

As the World Turns

Strand Earth Patterns, Cycles, and Change

Topic Seasons, day and night

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

- b) predictions are formulated using a variety of sources of information;
- d) natural events are sequenced chronologically;
- j) inferences are made and conclusions are drawn.

Background Information

Some events in nature occur in a pattern or cycle, such as the seasons and day and night.

Relationships that exist between and among the Earth, sun, and moon result in day and night and seasonal changes. Earth's rotation causes day and night and Earth's revolution causes the seasons. The cause of the seasons is due to Earth's tilt on its axis. During the summer time in the Northern Hemisphere, the Northern Hemisphere is tilted toward the sun, receiving more direct rays from the sun. In the winter time, the Northern Hemisphere is tilted away from the sun, less direct rays. Because the orbit of the Earth around the sun is elliptical, not circular, there are times when the Earth is closer to the sun and times when the Earth is further away from the sun. The Earth closest point to the sun is actually in January, but at that time, due to the Earth's tilt on its axis, we in the Northern Hemisphere are tilted away from the sun.

Materials

- Globe of the Earth (You can use a regular globe for this demonstration, but a white globe (painted) creates a much more dramatic effect.)
- Lamp with 100 watt light bulb
- "Rotate" sign
- "Spin" Sign
- "Revolve" sign
- "Circle" sign
- Sticky note
- A room that can be darkened
- Copies of SOS Summary sheet
- Copies of 3-2-1, Why is the movement of the Earth important? sheet

Vocabulary

rotate, revolve, tilt, frame of reference, spin, axis

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

Introduction

1. Draw a human figure on the small portion of a sticky note. Dim the lights in the room for the demonstration.
2. Say to the class, “Let’s look at this globe. What things do you notice about this globe? Let’s find where we live on this globe.” Point out Virginia on the globe. Attach the tiny sticky note with the figure drawn on it to Virginia. Make sure that the little figure is looking toward the North Pole. This little figure is going to represent us as we talk about the globe.
3. Tell the students that as we talk about the movements of the sun and Earth, we will pretend that we are standing in Virginia and facing the North Pole. This is our point of view or frame of reference.

Procedure - Rotation of the Earth Demonstration

1. Ask the students, “Can anybody tell me what the word *rotate* means?” Ask all of the students to rotate, and have one student be the rotate sign holder, holding up the sign every time you say the word *rotate*. Have another student hold up a sign labeled spin to remind the students that rotate means to spin. Turn the globe slowly counterclockwise, and explain that Earth rotates in a *counterclockwise* direction.
2. Say, “This light we have set up represents the sun. We will now be getting up and rotating in place. As you rotate, imagine that your nose is *you* and the top of your head is the North Pole.”
3. Make a prediction about what it looks like on Earth.
4. Notice that your nose goes through a repeating cycle — night (away from light) – day (facing light) – night – day – night – day, and so on. Also, the sun seems to rise in the east and set in the west, but it’s really you who is moving, not the light (sun).
5. Demonstrate the same phenomenon — the sequence of night and day — using the globe. Be sure to point out the little figure that represents us. Follow the little figure through several cycles of night and day. “Where is the sun when the little figure sees the dawn start?” “Where is the sun when the little figure is ready for lunch around noon?” “Where is the little figure when it’s sunset?” “Where is the little figure when it’s night?” Depending on the ability level of your students, you may want to add that this is why the stars, moon, and planets also appear to rise and set. Emphasize that these objects aren’t really moving across our sky from east to west, but that Earth’s rotation makes all of these objects look like they are moving — rising and setting.
6. Show “Earth's Rotation Diagram” that demonstrates why the sun appears to move across the sky because of Earth’s rotation. Be sure to tell the students that Earth and the sun are not drawn to scale. Ask, “Can anyone tell how long it takes Earth to rotate once on its axis, from noon to noon?”

Procedure - Revolution of the Earth Demonstration

1. Say, “Now, we’re going to learn about another movement that Earth makes. At the same time that Earth is rotating on its axis, it’s making a circle — or *revolution* — around the sun. We say that Earth revolves around the sun.” Have a student be the revolve sign holder, holding up the sign every time you say the word *revolve*. Have another student hold up a sign with a circle on it to represent that revolve means to make a circle. Make sure everyone gets the idea of revolving.

