

DAM CONSTRUCTION CHALLENGE (5 HOURS OF CLASS TIME)

Procedure:

- 1.) Share the Dam Google Slides with the kids.
 - a.) Encourage students to look at shapes, materials, etc. and to think about the function of a dam.
- 2.) Read "Student Resource: Dams" from <http://tryengineering.org/lessons/engineeradams.pdf>
- 3.) As a class, view <http://www.pbs.org/wgbh/buildingbig/dam/basics.html> Talk about the different types of dams.
- 4.) Look at the handout showing the forces exerted upon and by different types of dams. (Handout follows procedure in this packet.) Discuss the forces acting on each type of dam.
- 5.) Ask the students what types of dams they could actually build in the classroom. Have them explain their logic.
- 6.) Present the testing and construction scenario to the class.
- 7.) Allow one hour for the initial testing.
- 8.) Give students time to discuss the results of their tests and plan their new dam design.
- 9.) Give students 40 minutes to build their dams.
- 10.) Test the dams as a class.
- 11.) Discuss features that contributed to dams' success or failure.
- 12.) Have students complete reflection paper.

Materials:

- One plastic shoebox per group
- One one-quart bucket per group
- Sand
- Soil
- Plasticine clay
- Pebbles
- Popsicle sticks

THE SCENARIO

It's an El Niño year...so there's going to be a lot of rain. You are a structural engineer tasked with building a dam to prevent runoff on Sun Valley Hill from destroying Ms. Carter's room. (Oh no!) You may only use materials provided in the classroom *AND* you will need to stick to a budget.

Of course, since you are a good scientist, you wouldn't start building your final dam without knowing how the materials perform, so first you need to do some tests! You will pour two cups of water on one side of a dam constructed of each of the six building materials, and measure the time it takes for water to begin to seep (to pass, flow, or ooze gradually through a substance). Graph this data on the attached form. Then, you will use this information and a pricing schedule to decide what materials you would like to purchase to construct your dam.

THE TESTS

You will construct simple embankment dams using two cups of each of the provided construction materials, building with one material at a time, so that you can measure the time it takes for two cups of water to visibly seep (flow or leak slowly through) through the dam. Carefully record your seepage time on the chart below.

MATERIAL	SEEPAGE TIME (IN SECONDS)
soil	
gravel	
clay	
sand	

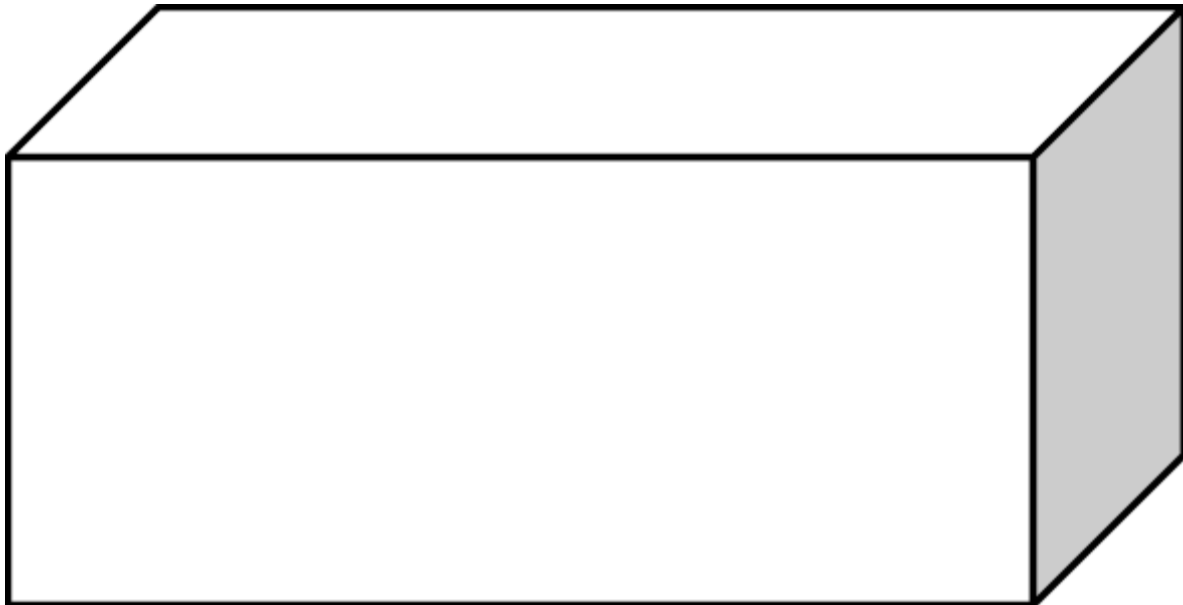
THE CONSTRUCTION CHALLENGE

Now that you've tested your materials, it's time to design your bridge and pick what combination of materials you feel will be most effective in constructing your dam. Keep in mind, cost is a factor. As a good engineer, you need to deliver a strong dam that is within your client's budget. For this task, you will be given \$5,000.

Prices below are per pint of material, unless otherwise indicated.

MATERIAL	COST
soil	\$500
gravel	\$500
clay (per 4 oz)	\$1,500
sand	\$1,000
popsicle sticks (per 10 sticks)	\$250

Sketch your dam plan below:



HOW DO FORCES AFFECT DAMS?

Look at the arrows to see the way forces are exerted on these four different types of dams. Can you draw a line to match each picture to a text description below?

(Arrows indicate the direction of forces acting upon the dam or produced by the dam itself.)



Gravity Dam: Forces

Water pushes against the gravity dam, but the heavy weight of the dam pushes down into the ground and prevents the structure from falling over

Buttress Dam: Forces

Water pushes against the buttress dam, but the buttresses push back and prevent the dam from toppling over. The weight of the buttress dam also pushes down into the ground.

Embankment Dam: Forces

Water pushes against the embankment dam, but the heavy weight of the dam pushes down into the ground and prevents the structure from falling over.

Arch Dam: Forces

The arch squeezes together as the water pushes against it. The weight of the dam also pushes the structure down into the ground.

Name: _____

REFLECTION QUESTIONNAIRE

Think back on your group's dam. What is one feature of your construction plan that you think worked well? Explain why you feel this way.

What is one feature of your group's dam that you feel was not helpful in protecting Ms. Carter's classroom?

If you were to rebuild your dam, what is one design feature you would change? Why?
