

Grade 9 Integrated Technologies

Straw Tower Design Process

Design Challenge

Using a limited amount of straws* , paper and a reasonable amount of tape, construct tower that will support a text book on the top. The bridge must meet the following specifications:

- It must support the size and weight of a text book
- The tower's height must be 2 straws high.
- You must have a platform for the book to rest on AND You may use paper only for the platform.
- The tower and balanced book must stand on its own. You may not hold it.
- Tape can only be used to join the straws, or straws to the paper. It may not be used structurally. For example, wrapping the tape around each straw ten times will give it added structural support and may not be allowed.

* The amount of straws will be determined by your teacher and every group will get the same number of straws.

Background (Research)

- Triangles are stronger than squares.
- Triangles make up trusses used in constructing buildings.

Solutions (Brainstorming)

Using the following considerations, answer the following questions in the space provided.

If you insert one straw into another, how will you ensure that the tower is 2 straws long?

What will you do to join the straws together?

What kind of platform will support the book?

Thumbnail Sketches

On a separate sheet of lined paper, entitle "Thumbnail Sketches: Tower Design". draw a minimum of 3 thumbnail sketches of possible tower designs. Vary your ideas. Number your thumbnail sketches.

(See Rubric: Thinking & Inquiry)

Best Solution (Choosing a possible and probable solution)

On the right hand side of the page with the thumbnail sketches, put the title, "Best Solutions: Pros and Cons Lists" across the top. For each thumbnail sketch, make a separate "Pros and cons" list. Here are some things to consider.

- Will there be enough straws?
- How well does your tower balance compared to other designs?
- How strong is your tower compared to other designs?

(See Rubric: Thinking & Inquiry)

-Planning

Drawing

Using the single side of a sheet of paper, draw a 3d design of your final idea for the new tower. Label the different parts using terms like truss, base, platform or anything that would help the understanding of the tower. Use pencil and a ruler. Use the entire side of the sheet of paper. The drawing should be done such that anyone can pick it up and understand how the tower is assembled. After the drawing, you may choose to build your own tower or work with a partner.

(See Rubric: Application Part I)

Step by Step Instructions

Do this after the tower has been built and tested. On a separate sheet of paper entitled, "Step by Step Instructions", write instructions of how to build the straw tower that you or your group created. Number each step. Use thumbnail sketches to supplement your instructions. Anyone should be able to read your instructions and create the tower that you made.

What part of the tower will you make first? (Describe and draw in the space provided on the right.)

Second? (Describe and draw).

Third? (Describe and draw).

Fourth? (Describe and draw).

(See Rubric: Application Part 2)

Production (Making your design)

Together with your partner, use the materials provided to create your tower.

Test

- Test the strength of your tower by placing it between two tables with only 2 centimetres overlapping the table on each end.
- Carefully place a 1 pound weight in the centre of the tower. Remove the weight and place a 2 pound weight in the centre.
- Why not? Add the one pound weight on top of the 2 pound weight.

Evaluate

Write a report on your tower using the criteria outlined in the evaluation scheme.

(See Rubric: Communication)

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Straw Tower Evaluation

Thinking and Inquiry

Solutions: Thumbnail Sketches Rubric

Using a separate sheet of paper, draw a line down the middle. On the left side put the title "Solutions: Thumbnail Sketches. On the right side, put the title "Best Solutions: Pros and Cons".

Draw 3 thumbnail sketches of possible tower designs. Vary your ideas. Number your thumbnail sketches.

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
Thumbnail sketches are limited in neatness: Difficult to understand: Limited variety of ideas	Thumbnail sketches are somewhat neat: Somewhat easy to understand: Some variety of ideas	Thumbnail sketches are considerably neat: Considerably easy to understand: Considerable variety of ideas	Thumbnail sketches are neatly drawn: Easily understood: Variety of ideas: Pencil used

Best Solutions: Rubric for Pros and Cons List

On the right hand side of the page with the thumbnail sketches, put the title, "Best Solutions: Pros and Cons Lists" across the top. For each thumbnail sketch, make a separate "Pros and cons" list. Here are some things to consider.