2. Make a prediction about what season it will be when you hold the globe in each location.
3. Say, “Let’s do one last movement around the sun! I want everyone to make one revolution around the sun and rotate on your axis at the same time. Can anyone tell me how long it takes for Earth to revolve around the sun one time?”
4. The “Earth’s Revolution Diagram” is designed to show the movement of Earth around the sun. The sizes of the sun and the Earth and the distances between them are not drawn to a single scale.
5. Pass out the SOS Summary sheet and have the students complete the information.

Conclusion

1. Have the students complete the 3-2-1 - Why is the movement of the Earth important? survey.
2. When all students have completed the sheet, discuss the 3-2-1 survey together as a class.

Assessment

- **Questions**
 - What is the difference between revolve and rotate? Draw a diagram to help you explain.
 - Explain what causes the seasons on Earth to occur.
- **Journal/writing prompts**
 - Ask students to make a drawing that shows the early morning or late afternoon sun in the sky. East should be on the right side of the picture and west on the left side of the picture. Remind students to include the shadows that the objects in the drawing cast on the ground and to write the time of day in the lower right-hand corner of the drawing.
- **Other**
 - Have students draw diagrams to depict the seasons and day and night with respect to the position of the sun and Earth.

Extensions and Connections (for all students)

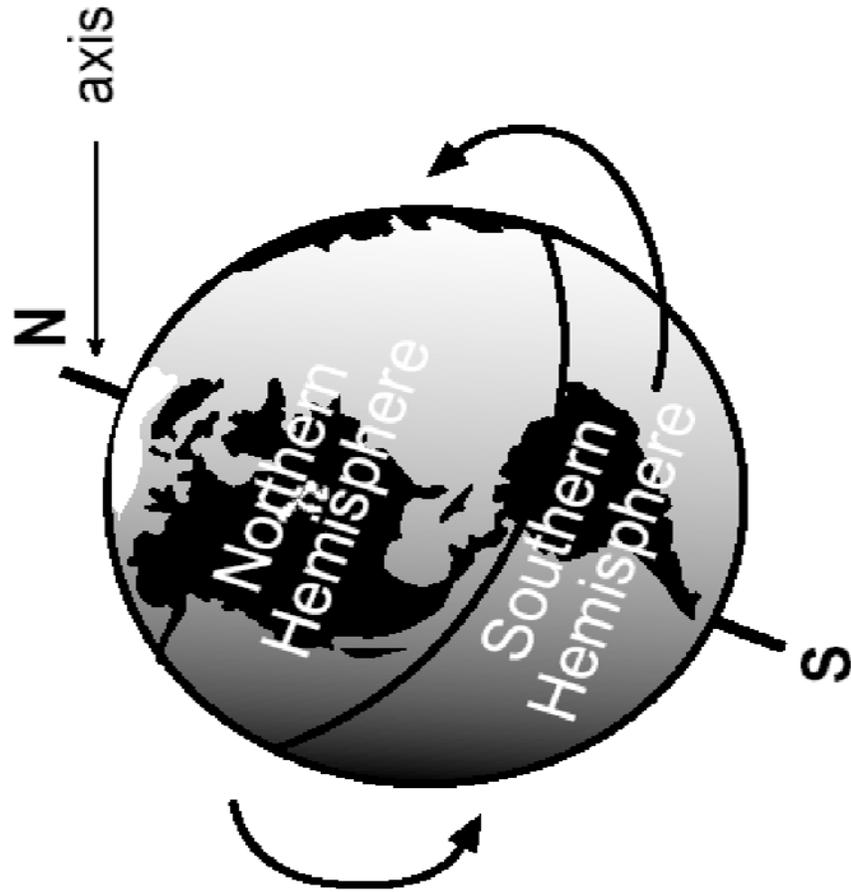
- Divide the class into groups of three to four students. Have each group design a demonstration or a skit or a song or a...that explains how day and night happen.
- Do the same thing for how the seasons occur.

