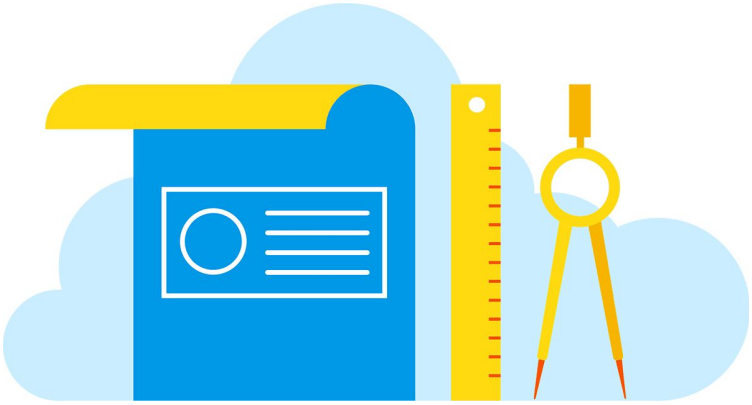

Balsa Bridges and Financial Literacy

Grades 6-8

Teacher: Jordan Cougar LAB - CM

Date: 09/04/2019

Overview & Purpose

Provide the lesson title and a short (3-4 line) purpose statement expressing your vision for this lesson.

This lesson will help students learn financial literacy skills while doing a Balsa Bridge Building Project for an Exploring Engineering class. Students will learn budget skills and how to make cost effective designs. This will help prepare them for personal financial decision making and for financial decision making in an engineering and design context.

Objectives

List your 3-5 objectives. Specify the new skills that the students will gain as a result of the lesson. What will students have learned or experienced by the end of the lesson?

1. Work within a budget to complete a design objective.

2. Modify a design to make it more or less expensive to build while still meeting minimum performance standards.
3. Modify a design to increase cost effectiveness. For the bridge project this would be based on ratio of weight bridge can hold divided by the cost of the bridge.

Materials Needed

What items do you need to complete this lesson? Please include items you requested in your project as well as anything else you used to bring this lesson to life.

1. Balsa Wood Strips
2. Wood Glue
3. T-pins
4. Balsa Wood cutters (Pitsco Lumberjack)
5. Foam boards
6. Wax paper
7. Digital scale to weigh models
8. Hanging scale to measure the amount of weight bridge can support.

Verification

What 3+ steps did you go through to make sure that your students understood the concepts you taught in your lesson?

1. Calculate cost for a sample bridge.
2. Brainstorm ways to reduce cost of sample bridge, then recalculate new cost.
3. Use Bridge Design software simulator that has students design a metal bridge and tests its strength and calculates it's cost.

Activity

What activity did you take students through to reinforce the concepts you taught during your lesson?

Students will work in groups to design 2 balsa wood bridges for the competition. You need to give them basic design specs. Sample design specs might be bridge span = 10

inches, roadway width = 2 inches, only use 1/8 inch by 1/8 inch balsa wood and wood glue, and must support at least 20 pounds. There are many online resources for bridge building contests that include sample design specs and how to test bridges. Pitsco Education also sells bridge building activity packs.

Bridge One (Cheapest Bridge): Goal is to build the cheapest bridge (based on total calculated cost of balsa wood and labor) that meets design specs. Teams will want to slightly overbuild since if bridge fails to hold minimum weight they are disqualified. The team with the cheapest bridge that passes the load test (can hold the minimum weight) wins. Winning bridges aren't destroyed, which is nice since you get to keep them to show for open house or as samples for future years.

Bridge Two (Most Cost Effective Bridge): Goal is to build a bridge with the lowest cost per pound ratio. Bridge must pass basic design specs which can be same as for Bridge One contest. Bridges will be loaded with increasing weight until they fail and the maximum weight held will be recorded. This is a destructive test since bridges are loaded until they collapse. It is nice to take photos of bridges before contest in order to see what winning designs looked like. Winner will be the bridge with the lowest calculated cost per pound.

Notes on Cost Sheet:
https://docs.google.com/spreadsheets/d/1mnRbLdbolMNmkQpz3sOmuQ6fXVJeP_CfMDU4EpJ_Ib8/edit#gid=0

Material Costs:

Students need to list each length of balsa they use in their model and calculate costs. Cost is based on $8 per foot of balsa wood in my example.

Labor Costs:

Each unique piece is assessed a $100 labor cost. A piece is unique if it is a different length. This provides an incentive to simplify designs so they don't have lots of different size pieces that need to be cut.

Angled Cut Costs:

Cuts that are 90º (straight cuts) are easy to make and don't incur additional labor costs. Cuts that are angled (22.5º, 30º, 45º, 60º etc) take extra time and incur extra labor costs.

Variations:

If you change the cost per inch, cost per unique item, or cost per angled cut, it will change the strategy needed to win. If doing this project every year, feel free to change those values so winning past designs will no longer be the best.

Related Software:

Bridge Designer 2016 Software - (software simulator for creating bridge designs that also have a pricing scheme embedded)

Free download at http://bridgedesigner.org/download/