Using Star Maps

This science activity is designed for students in grades five through eight. It can be presented by teachers with no special preparation in science. "Using Star Maps" is keyed to concepts in the planetarium program, "Constellations Tonight," so it will probably be most effective if presented just before or after the planetarium visit. Each teacher may wish to adapt the language and pace of the activity to his or her particular class.

Objectives

The primary objective of this activity is to improve the students' ability to use maps. Following the lesson, the students will be able to:

1. Use "direction" and "distance" to find locations in the classroom.
2. Draw a map of the classroom.
3. Use a star map to locate the positions of constellations in the sky by noting the direction and distance from the zenith (point overhead).
4. Use a star map to visualize the orientation of constellations in the sky.

Before Class

1. Gather the following materials for each student: a pencil, and one copy each of "Map of My Classroom" and "Sky Windows." (Master for photocopy on pages 4-5; if necessary, make a new version of sheet #1 to match the shape of your room.) Also make a copy of the star map from the current month (from *Constellations Tonight* script) for each student.
2. Label the four walls of your classroom with paper signs marked with the four primary compass directions. These need not correspond to the actual compass directions. However, a person facing "North" should be able to see "East" to the right, "West" to the left, and "South" to the rear.
3. To illustrate how to draw a map of the classroom, draw a rectangle on the blackboard, and label the four directions (as on Worksheet #1). Draw in the teacher's desk or some other prominent object so the students can see how to proceed.
4. Optional: make an overhead projector transparency of the current season's star map. Create a cardboard "Star Window" of appropriate inside dimensions which will, when placed on the star map transparency, frame views that will illustrate those on Worksheet #2.

Part A. The Directions Game

We will begin today's lesson about Star Maps by playing the Directions Game. Notice the four signs on the walls that indicate the primary compass directions: North, South, East, and West.

What direction would I look to see Northeast? Southeast?

Point to the four direction markers. Question the students to

see if they understand the system of compass directions.

Now we are ready to play.

Who will be our first volunteer?

Okay, [Jennifer], please stand in the center of the classroom and face AWAY from the blackboard. I will write the name of some object in our classroom so that everyone but [Jennifer] will know what I have in mind.

Write the name of an object that is within Jennifer's line of sight—say "George's Desk"—on the blackboard. Let everyone read it, then erase it.

Now I would like someone to give directions to Jennifer so she can find the object, just by looking around. Do this by giving the DIRECTION she should turn, and HOW FAR she must look. For example, you might say, "Look Northeast, about halfway to the wall."

Who wants to give Jennifer directions first?

If Jennifer fails to find the object on the first try, encourage the students to give clues, but not to name the object. Let the students use whatever strategies they can think of (like giving the size, shape, or color of the object.)

Good! Now that Jennifer has found the object, who would like to try the next one?

Part B. Map of the Classroom

On the blackboard I have started to draw a map of our classroom. Notice that I have labeled the four primary directions and I have drawn the location of my desk. Point to the example on the blackboard.

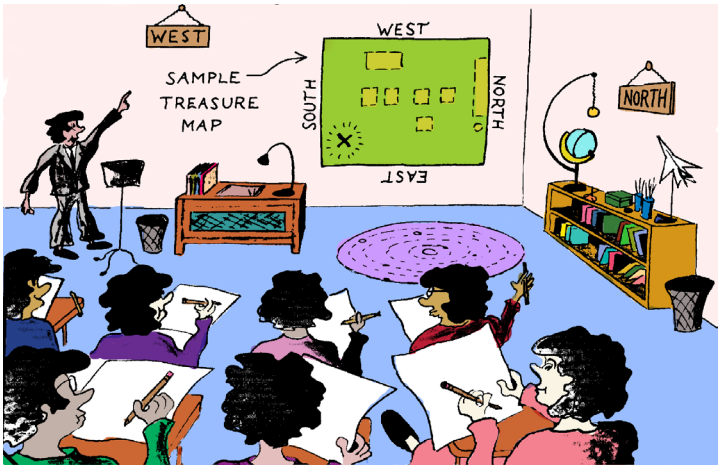
If a stranger who has never before been to our classroom saw this map, how would he or she use it to find my desk?

If the students are not able to transfer learning from the "Directions Game," help them by drawing an arrow from the center of the map to the location of the desk, and ask what the stranger would do if he or she stood in the center of the room.

Now that you understand how to use direction and distance to locate things on a map, I want you to complete the map of our classroom. On this paper, show all of the things that rest on the floor—chairs, tables, desks, and anything else you think is important. Make sure the directions on your maps correspond to the directions in the classroom, and that the distances are about right.

Hand out Sheet #1. Help students as they request it. Allow them to look at each others' papers to get ideas and to criticize.

