Island of the Blue Dolphins, Chapter 16

Island Tides

Grade Level
Upper Elementary: Third Grade through Fifth Grade

Subject
Literacy and Language Arts, Science

Common Core Standards
RI.3-5.3, RI.3-5.5, W.3-5.7, SL.3-5.1

Next Generation Science Standards
3-PS2, 3-ESS2, 4-ESS2-2, 5-PS2, 5-ESS2

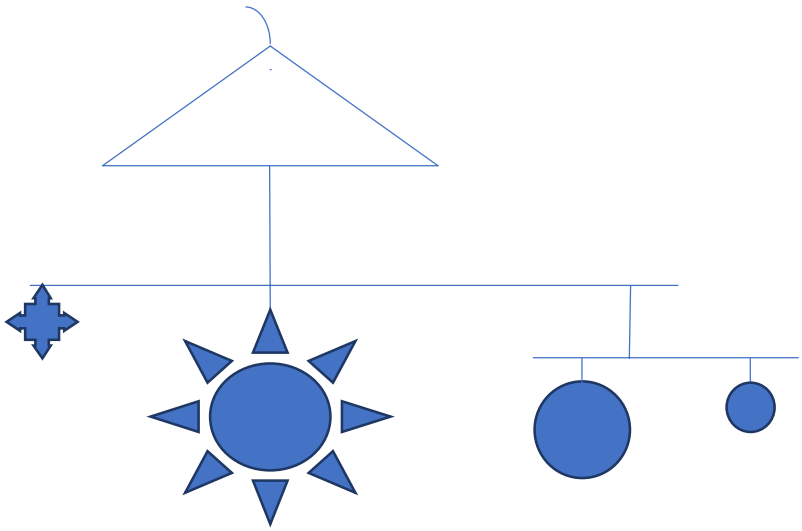
Background Information
Because Karana lives on an island, the ocean is a critical part of her natural environment, and she interacts with it every day. In chapter 16, Karana makes progress repairing an abandoned canoe, but its size and weight pose a challenge for her. This challenge is compounded by the fact that the canoe has been buried by the high ocean tides.

This activity introduces students to how tides are caused by the gravitational pull between the Sun, the Moon, and Earth. As the Moon rotates around Earth, the water on Earth's surface follows it and forms the daily tides. The Sun's effect on the tides is about half that of the Moon's because the Sun is so much farther from Earth. Tides are also affected by weather and geography, such as the shape of bays and estuaries. Most coastal areas experience two daily high and two daily low tides. Some areas, such as the Gulf of Mexico, have only one high and one low tide per day. Large continents blocking the westward movement of the tidal bulges as Earth rotates cause this.

Materials
- Construction or heavy white drawing paper
- Scissors
- Crayons, markers, or paint
- Hanger, two sticks (such as bamboo skewers), string, glue, paper clips per student or student group
- Class set of *Island of the Blue Dolphins*

Procedure
1. Decide if students are working independently or in teams to make a tide mobile.
2. Instruct students to draw their own star, Sun, Earth, and Moon on a folded piece of drawing paper and cut out the shapes. They will have two pieces for each shape. Students can add decorative features to the front and back of each shape.

3. Instruct students to place paper clips between matching pieces and then glue the pieces together. The paper clips help provide balance for the mobile.
4. Have students construct a mobile that looks like the one in the drawing below. The star shape shown on the left below or additional paper clips may need to be added for balance. Location of string along the sticks can also be adjusted, to further help with balance.



5. Research **spring tides** (highest tides of each month) and **neap tides** (lowest tides of each month) to determine how to position Earth, the Moon, and the Sun for each type of tide. Some excellent online resources are listed below.
   - For teacher background information:
     http://oceanservice.noaa.gov/education/tutorial_tides/welcome.html
   - To consider for use with students:
     http://www.education.com/science-fair/article/astronomy_moon-phase/
     https://docs.google.com/presentation/d/1xgirfZgP7L2daMfeNVsp6y8IEeojmrxDTFc5ESQxLcs/edit#slide=id.p
     https://www.youtube.com/watch?v=5ohDG7RqQ9I&t=31s
   - To view the same locations at high and low tide:
     https://www.buzzfeed.com/richardhjames/stunning-images-that-show-how-the-tide-transforms-the-bri?utm_term=.heq8MrEoM#.os7J41ae4

Enrichment Activities

1. If students live near the coast, have them access and study local tide charts. If students don't live near the coast, have them identify and select a coastal location and research its daily tides. If students track the tides over a month's time, they will be able to see the differences in tide levels that correspond to the phase of the moon.

Some online resources to access tide charts and information about them are:
https://middleschoolscience.com/2015/02/01/using-real-time-data-noaa-tides/
https://tidesandcurrents.noaa.gov/tide_predictions.html
https://tidesandcurrents.noaa.gov/map/

2. Locate a world outline online and provide each student with a copy. In order to help then visualize Earth's coastal areas, have students use crayons or colored pencils to outline all coastal areas visible on the map. You may also consider highlighting on a projection screen. At least 10 percent of the world's population lives in low-elevation coastal areas, under 30 feet above sea level. In addition to being affected by high and low tides, these coastal areas are also affected by sea level changes due to storms and climate change.