

Seasons

Background Information

Objectives

By the end of this activity, students will be able to:

- demonstrate that seasons exist because of the tilt of the earth and its impact on the intensity of the sunlight at a given location.
- explain why seasons exist.
- determine what would happen if there was no tilt of the Earth.

Instruction Time

45 Minutes

Materials

- Globe
- Flashlight
- 4 styrofoam balls
- 4 pencils
- 4 thumbtacks
- circle cut from black paper (approx. 8 inches in diameter)
- figure of a person cut-out of purple paper
- figure of a person cut-out of pink paper
- tape
- Astronomers Journals pages 18-19

Procedure

1. Ask: "What are the different seasons? What are some differences and/or similarities between the seasons? Why are there seasons? What is the weather like during the different seasons? When you go to bed in the summer is it light or dark outside? When you go to bed in the winter is it light or dark outside?" Write the sequence of the seasons on the chalkboard for reference after the class answers the first question (Winter, Spring, Summer, Autumn).
2. Ask for one volunteer to hold the globe and play the part of the earth (Atlas). Ask another volunteer to hold the flashlight and play the part of the sun (Helios, the god of the sun). The rest of the class should sit to one side so that they can clearly see Atlas and Helios at the same time. Have Atlas hold the earth straight up and down (teacher may assist). Now ask two more volunteers to tape the purple and pink person to the globe. The purple person should be taped midway between the equator and the pole. The pink person should be taped midway between the equator and the south pole.
3. The teacher explains how the earth goes around the sun while Atlas and Helios demonstrate. Atlas walks around Helios while Helios keeps the flashlight pointed

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straight at the earth. The two should stand no further than 5-7 feet apart. Have Atlas stop when the purple person can see the sun. Ask Atlas if he/she can tilt the earth so that the sun is directly overhead of the purple person in the north. The rest of the class can help Atlas. Ask: "Is the sun bright or more direct for the purple person or the pink person? Do you think it is hotter for the purple person or the pink person?" Refer to Direct/Diffuse Light Lesson if needed. Now ask Atlas to tilt the earth so that the sun is directly overhead of the pink person. Ask: "Is the sun brighter or more direct for the purple person or the pink person? Do you think it is hotter for the purple or the pink person?"

4. While Atlas has the sun over the pink persons head, the teacher helps the class find the point to which the north pole points in the classroom (wall, ceiling, etc.). Teacher tapes the black circle on the wall or ceiling as a reference point. Ask Atlas to orbit the sun (walk around the flashlight) keeping the north pole pointing at the black circle. Remember to have Helios keep his light pointed at the earth. Have the rest of the class help make sure Atlas doesn't change the tilt of the earth. Have Atlas stop after one-half of an orbit so that he is opposite of where he started. As the earth is orbiting the teacher explains that the earth is tilted one way and stays tilted the same way all the time.
5. Ask a volunteer to come up and make it daytime for the pink and purple people. It should be night for them if Atlas has orbited correctly so the volunteer will have to spin the earth. Ask: "Is the sun more direct on the purple person or on the pink person? Is it hotter for the purple person or the pink person? Is it summer time or winter time for that person? (summer for the purple person) Is it summer or winter for the pink person?"
6. Now have Atlas orbit the sun halfway around again making sure to keep the north pole pointed at the black circle. Ask a volunteer to make it daytime for the purple and pink people. Ask: "Is the sun more direct on the purple or the pink person? Is it hotter for the purple or the pink person? Who is it summertime for? Wintertime? How do you know that? Is the sun brighter or more concentrated for the person who is in summer or the person who is in winter?"
7. At this point it is a good idea to point out that the seasons are opposite for people on the top (north) of the earth and on the bottom (south) of the earth. Ask: "When it is winter on the top (north) of the earth, what season is it on the bottom (south) of the earth? When it is winter on the bottom (south) of the earth, what season is it on the top (north) of the earth?" Teacher should repeat the orbit model as often as necessary, giving other volunteers the earth/sun responsibilities.
8. Remove the pink person. Ask the students: "When is Autumn?" (refer to the sequence of seasons on the chalkboard; in between summer and winter) Have the class help position the earth so that it is summertime for the purple person, remembering to keep the north pole pointed at the reference point. Ask Atlas to orbit slowly toward the winter position. (Teacher and class can help.) Ask the

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- class to help Atlas stop when it is autumn, halfway between summer and winter. Ask a volunteer to point on the globe where the sun is most direct. (equator)
Have Atlas continue orbiting to the winter position.
9. Ask the students: "When is Spring?" (refer to the sequence of seasons on the chalkboard; in between winter and summer). Ask Atlas to orbit slowly toward the summer position for purple person. Have the class help Atlas stop when it is spring for the purple person, halfway between winter and summer. Ask a volunteer to point on the globe where the sun is most direct (equator). Teacher should repeat this model as often as necessary giving other volunteers the chance to be Atlas and Helios.
 10. (Before teaching this part of the lesson the teacher should prepare the styrofoam ball earth model as follows: Insert a pencil through each of the styrofoam balls so the pencil passes as close to the center of the ball as possible. The point that the pencil enters and leaves the styrofoam ball is supposed to represent the north and south poles. Draw an equator around each earth model with a black magic marker.)
 11. Divide the class into four groups. Pass out one earth model, one thumbtack and one flashlight to each group. If there are not enough flashlights available, then one group member can hold a yellow colored styrofoam ball which will represent the sun. Have a member of each group push the thumbtack midway between the equator and a pole. Explain that the thumbtack represents a person. Have the groups practice modelling the different seasons. Allow enough time for each group to practice so that they will be able to model the different seasons for the rest of the class.
 12. Have each group model for the class the different seasons using their earth/sun models. The class can help correct any confused groups. This will also help the teacher assess how well the students understand the mechanisms which produce the seasons.

Expected Results & Explanations

1. In Astronomer Journal page 18, have students look at the two-dimensional model for the positions of the seasons of the earth around the sun and label the season for each position.
2. Sketch in journal or on large sheet divided into four sections a picture of what each season represents to them. (trees, flowers, clothes, holidays, animals, etc.)
3. Discuss/list/illustrate how seasonal changes affect people.
4. Have each student write a short story about his/her favorite season and illustrate on page 19 of the Astronaut Journal. Display these around the room.