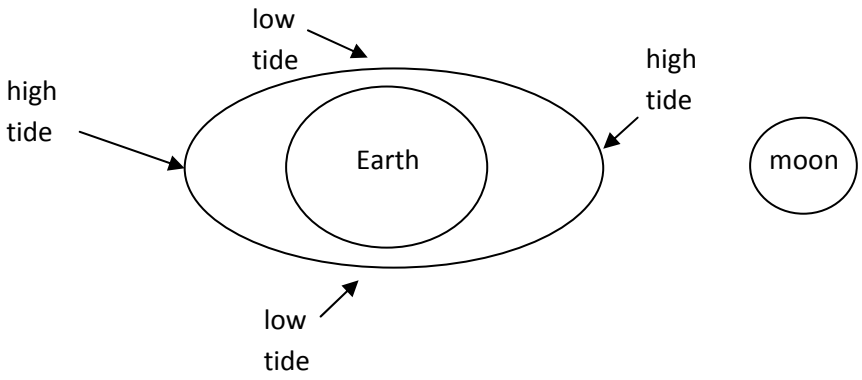
The Tide Waits for No Man

Strand Earth Patterns , Cycles, and Changes
Topic Tides
Primary SOL 3.8 The student will investigate and understand basic patterns and cycles occurring in nature. Key concepts include
a) patterns of natural events such as day and night, seasonal changes, simple phases of the moon, and tides.
Related SOL 3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
h) data are gathered, charted, graphed, and analyzed;
i) unexpected or unusual quantitative data are recognized;
k) data are communicated.

Background Information

Gravity is the major force responsible for tides. The gravitational force of the moon and Earth is strongest on the side of Earth closest to the moon. The water on this side is pulled toward the moon resulting in a high tide. See diagram below (not to scale).



The water on the opposite side of Earth also experiences a high tide. Inertia exceeds the gravitational force of the moon and the water tries to continue in a straight line; resulting in a high tide. Most tides follow patterns of two high tides and two low tides occurring in a 24 hour period. They occur approximately 6 hours and 12.5 minutes apart.

Materials

- A yardstick or meter stick
- Tide schedule for self-selected dates and area

Per student:

- "Tide Card" copied on blue 8½ x 11 inch paper

Vocabulary

high tide, low tide, gravity

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Read a book about the beach, river, or other waterway affected by tides to establish a connection of waterway and tidal waters.
2. Display a tidal chart from a Web site or the newspaper. Web sites allow for choices of the area for the tides and dates. The dates displayed should match ¼ the number of students in class.

Procedure

1. Explain to the students that they will be making a "living graph" of the low tides and high tides that occur over a period of time. Students will describe tides based on their experiences and based on the book shared at the beginning of the lesson.
2. Distribute a copy of the Tide Card that was copied onto blue paper.
3. Show the students how to read the Tide Table, pointing out the days, times, and low and high tides.
4. Assign each student a day, tide, and time.
5. Once each student has his or her assignments, have them write their day on the card, circle the correct tide, write in the time, and circle "a.m." or "p.m." on their Tide Card.
6. Students are now ready to form their "living graph"! Have the students line up in the front of the room in chronological order beginning with the earliest date and time.
7. Have the students who are the "high tides" hold their cards above their heads.
8. Have the students who are "low tides" hold their cards waist high.
9. Use a yardstick to show the usual height difference between high and low tide in Virginia tidal waters.

Conclusion

1. Lead a class discussion, using the following prompts:
    - How many high tides usually occur in one day?
    - How many low tides usually occur in one day?
    - What is the approximate time interval between one high tide and the following low tide?
    - Would you describe tides as occurring in a cycle that follows a natural pattern? Why, or why not?
    - Name some other cycles or patterns found in nature.
    - Name some people who need to know where to find and how to read tide tables.

Assessment

- **Questions**
    - What other repeating patterns happen in your life that are like the repeating patterns of the tides?
    - Why are tides important?

- **Journal/writing prompts**
  - The tides have stopped occurring. What will happen?
  - How are tides and the cycles of the moon alike?
- **Other**
  - Give the students a tide table, and assess their reading of it.

Extensions and Connections (for all students)

- Use an aquarium to model the tides on the beach
  - Pour sand in the aquarium making the level higher on one end and lower on the other.
  - Students pour water into the aquarium.
  - Use a board to create slow waves and watch the tides rise and fall on the beach.

Strategies for Differentiation

- Have students draw a picture of the beach at high tide and at low tide.
- Research "tides" on the Internet to provide students with visuals of high and low tides. (Bay of Fundy is one beneficial tide to view.) Use a weather Internet site to check times of high tide and low tide.
- Have a fisherman come to discuss the aspects of high and low tides.
- Have a person who has surfing experience discuss aspects of tides and their effect on "catching" a wave.
- Have different groups draw and explain the effects of low tide and high tide.
- Use video clips or videos of high and low tides and their impact on surfing and other water related activities.