Paper Bridge: Independent and dependent variables

1 Length and Objectives

This activity can take 75-90 minutes. The objective of this lesson is for the students to plan, design, and implement their design for a free standing paper bridge that will hold the most pennies. Students will also learn how to create their own independent variable and see how it changes the dependent variable.

2 Materials

- Standard printer paper
- 250+ pennies per group
- 10 inches of Scotch tape
- One 12 fluid ounce paper cup per group
- Scissors
- Two tables which the same height -OR- two paper bowls turned upside down.
- Ruler

3 Grade Levels and Topics

- Optimal for grade 6, however the lesson could easily be modified for higher grade levels.
- This lesson focuses on the topic of using variables to represent two quantities in a real-world problem that change in relationship to one another.
- Independent and dependent variables.

4 Procedure

1. Students will get into groups of three.
2. Give each group the materials listed above.
3. Instruct the students that they are to build a bridge out of one sheet of printer paper that will be able to hold at least 13 pennies inside the 12 oz. paper cup. The bridge will be connecting two tables that are 13 inches apart. The tape CANNOT be used to connect the bridge to the tables.

4. Make sure the students write down the maximum number of pennies that their design is able to hold.

5. Once each group has succeeded the task or after 30 minutes, have each group present their designs to the class. Have them talk about any flawed designs they may have tried, how many pennies was their bridge able to hold, and how they could improve on their design.

6. Now the students will go back to their groups and come up with a plan to optimize their design. Each group will need to decide on a variable of their bridge construction (i.e. Number of corrugations, width of the bridge, etc...). Then they will create two designs, one with that variable increased and another with that variable decreased and see how it changes the carrying capacity of their bridge.
5 Examples

Here is one example of where the design used corrugations and the variable $x$ we increased was the number of corrugations.

$x = 4$

$x = 9$

Other example:

- Rolling the paper up diagonally into a tube and the independent variable is the number of tubes.