Strategies for Differentiation

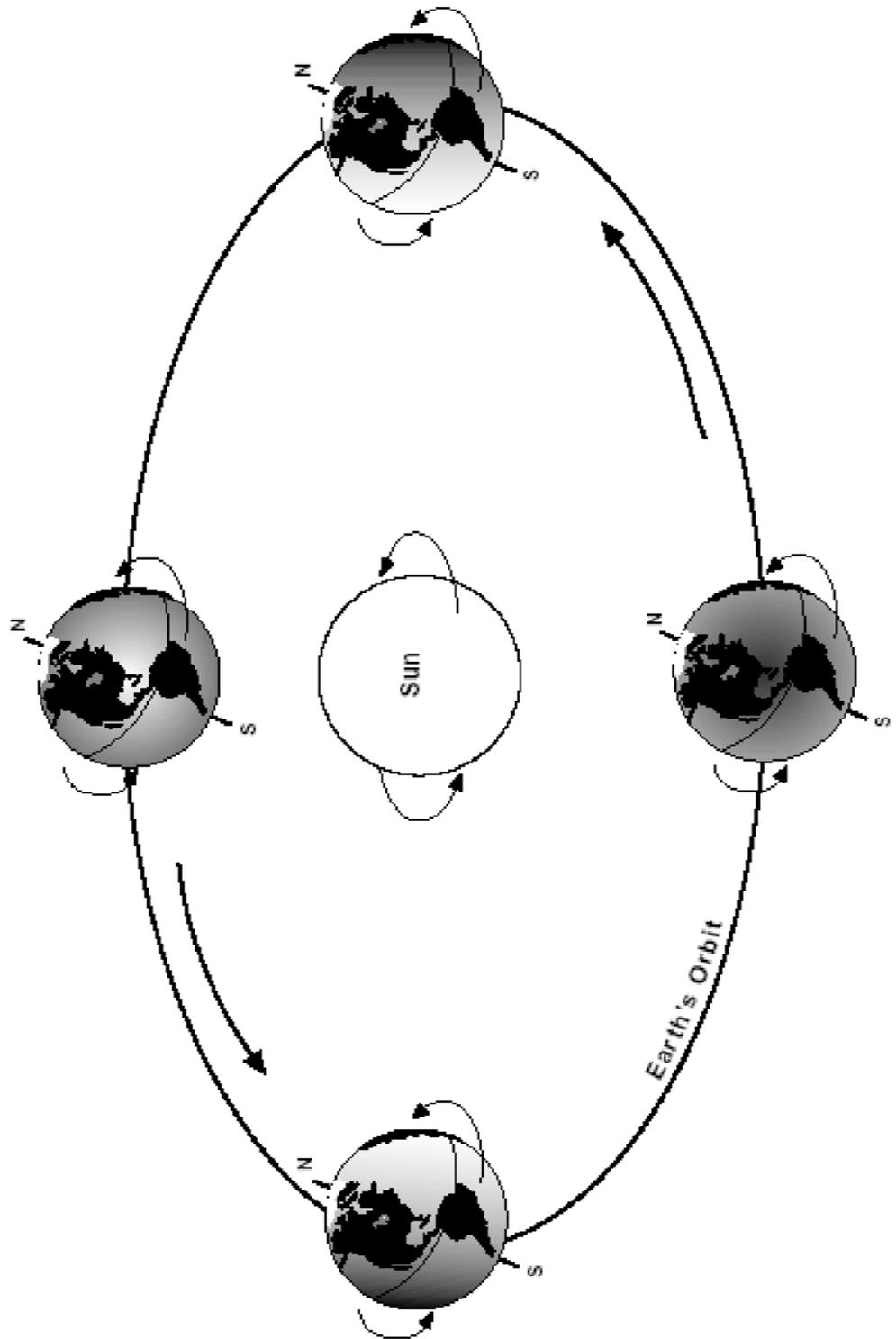
- Teach the students this lesson over a two-day period instead of one, in order to have them master one concept at a time.
- Children with mobility difficulties can actually revolve or rotate the globe instead of revolving/rotating their bodies. They may also play the role of the sun.
- 3-2-1 - students may draw/dictate instead of writing their answers.
- Provide a multimedia video clip of the concept in the lesson.
- Take a field trip to the Science Museum.
- Invite a meteorologist to talk about the effects of rotation and revolution.
- Think, pair, and share how to explain the difference between rotation and revolution.
- Have different groups create representations of the seasons on large sticky note posters and share them with the class by hanging them on the wall. Students take a “gallery walk.”

- Create a folded-layered book or other graphic organizer to aid in the understanding of rotation and revolution.