When you are finished, compare papers with one other person.



How are your papers similar? How are they different?

Improve your map if necessary to make it more useful to someone who has never seen our classroom before.

Now plant a "treasure" somewhere in the room and mark the spot with an "X" on your map. Exchange treasure maps with one other person and see if you can find each others' treasures.

The same exercise can be done with older students using the entire schoolground rather than just the classroom.

Part C. Reading Star Maps

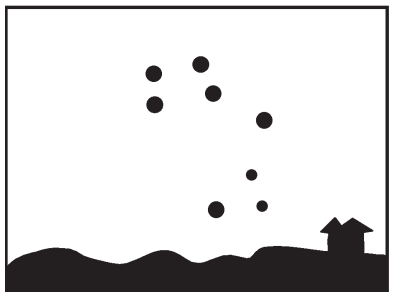
Hand out a star map for the current season to each student. Optional: in addition, display transparency of star map on overhead projector.

This star map shows how the stars will appear tonight at about 9 or 10 o'clock. The center of the circle shows the point directly overhead, called the "Zenith." The rim of the circle shows the "horizon," which is what we call the line where the sky meets the earth. I would like another volunteer to stand in the center of the room. Sam volunteers and takes his position.

Pretend the walls and ceiling of our classroom are the sky.

Where would you look, Sam, to see the zenith? How about the Northern Horizon? The Southwestern Horizon?

If Sam has difficulty, other students can help. Thank Sam and ask him to be seated. Select a constellation near the horizon. For example, on the March-April map, Orion is near the Western horizon.



Optional: use the overhead transparency star map and your cardboard window frame to allow the whole class to view sample window frame portions of the sky.

To use the star map to locate a constellation, we must hold the star map so that the constellation we wish to find appears right-side up on the map. Let's try to find [Orion] (use the constellation you have selected for your star map). First locate [Orion] on your maps. Which horizon is [Orion] closest to? How far between the zenith and the horizon is [Orion]? Who would like to point to where [Orion] would appear in the sky?

Do this with several constellations, having students answer by indicating where on the walls or ceiling the constellation would appear. Then, hand out Sheet #2.

When you use these maps to find constellations in the real sky, remember to turn your map around until the direction you wish to look is at the BOTTOM.

Now I would like you to take Sheet #2 and draw the stars you would see in each "Sky Window."

Illustrate the first box on the chalkboard. Optional: use the overhead transparency map and cardboard window frame to help in illustrating. Illustration at left shows sample view for Sept-Oct star map.

Any questions?

While the students are working, draw boxes on the chalkboard labeled like the rest of the boxes on Sheet #2.

Who would like to come to the board and draw the stars as they are on your paper for the Eastern horizon? Call on a volunteer to draw.

Let's compare this answer with the Star Map.

What do you think? Is this what you would see in the sky if you looked in this direction tonight?

The answer will vary a little depending on how much of the sky the student tried to depict. Discuss each of the boxes the same way. In the box labeled "Zenith," there is the added subtlety of which way the observer's body is facing even though looking straight up. One drawing may be rotated compared with another drawing.

If you understand how the Star Map works, you can go outside tonight and find any of these constellations that you wish. Good Luck!

Map of My Classroom

South

East

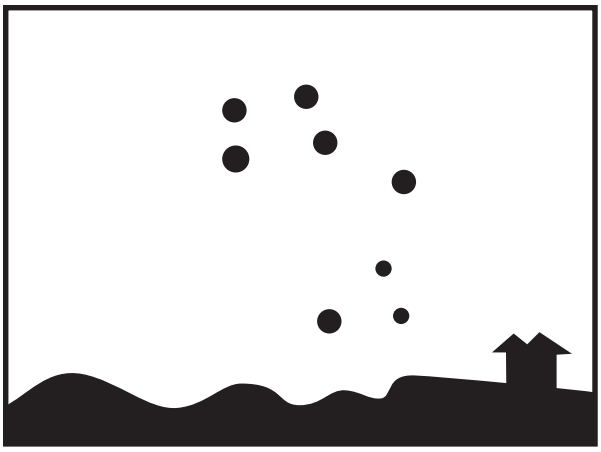
West

North

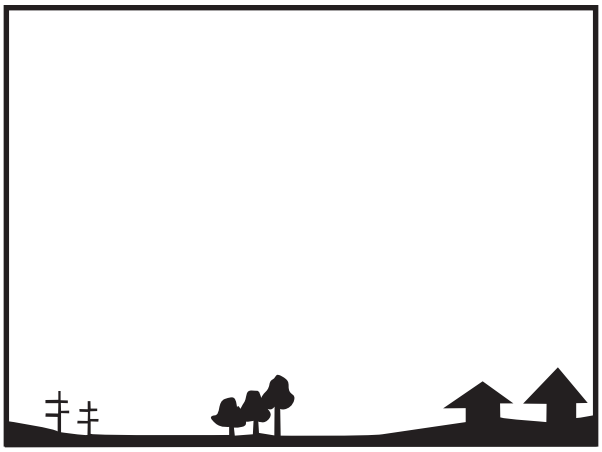
In order to get to my own desk from the center of the classroom, in what direction must I go? _____