- Will there be enough straws?
- How well does your tower balance compared to other designs?
- How strong is your tower compared to other designs?

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
List is limited in its investigation	List is somewhat thorough	List is considerably thorough	List is thorough

Application Part 1

Using the single side of a sheet of paper, draw a 3d design of you final idea for the new tower. Label the different parts using terms like truss, base, platform or anything that would help the understanding of the tower. Use pencil and a ruler. Use the entire side of the sheet of paper. The drawing should be done such that anyone can pick it up and understand how the tower is assembled. After the drawing, you may choose to build your own tower or work with a partner.

Drawing Rubric

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
Plan's neatness is limited: Details in the plan are limited: Limited use of a full sheet of paper utilized: Drawing is difficult to understand	Plan is somewhat neat: Some details are included in the plan: Some of the paper is utilized: Drawing is somewhat easy to understand	Plan is considerably neat: Most details are included in the plan: Most of the sheet of paper is utilized: Drawing is considerably easy to understand	Plan is neatly drawn using a pencil and a ruler: All details are included in the plan including labels: Full sheet of paper utilized: Drawing is easily understood

Application Part 2

Step by Step Instructions Rubric

Do this after the tower has been built and tested. On a separate sheet of paper entitled, "Step by Step Instructions", write instructions of how to build the straw tower that you or your group created. Number each step. Use thumbnail sketches to supplement your instructions. Anyone should be able to read your instructions and create the tower that you made.

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
<p>Instructions limited in their logic;</p> <p>Steps are accounted in a limited way;</p> <p>Sentences are limited in their completeness;</p> <p>Thumbnail sketches are limited in their appropriateness</p>	<p>Instructions are somewhat logical and easy to follow;</p> <p>All steps are accounted with considerable omissions;</p> <p>Sentences are somewhat complete;</p> <p>Thumbnail sketches are somewhat appropriate</p>	<p>Instructions are considerably logical and easy to follow;</p> <p>All steps accounted with few omissions;</p> <p>Sentences are considerably complete;</p> <p>Use of thumbnail sketches are considerably appropriate</p>	<p>Instructions are logical and easy to follow;</p> <p>All steps are accounted;</p> <p>Sentences are complete;</p> <p>Thumbnail sketches are used appropriately</p>

Communication

Having built the straw tower, you will write a report discussing how well you did and what you would improve. Write a minimum of one paragraph each. Skip lines between paragraphs.

1) How did your structure meet each aspect of the design challenge? Refer to each aspect of the Design Challenge in your answer.

- It must support the size and weight of a text book
- The tower's height must be 2 straws high.
- You must have a platform for the book to rest on AND You may use paper only for the platform.
- The tower and balanced book must stand on its own. You may not hold it.
- Tape can only be used to join the straws, or straws to the paper. It may not be used structurally. For example, wrapping the tape around each straw ten times will give it added structural support and may not be allowed.

2) Assuming you are given the same amount of material, how could you improve your second tower design?

3) What advise would you give someone who is about to start this project?

Evaluation Report

Level One	Level Two	Level Three	Level Four
10 11	12 13	14 15	16 18 20
<p>Paragraph structure is limited;</p> <p>Limited use of good grammar in sentences;</p> <p>Analysis is limited in its scope</p>	<p>Paragraph structure is somewhat proper;</p> <p>Sentences have somewhat correct grammar;</p> <p>Analysis is somewhat thorough</p>	<p>Paragraph structure is considerably proper;</p> <p>Sentences have considerably correct grammar;</p> <p>Analysis is considerably thorough</p>	<p>Proper paragraph structure used;</p> <p>Sentences are grammatically correct;</p> <p>All questions are thoroughly answered</p>