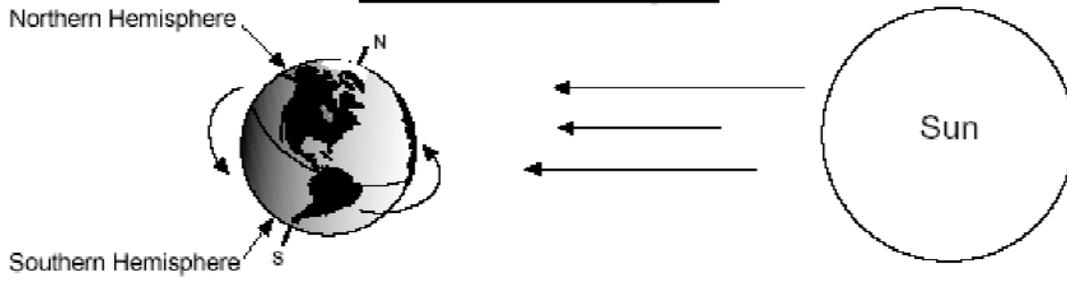
rotate



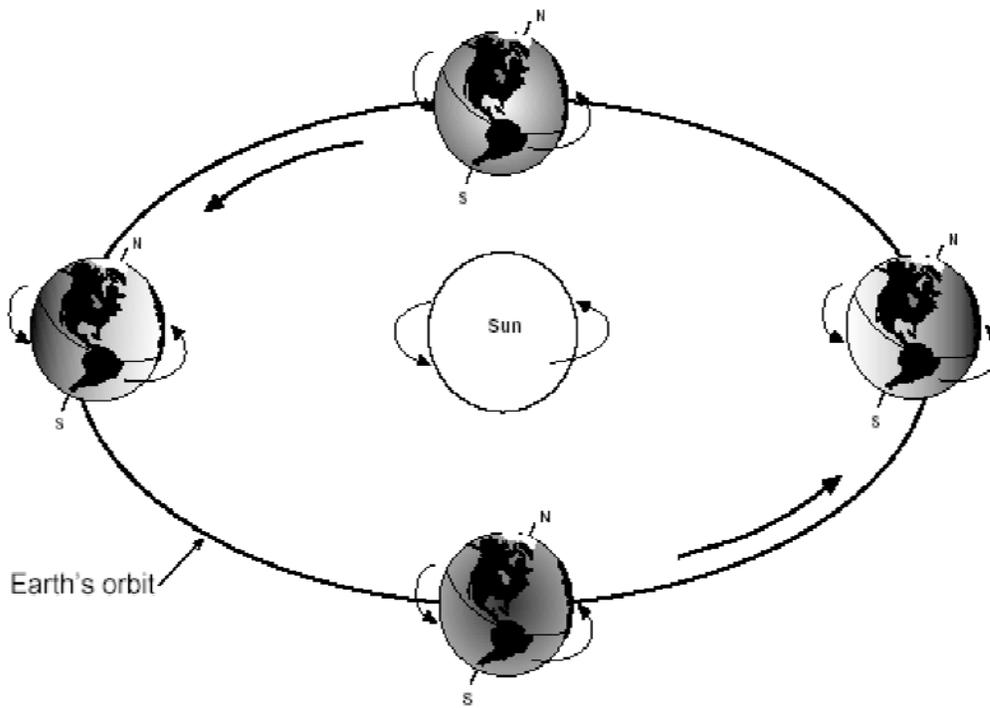
revolve



Earth's Rotation Diagram



Earth's Revolution Diagram



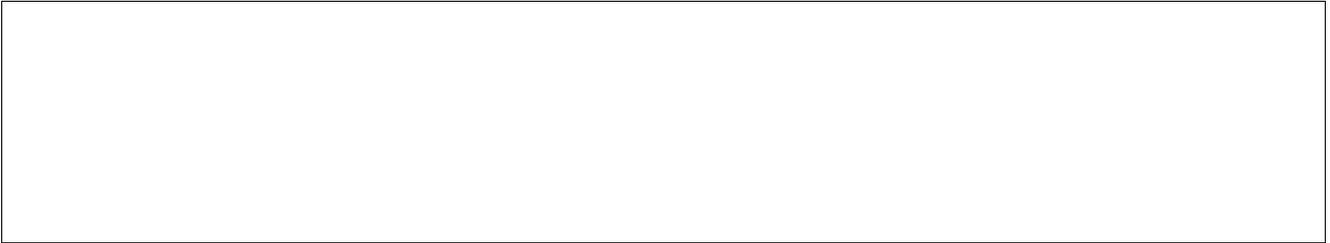
SOS Summary

Name: _____ Date: _____

Read this Statement:

The Earth's revolution causes the seasons.

Draw a picture of the statement:



Opinion?

- I agree
- I disagree

Support your opinion (facts, reasons, examples, drawings, etc)

○

○

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3-2-1 - Why is the movement of the Earth important?

Name: _____ Date: _____

List three facts about the Earth's movement:

- _____
- _____
- _____

What are two advantages to the Earth's movement?

- _____
- _____

Questions I still have:

- _____
- _____
- _____