How far towards the wall must I walk? _____

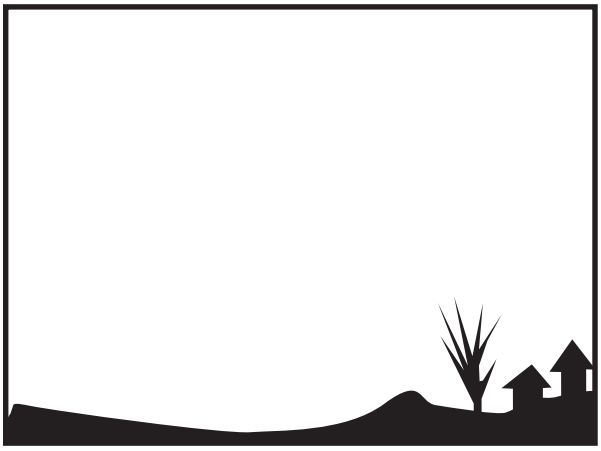
Sky Windows



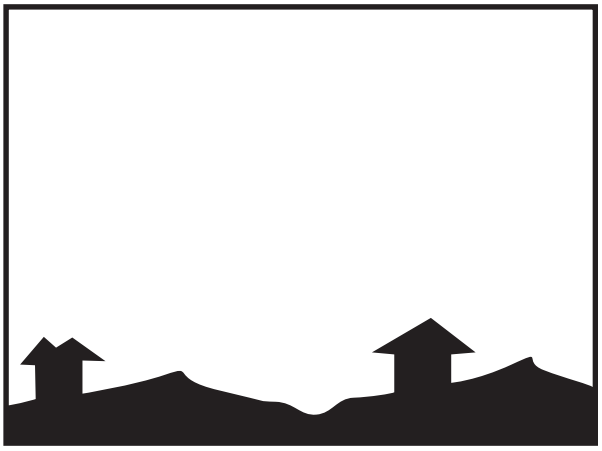
Southwestern Horizon



Eastern Horizon



Northern Horizon



Western Horizon

Zenith (*overhead*)

Halfway between Zenith and Northern Horizon

Follow-Up Activities

1. Have the students locate the constellations in the sky at night and draw in more stars for each constellation they can find.
2. Have the students draw the SHAPE and POSITION of the moon on their star maps each night for a period of two weeks. Instruct them to show where the moon is located in comparison to the stars and constellations. Look on a calendar, in a newspaper, an astronomical magazine, or call your local planetarium to find out when the crescent moon will start to appear so the students can begin their observations.
3. An activity in which students use the constellations to make "Star Clocks" is described in ***Earth, Moon, and Stars***, a teacher's guide in the series, Great Explorations in Math and Science (GEMS). For a brochure and order form write to: GEMS, Lawrence Hall of Science, University of California, Berkeley, CA 94720.
4. Try out ***Sky Challengers***, a set of activities for stargazers in the form of interchangeable star "wheels" which can be set for any season at any time of night (like a planisphere). They are available at Discovery Corner, Lawrence Hall of Science, University of California, Berkeley, CA 94720. Edna DeVore of Independence Planetarium in San Jose, CA has made a nice adaptation of ***Sky Challengers*** in her "Do It Yourself Star Finder" which is available from Learning Technologies, Inc., 40 Cameron Avenue, Somerville, MA 02144, 800-537-8703.
5. Use this unit as an introduction to social studies activities using maps. The Elementary Science Study (ESS) unit on ***Mapping*** provides a large number of different activities. ESS is out of print, but copies may be in your school library and permission to reproduce may be obtained from Educational Development Center, 55 Chapel St., Newton, MA 02160, 617-969-7100.
6. Gerald Mallon of the Methacton School District Planetarium recommends further activities in ***Igniting Creative Potential*** by Project Implode, Bella Vista Elementary School, Salt Lake City, UT.
7. Jeanne Bishop at the Westlake Public Schools Planetarium recommends additional activities in the Science Curriculum Improvement Study (SCIS) unit "Relative Position and Motion," published by Delta Education, Inc., P. O. Box M, Nashua, NH 03061, 800-258-1302.