Objective: To simulate the design aspects of a Structural/Civil Engineer. To test students’ skills to see if they can design and construct a cost effective structure that meets the specified criteria, on time and within budget. Students will construct a paper structure that will support a standard hard cover textbook at least 12 inches above a flat sturdy surface for a minimum of 30 seconds.

Warm Up: Explain what a blueprint is.

Materials: (For Each Group)

* 10 sheets of typing paper (8 1/2 x 11)
* 10 inches of 1/2 inch wide masking tape
* 12 inch ruler
* scissors
* stop watch
* "Structural Engineering" Worksheet

Background Information:

The structure will be made entirely of paper and masking tape. "Often, specific constraints limit the materials available to engineers".

Paper used for construction shall be standard size typing or notebook paper (8.5 inches wide and 11 inches high). Materials come in standard dimensions from the vendor, engineers must adapt their design to make use of these materials."

You should complete your design and construction within 30 minutes. "Engineers have deadlines that must be met."
Each sheet of paper used during construction will cost $1,000, and each $\frac{1}{4}$ inch of tape will cost $100. Construction materials are not free.

The best design meets the specified objective at the lowest cost.

There will be a cost for all materials used or damaged in construction, even discarded materials.

The structures cannot be load tested before it is declared "complete".

The book may be weighed and measured any time during the construction of the structure. Engineers investigate the maximum loads that the structure must support.

**Procedure:**

Explain directions from above BACKGROUND INFORMATION. Students will have only 30 minutes to design and construct their structure. They may only use paper and masking tape to build. Each piece of paper costs $1,000 and each $\frac{1}{4}$ inch of tape costs $100. The best design meets the specified objective at the lowest cost.

Students will construct a paper structure that will support a standard hard cover textbook at least 12 inches above a flat sturdy surface for a minimum of 30 seconds.

1) Give students 30 minutes to brainstorm design concepts and then begin constructing their structure. They can create a square, tri-pod, circular - whatever they think will work the best.

2) To load test each structure:
   - Place structure on sturdy level surface
   - Gently place textbook on paper structure
   - Start timer (book must be supported for at least 30 seconds)
   - Measure to insure that the book is supported at least 12 inches off the flat surface

3) Students will keep track of the costs and the amount of time each structure held the load on the “Structural Engineering” Worksheet.

4) Students will review “Structural Engineering” Worksheet Data and decide which groups structure was the most efficient and cost the
least amount of money and record this on the bottom of the worksheet.

**Evaluation:** Observation of group work and review of "**Structural Engineering**" Worksheet.
Below record each group's final cost of materials and the amount of time that their structure was able to hold the load.

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<th>GROUP NAME</th>
<th>FINAL COST OF MATERIALS</th>
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Which group(s) structure cost the least and supported the weight for at least 30 seconds??