

Lesson Plan

Lesson: Rotation of the Earth

Length: 45 minutes

Age or Grade Level Intended: 4th

Academic Standard(s):

Science: Earth and Space: 6.2.1 Describe and model how the position, size and relative motions of the earth, moon, and sun cause day and night, solar and lunar eclipses and phases of the moon.

Skills: Describe, model

Knowledge: position, size, motion, earth, moon, sun, day, night, solar eclipse, lunar eclipse, phases, moon

Performance Objective(s):

Given a short answer quiz, the students will answer 3 out of the 4 questions correct.

Given a bag of materials, the students will discover that the sun can never reach all parts of the earth at the same time with 100% accuracy.

Assessment:

The students will complete a short 4 question quiz. The questions will include 1. What is the shape of the Earth? Provide an example of this shape. 2. What causes day and night? Explain completely. 3. How long is the Earth's day? 4. When it is daytime in the USA, what time of day is it on the other side of the world? An answer key is provided.

During the explanation portion, the students will explain why day and night happens. The teacher will be checking to see that the students understand that the sun cannot research all parts of the earth at the same time. The teacher will informally assess the students and their answers.

Advance Preparation by Teacher:

- Lesson Retrieved from: Maryland Learning Outcomes
<http://cte.jhu.edu/techacademy/fellows/ullrich/webquest/ScienceLesson.html>
- Material Bag
 - 2-3 different size spheres
 - Flashlight
 - Blank Piece of Paper for the Chart
- Lamp
- Globes
- Print quiz

Procedure:

Introduction/Motivation (Engagement):

Tell the class a story. My neighbors are originally from India and they have recently decided to move back home. We still want to keep in touch with them so we exchanged phone numbers. My problem is trying to decide what would be the best time to call because they are on the other side of the world. How does the rotation of the earth affect day and night?

Step-by-Step Plan: (Exploration/Explanation/Enrichment)

Exploration

1. Create groups of 4 and give each group a materials bag
 - a. Give each student in each group the number 1,2,3 or 4
 - i. Student #2 selects a sphere and holds it in front of him/her.
 - ii. Student #1 makes a chart and writes the size of the sphere on the chart. (Gardner's: Logical-Mathematical)
 - iii. Student #3 turns on the flashlight and shines it on the sphere holding it about 8 inches from the sphere.
2. The group will observe the sphere to determine about how much of the sphere is lighted.
3. Then they will make estimations and student #1 will records it on the chart. (Gardner's: Bodily Kinesthetic)
 - a. Whole sphere, half the sphere, just a slice of the sphere, etc.
4. Student #4 holds up the second sphere and the group will repeats the activity.
 - a. Put the spheres back in the bag.
5. The group will then discuss why they think that much of the sphere was lighted by the flashlight.

Explanation

6. Bring the group back together and have a discussion about their findings.
 - a. What did you find?
 - b. Question: Why do you think this occurred?
 - i. Guide the class towards the correct answer: Light spreads only to the widest part of the object; it can't bend around the sides. So, one half ends up being dark.
7. Ask the students: What is the shape of the Earth? (Bloom's: Knowledge)
 - a. Answer: Sphere
8. What do you mean by that? (Bloom's: Comprehension)
 - a. Give me an example.
 - b. So, is a sphere the same thing as a circle?
 - i. No! Sphere - 3 dimensional
 - ii. Circle - 2 dimensions
 - iii. Show pictures of the actual sun and earth with the back side of the earth dark
9. Show students a grapefruit and ask if the shape is pretty close to spherical?
 - a. Would you have got the same results from this grapefruit as you did with the items in your bag?
10. Do you think the same thing will happen with a globe? Why or why not?
 - a. Distribute a globe to each group and have them try the same flashlight activity.

- b. Collect the flashlights and have the students bring the globes with them.
11. Move all the students to a circle in the back of the room place a lamp without the shade in the middle of the circle.
 - a. Have them place the globes in front of them.
 - b. Did it you get the same results with the globe?
 - i. Discuss
 12. What does my light represent? (sun)
 - a. How did you know?
 - b. Answer: It shines in all directions, center of the circle, etc.
 13. Turn your globe so the USA faces the sun.
 - a. What do you notice?
 - i. Half of the world is lit; what time of day would it be in the USA?
 1. Answer: Day
 - j. Don't move the globe, but look at it and tell me about the countries on the other side of the Earth?
 1. Answer: It is dark; it is night time.
 - k. What about at the edges where it is just fading into the darkness?
 1. Answer: This is dawn or dusk.
 - l. When will the other side of the Earth have daylight?
 1. Answer: When the sun shines on it.
 14. Next push a long stick through the grapefruit and see if the students know what it represents.
 - a. Answer: Axis
 - i. What is the Earth's axis?
 1. Imaginary line through center of the Earth extending from the north to the South Pole; it has a slight tilt
 2. What is the purpose of the axis?
 - a. Answer: Earth rotates around it like a top spins.
 - ii. The Earth will need to spin on its axis until it moves into the sunlight.
 15. Have students spin globe until USA (North America) faces the student and India is in the sunlight. Now tell me what you notice. Explain.
 - a. Does this change from day to night occur all at once?
 - i. No, it is gradual.
 - b. What are the periods in between called? Explain what it is like outside at those two times of the day.
 - i. Dawn and dusk
 1. Refer to the text book about the different parts of the day.
 16. What have we observed as the cause of day and night?
 - a. The rotation of the Earth on its axis.
 17. Do you think it matters which way the Earth spins? Explain.
 18. Do you know where the sun rises and sets?
 - a. Rise – east
 - b. Sets – West
 - c. Why is this important?
 - i. The earth needs to spin this way so that the sun always rises in the east and sets in the west. Keeps our days equal.

