

EARTH/SUN RELATIONSHIPS

Performance Standard 17B.E

Using a styrofoam sphere and other materials to construct a model of Earth that contains the principal parallels. Use the model to explain in writing relationships between the Sun and Earth such as day/night, change of seasons temperature and positions accordingly:

- *Knowledge:* identify key locations such as the North and South Poles, equator, the Tropics of Cancer and Capricorn, and the Arctic and Antarctic Circles;
- *Reasoning:* explain the Earth/Sun relationships and the connection to the locations; and
- *Communication:* make a model and write an explanation that is well-organized and well-detailed; express all ideas in a way that provides evidence of knowledge and reasoning processes.

Procedures

1. *In order to analyze and explain characteristics and interactions of Earth's physical systems (17B)*, students should experience sufficient learning opportunities to develop the following:
 - Demonstrate understanding of Earth/Sun relationships by preparing a model or by designing a demonstration to show the tilt of Earth in relation to the Sun in order to explain day/night and length of day at different locations on Earth.
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. The assessment assumes the student has completed learning activities on Earth/Sun relationships and has developed an understanding sufficient to allow completion of this assessment.
4. Using a styrofoam sphere, round toothpicks, string, ballpoint pen, and ruler, construct a model of Earth that contains the North and South Poles, the Tropics of Cancer and Capricorn, and the Arctic and Antarctic Circles.
5. Use your model to explain *in writing* how you would demonstrate the following:
 - cause of day and night
 - changes in length of day and night throughout the year at different locations between the equator and a pole
 - change of seasons throughout the year
 - changes in temperature between the equator and the poles
 - the position of Earth with respect to the Sun during the equinoxes and the solstices.
6. Examine the student's styrofoam model of Earth to determine the accuracy of the following.
7. Evaluate each student's work using the Social Science Rubric as follows and add the scores to determine the performance level. (The teacher may want to reference the Making the Globe exercise sheet attached to this assessment):
 - *Knowledge:* the identification of key locations (poles, equator, Tropics of Cancer and Capricorn and the Arctic and Antarctic Circles) are clear and accurate.
 - *Reasoning:* the written explanation gives reasons for the cause of day and night, changes in length of day at different locations and times of year, change of seasons, changes in temperature and the position of the Earth during the equinoxes and the solstices (Earth/Sun relationships) and is logical and well-reasoned.
 - *Communication:* the model and writing are well-organized and well-detailed; the knowledge and reasoning were completely and effectively communicated.

Examples of Student Work not available

Time Requirements

- One 50-minute time period

Resources

- Building a Model of Earth/Sun Relationships exercise sheet included with this assessment.
- One and a half or two inch diameter styrofoam sphere
- Ballpoint pen, and writing pad
- String and ruler
- Round toothpicks
- Social Science Rubric

BUILDING A MODEL OF EARTH/SUN RELATIONSHIPS

Making the Globe

- Step 1. Insert a toothpick a short distance into the styrofoam sphere. Check to see if the toothpick is moving toward the center of the sphere by spinning the sphere with the toothpick (note the amount of wobble). Adjust the angle of the toothpick to minimize the wobble, then continue to insert the toothpick into the sphere, being sure to leave at least one-half of the toothpick exposed. Let this toothpick be the North Pole on your sphere.
- Step 2. Tie a slipknot in one end of a short piece of string and place it over the toothpick on the sphere. Be sure your string is long enough to go all the way around the sphere. Tighten it at the sphere's surface and stretch it all the way around the sphere at its widest point and back to the toothpick again. Mark the string with your ballpoint pen where it meets the toothpick.
- Step 3. Carefully remove the string (be careful not to increase or decrease the size of the loop in the slipknot) and measure the distance from your mark to the center of the loop. Mark your string again at the point exactly half way between your first mark and the loop.
- Step 4. Slip the loop back over the toothpick and pull the string around the widest part of the sphere again. Insert another toothpick in the sphere at the halfway mark on the string. Again, check for wobble by spinning the sphere, then finish inserting the toothpick into the sphere. You now have identified the South Pole on your sphere.
- Step 5. Use the same string-marking procedure to find the point half way between the poles. Draw a line around the sphere at this point. This line represents the equator. Estimating distance, draw lines parallel to the equator around the sphere to represent the Tropics of Cancer and Capricorn and the Arctic and Antarctic Circles.