Experiment Instructions

Chapter 19 - Tilted Tales: How Earth's Axis Creates Seasons

Gather Your Materials and Mark Below

- ☐ Globe of Earth
- ☐ Flashlight
- ☐ Ruler
- ☐ Foam ball
- ☐ Clay

Overview

Detailed instructions found on student lab pages

Part 1: Discover Earth's Shape

Explore a globe to see that Earth is round, not flat. Watch how it spins and locate different continents and oceans. Then, learn how ancient Greeks figured out Earth's shape by observing the curved shadow it casts on the Moon during a lunar eclipse.

Part 2: Model Earth's Rotation

Use a globe and flashlight to see how Earth's rotation causes day and night. As the globe turns, different parts light up while others go dark. You'll see how one full spin takes about 24 hours, creating our daily cycle.

Part 3: Explore Earth's Tilt and Seasons

Tilt the globe and shine a flashlight on it to understand how sunlight hits Earth differently throughout the year. This tilt—about 23 degrees—is what causes our seasons. Watch how light changes as Earth moves, and record your observations on how tilt affects sunlight and temperature.

Title _____ Date _____

Objective _____

My Question _____

Materials

Check your materials and make sure you have everything you need

- ☐ Globe of Earth
- ☐ Flashlight
- ☐ Ruler
- ☐ Clay
- ☐ Foam ball

Experiment: Test, Tinker, Try

Step 1 : Gather Your Materials

- Make sure you have all the materials laid out on a clean, flat surface within easy reach. Check that everything is in good condition and ready to use.

Step 2 : Investigating Earth

- **Shape of Earth:**
  - Activity:
    - Observe the globe and understand that Earth is a sphere. Rotate the globe and note different continents and oceans.
    - Place the globe between the foam ball and the lamp (Sun). Observe the shape of the shadow on the foam ball.
  - Discussion:
    - Explore how ancient Greeks used lunar eclipses to deduce Earth's shape by observing its shadow on the Moon

- **Earth's Rotation:**
  - **Activity**:
    - Use the flashlight to represent the Sun and rotate the globe to see how day and night are created.
    - Tip: Observe how different times of day are represented by moving the flashlight around the globe.
  - **Discussion:**
    - Understand that Earth takes approximately 24 hours to complete one full rotation, giving us day and night.

- **Earth's Tilt:**
  - **Activity:**
    - Set your globe on a 23° tilt and place a lamp nearby as your "Sun." Slowly orbit the globe around the lamp once, keeping its axis pointed in the same direction. Observe how each hemisphere alternately tilts toward and away from the light source.
  - **Discussion:**
    - As the hemisphere tilts toward the lamp, sunlight strikes it more directly, creating summer. When it tilts away, the rays are more slanted and spread out, creating winter. This 23° axial tilt–and Earth's annual orbit–drives our changing seasons.

Results

Record your results

- Observe each aspect of the experiment carefully and write down your findings in the table below.
- Hint: Note how the tilt affects sunlight distribution and how the rotation creates day and night.

Earth's Features	Observation Notes
Shape	
Rotation	
Tilt	

Conclusions

Tilted Tales: How Earth's Axis Creates Seasons

Materials List

- Globe of Earth
- Flashlight
- Foam Ball (to represent the Moon)
- Plasticine or Clay
- Ruler
- Notebook
- Pencil

Objectives

- Students explore Earth's shape and position in space.
- Students conduct simple observations and experiments to illustrate the Earth, Moon, and Sun.
- Students ask questions, make observations, and analyze data.

Research

- Review Chapter 19. Discuss about Earth's place in the universe. Explain that Earth is a spherical planet that orbits the Sun and rotates on a tilted axis.
- Show some pictures of Earth from space and discuss how these images have helped us understand Earth's shape and position.
- Engage students with questions like, "Have you ever wondered why we have seasons?" and "How do you think day and night happen?"
- Discuss the concept of Earth's tilt and its significance in creating seasons.

Ask Questions

- **Step 1: Write Down Questions**
  - Ask students to write down any questions they have about Earth in space. Encourage them to think broadly.
    - **Examples:** "Why does Earth have different seasons?" "How does Earth's tilt affect daylight?"
- **Step 2: Improve the Questions**
  - Guide students to refine their questions by converting closed-ended questions to open-ended ones and vice versa.
    - **Example:** "Why does Earth have different seasons?" can be refined to "How does Earth's tilt cause the seasons?"

- **Step 3: Prioritize the Questions**
    - Ask students to review their list of questions and prioritize the ones they find most interesting or relevant.
- **Step 4: Record Your Question**
    - Have students write down their prioritized questions in their notebooks for further exploration during the experiment.

Test, Tinker, Try: Activity

- **Shape of Earth:**
    - **Activity:**
        - Observe the globe and understand that Earth is a sphere. Rotate the globe and note different continents and oceans.
            - Place the globe between the foam ball and the lamp (Sun). Observe the shape of the shadow on the foam ball.
        - Discussion:
            - Explore how ancient Greeks used lunar eclipses to deduce Earth's shape by observing its shadow on the Moon
- **Earth's Rotation:**
    - **Activity:**
        - Use a flashlight to represent the Sun and a globe to represent Earth. Darken the room slightly and rotate the globe to show how Earth rotates, creating day and night.
        - **Tip:** Move the flashlight around the globe to demonstrate different times of day at various locations.
    - **Discussion:**
        - Explain that Earth takes approximately 24 hours to complete one full rotation, which gives us day and night.
- **Earth's Tilt:**
    - **Activity:**
        - Set your globe on a 23° tilt and place a lamp nearby as your “Sun.” Slowly orbit the globe around the lamp once, keeping its axis pointed in the same direction. Observe how each hemisphere alternately tilts toward and away from the light source.
    - **Discussion**:
        - Explain that as the hemisphere tilts toward the lamp, sunlight strikes it more directly, creating summer. When it tilts away, the rays are more slanted and spread out, creating winter. This 23° axial tilt—and Earth’s annual orbit—drives our changing seasons.

Observations

- Have students observe each activity carefully and write down their findings.
    - For example, ensure they note how the tilt affects sunlight distribution which results in season, how lunar eclipses indicate Earth’s shape, and how the rotation creates day and night.

Analyze

- **Analyze Data:**
  - Guide students to analyze their observations. Ask them to identify patterns in the data, such as the effect of Earth's tilt on sunlight.
  - Encourage them to discuss how Earth's shape and rotation contribute to our understanding of day, night, and seasons.
- **Evaluate Findings:**
  - Help students draw conclusions based on their observations. For example, they might conclude that Earth's tilt is responsible for the seasons and that its rotation causes day and night.
  - Ask them to consider why understanding these concepts is important for our daily lives.
- **Discuss Implications:**
  - Facilitate a discussion about how understanding Earth's shape, rotation, and tilt helps us predict seasons and understand the day-night cycle.
  - Ask students to think about how this knowledge is used in various fields, such as agriculture, navigation, and astronomy.

Share Results:

- **Have students prepare presentations** to share their findings with others. They can use visual aids such as charts and graphs to illustrate their data.
- **Encourage students** to write a detailed report summarizing their experiment, including their research, question, hypothesis, methods, observations, data analysis, and conclusions.
- **Facilitate a group discussion** where students compare their results and discuss any differences or similarities.

Notes