

Glass Rods

Objective: Experience a discovery activity using the alphabet.

Materials: Symmetry Chart Information Sheet Transparency
One typed red sentence per group
One typed black sentence per group
One solid glass stirring rod per group
A few red pens

Procedures:

1. Pass out a typed phrase to each group. The following phrases should be typed in upper case with the second word of each pair in red.

CARBON DIOXIDE
RAW HIDE
WHY DECIDE
TIGHTLY BOXED

2. Instruct each member of each group to take a turn reading the phrases through the glass rod. Tell them to place the glass rod directly on top of one of the phrases, and then to slowly raise the rod slightly above the phrase until the letters focus. Tell them that this is a "loud/quiet" activity. You want them to discuss it within their group, but quietly enough so that other groups cannot hear their hypothesis. Ask each group to decide (1) what happens, and (2) why it happens. Tell them that you will move among the groups and let them ask you questions, and tell you their hypotheses, quietly, so that other groups cannot overhear their ideas. If a group says that it may have something to do with the one part of the phrase being typed in red, quickly offer them a red pen to test this hypothesis. If they explain that all of the letters in the readable part of the phrase are horizontally symmetric, or say something like "the letters in the red word are the same on the top as on the bottom", say something like: "I wonder? Try to make sentences using some of these kinds of letters to test your hypothesis."
3. When all of the groups have had ample time, ask for a volunteer to state why one word of the phrase can be read and the other cannot. When one of the participants says that it is because all of the letters in the red word are symmetrical, or if they explain it in layman language, agree and further explain that they indeed have a horizontal line of symmetry. The solid glass rod acts a mirror. Since the letters are horizontally symmetric their reflection is congruent to the original letter. It does not matter if the letter is flipped over, or not, it still appears the same. The letter H is such a letter. Demonstrate this by writing a capital, block letter H on the

overhead. Draw a dotted line through its center horizontally. Ask them if they can fold this letter on this horizontal line, in their minds, and see that the top of the letter would fit exactly on top of the bottom of the letter, if folded. Go on to explain that the letter H also has a vertical line of symmetry. Draw a dotted line down its center, vertically. If the letter H was folded along this vertical line both halves would lay exactly on top of each other. Therefore, the letter H has two lines of symmetry: a horizontal line of symmetry, and a vertical line of symmetry.

SYMMETRIC MEANS THAT A FIGURE CAN (1) BE DIVIDED INTO TWO CONGRUENT PARTS THAT (2) WILL FIT EXACTLY ON TOP OF EACH OTHER IF FOLDED ALONG THE LINE OF SYMMETRY.

4. Use the "Symmetry Chart Information Sheet" transparency and have the participants decide which capital letters of the alphabet are horizontally symmetric, which ones are vertically symmetric, which are both vertically and horizontally symmetric, and which ones have no lines of symmetry. Discuss the fact that sometimes it depends on how a letter is written, or typed, with its legs meeting at a point in the middle of the vertical line of symmetry it is horizontally symmetric. If it is written, or typed, with the bottom leg connected to the top leg, rather than the vertical line, it is not symmetric. Ask the participants if they agree on the lists you have compiled on the overhead. If there is no argument on which heading the letters have been placed under, then go to the next step, which is a challenge to each of the groups.
5. Challenge the groups to make words, then sentences that can be read through the glass rods. See which group can construct the longest sentence using only horizontally symmetric letters. Stress that students doing this activity would also reinforce an English lesson: a sentence must have a noun and a verb. Have one of the participants from the group constructing the longest sentence write it on the overhead, and have each group copy it down in neat, block letters, and test it under the glass rods. Give the winning group either applause or a prize.

Notes:

1. If it looks as though you may be pressed for time you could just explain how the challenge (step number five above) could be done in the classroom, but not actually go through it with the participants. If you have time this is a fun addition to the glass-rod activity.
2. Glass rods can be obtained through most science supply companies.
3. The activity Paper Folding Pinwheels can be used as a focus activity instead, and the symmetry of letters activity can be done either before or after the geoboard activities.
4. Check this out. DID EDDIE IKE HICKOCK COOK DICED OX HIDE

SYMMETRY OF THE LETTERS OF THE ALPHABET

Instructions: Place each letter of the alphabet under the appropriate heading.

HORIZONTAL	VERTICAL	BOTH	NOT SYMMETRIC

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