19. Does the sun really rise and set?
- a. No, it only appears that way because of the Earth's movement; the sun stays in the same place.
20. Let's try something. First, find the US on your globe and point to the east coast of the USA.
- a. Check to see that all students are pointing to the correct area.
 - b. Which direction would the globe have to spin for the sun to appear to rise over the east coast first?
 - ii. From west to east or as the students are seated spin it from right to left
 - iii. Give students an opportunity to investigate by moving the globe in different directions.
 - iv. Have students share their findings; demonstrate if no group has the correct answer.
21. Okay, put the USA in the night time position again. It is now midnight in the USA; how long would it take for the Earth to make a complete rotation with the USA returning to the position it is in now?
- a. While the students think about the question demonstrate the 360 degree rotation.
 - i. Answer: It will take 24 hours to make a complete rotation.
 - b. So how long is one day on the Earth?
 - i. 24 hours
 - c. When we say one day is 24 hours, does that mean that we have daylight for 24 hours?
 - i. Use the globe to explain that during that 24 hour period the USA will experience dawn, daylight, dusk, and night time because of its rotations and the location of the sun.
 1. Have the students help with this explanation!!
 - d. Are day and night exactly 12 hours each?
 - i. No, because it depends on the season.
 1. Think about how long summer days are compared to winter days.
 - e. If it is 12 midnight in the US, what time would it be in India if it is half way around the globe?
 - i. 12 noon
 - f. How can you support your answer? (Bloom's: Evaluation)
 - i. 1/2 of 24hrs is 12 hours
 - i. Give a few more examples:
 - i. China/night - North America/day
 - ii. Greenland/night - Australia/day
 - iii. Japan/night - Brazil/day

Closure (Extension)

1. Homework - Tell the students: Remember how I told you about my neighbors who are moving back to India? Well I need your help to figure out the best time for me to call them. Remember that I don't want to wake them up in the middle of the night. Also, I can't call them in the middle of their day because they work. Figure out what you think the best time is for me to call them and write an explanation of why. You

may use the globe for assistance. (Bloom's: Application) (Gardner's: Verbal Linguistic) Bring back your time and explanation tomorrow. I can't wait to read your responses and figure out the best time to call my neighbors.

* The following day, give the students the short answer quiz.

Adaptations/Enrichment:

Student with ADHD: Have the student with ADHD hold the flashlight during the activity. This will provide him with something to do so he doesn't get distracted. Also, use a signal that only the student and teacher know to remind the student to stay on task if he gets off task.

Enrichment: Have the student create a model of how the day and night are created. Have the student present it to the class and explain what is happening.

Self-Assessment:

Self-Reflection:

This is an inquiry based lesson because it has to students seek out the answer to the question rather than just telling them the answer. They are presented with various questions along the way which lead them to the correct understanding of why we have day and night.

Name _____

Date _____

Rotation of the Earth

1. What is the shape of the Earth? Provide an example of this shape.
2. What causes day and night? Explain completely.
3. How long is the Earth's day?
4. When it is daytime in the USA, what time of day is it on the other side of the world? Why?

Name _____

Date _____

Rotation of the Earth – Answer Key

1. What is the shape of the Earth? Provide an example of this shape.

The earth is in the shape of a sphere.
Examples will vary – grapefruit, orange, ball, etc. (Could include a variety of things but must be in the shape of a sphere)

2. What causes day and night? Explain completely.

The sun is in the center of the solar system. Earth rotates on its axis around the sun. As the earth rotates the part of the earth facing the sun has day time while the part not hit by the sun has night time. During 24 hours, we will experience dawn, daytime, dusk, and nighttime.

3. How long is the Earth's day?

The earth's day is 24 hours.

4. When it is daytime in the USA, what time of day is it on the other side of the world? Why?

When we are having daylight in the USA, the people on the other side of the earth are having nighttime because the shape of the earth, a sphere, does not allow the sun to hit the back of the earth. The wider part of the earth blocks the back half from getting sunlight resulting in night.