



Drexel-SDP GK-12 ACTIVITY

Activity: Building Bridges

Subject Area(s) Landforms
Associated Unit Landforms, module 1
Associated Lesson embedded
Activity Title Building Bridges
Grade Level 6 (3-8)
Activity Dependency None
Time Required 50 minutes
Group Size 2
Expendable Cost per Group approx. \$2

Summary

Students were given a brief lesson on what civil engineers do and different types of bridge structures. A demo of a basic paper bridge was done, with a piece of paper across two stacks of books. The students were asked to guess how much weight (#of pennies) it would hold. After testing the bridge, they were challenged to build their own bridge.

Engineering Connection

Civil engineers must design around landforms all the time. Bridges, dams and levees must be built around water (aqueous) formations. Bridges, roads and tunnels must be built around mountains. Civil engineers also make use of maps to perform their job, just as students are learning how to read and interpret maps in their science lessons.

Keywords

Landforms, civil engineer

Educational Standards

- Science:4.2.7 Renewable and non-renewable resources, A. Know that raw materials come from natural resources, B. Examine the renewability of resources, 3.1.7 Unifying themes, C. Identify patterns as repeated or recurring elements in science and technology., 3.2.7 Inquiry and Design, B. Apply process knowledge to make and interpret observations., 3.4.7 Physical Science, Chemistry, and Physics, A. Describe concepts about the structure and properties of matter
- Math: 2.5-Mathematical Problem Solving and Communication, E. Develop problem solving strategies (drawing a picture or a diagram), 2.6- Statistics and Data Analysis, A. Organize and display data using pictures, tallies, tables, charts, scatter plots, bar and circle graphs, 2.8- Algebra and Functions, B. Discover and describe patterns including linear, nonlinear relationships, D. Represent relationships using pictures, words and tables

Pre-Requisite Knowledge

None.

Learning Objectives

After this lesson, students should be able to:

- Define a civil engineer
- Identify two types of examples of bridge building

Materials List

- Paper (8.5x11 plain paper)
- Pennies (2 rolls of pennies per group)
- Students should have their notebooks & pencils to record results
- Textbooks or books of similar size to create bridge
- *Laptop/computer & projector for power point
- *Hand-out copy of the power point slides for students to take notes

- *Optional materials

Introduction / Motivation

Review the embedded PowerPoint slides with the students, discuss the vocabulary, then begin the activity.

Vocabulary / Definitions

Word	Definition
Civil engineer	Plans, constructs and maintains fixed structures or public works.
Beam bridge	Horizontal beam supported by piers
Truss bridge	An assembly of triangles.

Arch bridge	Concrete or steel arches supporting a bridge
Suspension	Raised cables supporting a bridge structure – largest span of any bridge.

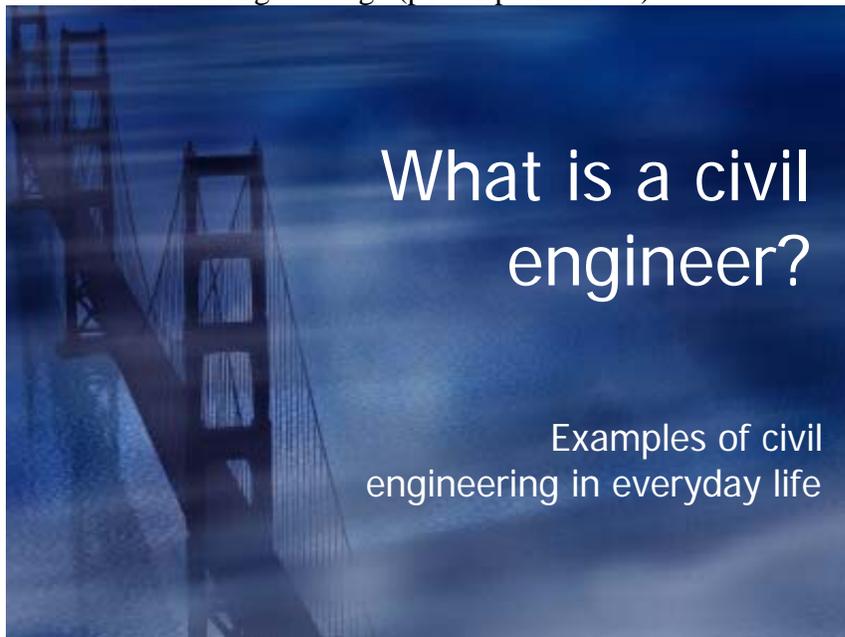
Procedure

Background

Students were given a brief lesson on what civil engineers do and different types of bridge structures. A demo of a basic paper bridge was done, with a piece of paper across two stacks of books. The students were asked to guess how much weight (#of pennies) it would hold. After testing the bridge, they were challenged to build their own bridge.

Before the Activity

1. What is civil engineering? (power point slides)



Example: Bridge building

- ◆ Beam bridge- horizontal beam supported by piers



- ◆ Truss bridge- an assembly of triangles



- ◆ Arch bridges - most are concrete or steel



- ◆ Suspension - largest span of any bridges

Civil Engineering

is a broad field of engineering that deals with the planning, construction, and maintenance of fixed structures, or public works

A photograph of the Golden Gate Bridge in San Francisco, viewed from a low angle looking up at the tower and cables. The sky is a deep blue.

How does civil engineering relate to landforms?

- ◆ Civil engineers design around landforms
 - ◆ Water: bridges, dams, levees
 - ◆ Mountains: bridges, roads, tunnels
- ◆ Use maps!
 - ◆ Topography
 - ◆ Aerial
 - ◆ Road/transit

A photograph of the Golden Gate Bridge in San Francisco, viewed from a low angle looking up at the tower and cables. The sky is a deep blue.

So what does that mean?

- ◆ Civil engineers work on:
 - ◆ bridges, roads, railways, structures
 - ◆ water supply, irrigation, the natural environment, sewer, flood control
 - ◆ transportation and traffic
- ◆ Civil engineers make life easier!

With the Students

2. Paper bridge demonstration
 - a. Use two sets of two books stacked and set 8 inches apart

- b. Set a single sheet of paper across the books to create a simple paper bridge.
- c. How many pennies can the bridge hold??
- d. Try it! (add 1 penny at a time)
- e. It will hold 1-2 pennies (if that)
- f. Do you have any ideas how to make a stronger bridge?

Safety Issues

- None

Troubleshooting Tips

Consider the reducing distance between the stacked books if students are having trouble with the strength of their bridge.

Investigating Questions

3. Engineering Challenge: build a paper bridge better than this one!
 - a. Try it!
 - b. Use paper (as many sheets as you want) and count the number of pennies you bridge holds.
 - c. Bridge must be 2 books high and 8 inches wide (distance between books)
 - d. Students should keep a record of what the bridges looked like, how they made them, and how many pennies they held.
 - e. Which design was the best? Why?

Assessment

Pre-Activity Assessment

None

Activity Embedded Assessment

Evaluation is based upon teacher observation of student participation as well as their record of what they did. Emphasis will be based on thought in design as well as thoroughness in recording of their results.

Post-Activity Assessment

Assign a writing activity based upon this lesson.

Activity Extensions

An extension to this activity is to build larger more complex bridges using K'nex kits.

Owner

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Contributors

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