



THE THREE BILLY GOATS GRUFF

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The three Billy Goats Gruff are happy eating grass on their hillside until one day they look across the stream and see another hillside; this one is even grassier and has flowers! In order to cross the stream they need to use a bridge. BUT under the bridge lives a mean, old troll who likes to eat billy goats! And they're not sure how sturdy the bridge is, so they decide to have the little billy goat go first to test things out. Each time the troll asks, "Who's that tripping over my bridge?" The billy goats are able to convince him to wait for the next billy goat. Of course, he makes a big mistake when he waits for the big Billy Goat Gruff to come across. Next thing he knows, he's in the water, all three billy goats are across the bridge, and he's still hungry!

To transition to these activities, talk about the bridge that the goats crossed over. Remind the children that although the billy goats had a plan for dealing with the troll, the whole thing would have ended quite differently if the bridge hadn't held their weights. The littlest billy goat might have made it across, but what about the middle Billy Goat Gruff? Or the big Billy Goat Gruff?

MATERIALS: Activity #1: pictures of bridges, several large bags of small gumdrops, multicolored round toothpicks, measuring tapes, 1 paper cup per child, pennies or other "weights", two 3" wooden blocks for each child for support at end of bridge span.

Activity #2: two pieces of corrugated cardboard (each about 12" x 12"), 100 five-ounce paper cups per team, five playing cards per team.

ACTIVITY #1. Gumdrops bridges: (This activity was taken from the winter 2000 issue of Scientific American Explorations, pp. 40-42. It is similar to one of the activities for Hansel and Gretel.) Models provide engineers with clues about how strong and stable a life-size structure will be. Use toothpicks and gumdrops to build a few models in various shapes to show the children; include squares, triangles, cubes, and pyramids. Pass around the models for the children to examine. Have them compare the sturdy triangular models to the more wobbly rectangular ones. Hand out the toothpicks and the gumdrops. Give the children a few minutes to play around with them, and then challenge them to make the longest bridges they can. When they

are done they can use their measuring tapes to determine which framework is the longest. Have the children evaluate the various bridges and predict which will be the strongest and, if possible, why. Next have them test the structures for strength. Be sure the children realize their models will be tested to the breaking point! Support each end of the bridge on a block and place the cup in the center of the span. Keeping a record of how many pennies they use, have the children add pennies, one at a time, until the bridge collapses. Record total amount of pennies for comparison. Have them evaluate their predictions in light of the results.

ACTIVITY #2. Bridge Crawl: (This activity also was taken from the Winter 2000 issue of Scientific American Explorations, pp.40-42.) Engineers construct bridges so that heavy loads are distributed among several supports. The supports work together to hold a weight they could not support individually. Move all furniture to the sides of the room. Before they start, mark a starting line and finish line on the floor with masking tape (about four feet apart for younger children; for older children you can stretch the distance up to about eight feet). Divide the players into groups/teams of three. Mix up the cards and have each player choose one of the five cards. The player with the lowest card (ace is low) will be the bridge walker. The other two will be bridge builders. Using the two pieces of cardboard and the paper cups, the bridge builders must build platforms to get the walker from the starting line to the finish line without touching the floor. They do this by arranging the cups upside down and laying a sheet of cardboard across them. Then the walker carefully steps onto the platform. If the platform collapses, the builders try again. (They can add or reposition cups but cannot reuse any crushed cups.) Each team has enough cardboard to build only two platforms, so, as the walker moves from one platform to another, the builders must continually move the cardboard from behind him out ahead. This can be a tense, slow race. Allow plenty of space between groups. If time permits, or on another day, have them redraw for functions (each person should be the walker only once). Have them talk about which number and arrangement of cups worked best.

TEACHER NOTES: See additional bridge ideas in the Minou activity in the Physics section. There is an AIMS Guide UNDER CONSTRUCTION © 1997 AIMS Education Foundation which has a great activity highlighting the Three Billy Goats Gruff. The website is www.aimsedu.org. The AIMS Education Foundation (AIMS - Activities Integrating Math and Science) is "a non-profit foundation dedicated to helping you help kids learn math and science. When your textbook isn't enough, or you need tools for differentiated instruction, let us help you with hands-on teaching".

STANDARDS:

BSL: 1.3, 1.4, 1.7, 1.11, 2.2, 3.3, 3.4, 8.1, 9.1, 9.5, 9.7, 11.1, 11.2, 12.1, 12.3, 12.5

NCTM: 1a, 1c, 2a, 3b, 4d, 4e, 10a, 11a, 11c

SCS: A1, B1, E2, E3, H2, H5

Asbjornsen, Peter Christian, and J.E. Moe. Three Billy Goats Gruff. NY: Harcourt Brace, c1991. ISBN#0156901501

Dewan, Ted. 3 Billy Goats Gruff. NY: Scholastic Inc., c1994.

ISBN#0590205153 (modernized!)

The Three Billy Goats Gruff. Retold by Ellen Rudin. Illus. by Lilian Obligado. NY: Golden Book, c1982 ISBN#0307101177

The Three Billy Goats Gruff: A Norwegian Tale. Illus. by Ellen Appleby. NY: Scholastic Inc., c1994. ISBN#0590411217 (less words)