Spaghetti Bridge Design Project Outline

Task:

To use the design process to **plan, build and test the most efficient bridge using only spaghetti and glue.**

Criteria:

**Groups** – student choice, 1-3 people

**Class time to plan / build** – 3-4 classes

**Materials:** Spaghetti (unlimited), glue (white / stick), elastic bands to help build (removed before testing), water, scissors, paint / glue, pail, sand

**Bridge Design:**

* **Brainstorm / Draw out** a plan before building**. Include at least 2** of the **structural components /strengthening methods** discussed in class.
* **Span** 1 ft, 12 inches or 30 cm
* **Unsupported and free standing** (not connected to anything else).
* There must be a **platform in the center of the bridge** to place the handle of the bucket on!
* **Max weight of bridge:** 3 lbs

**Testing: Calculate the structural efficiency**

The bridge will be **weighed before testing**, using a balance scale / spring scale / digital scale.

An empty 5 gallon pail handle will be place on a platform in the **center of the bridge**, and sand will slowly added by members of the group until failure occurs.

The **weight of the pail & sand** will be measured **after failure** occurs, and efficiency can be calculated.

Assessment:

**Design Report including:**

* *Problem / challenge* – explain what designed and why
* *Criteria* – rules about function, content, etc.
* *Brainstorming –* parts to include / make & reasoning
* *Planning* – drawing / plans for bridge (before building), steps to build and materials, safety
* *Testing* (criteria, test used explained)
* *Test results* – bridge weight & force held before failure, prediction and actual results, explained
* *Evaluating / Improving* – reflection, compare photos of bridge before and after testing (completed individually)

Spaghetti Bridge Design Project Outline **Name(s):**

**Problem / challenge:**

Explain your task in the space below.

**Criteria:** Write down the rules you must follow in designing your product in your own words.

**Brainstorm:**

* Include a **list of ideas / pictures** of things you might try, making connections with structural components and methods of strengthening materials discussed in class.

**Planning: (on a separate page, staple to this booklet)**

* Narrow your ideas down and draw one **labelled diagram** that you will show your teacher before beginning to build (must include at least 2 component labels).
* List the steps you will use / used to build your bridge.

**Testing:**

1. Explain how your bridge will be tested in your own words in the space below:

**Test Results:**

1. **Take a picture** of your final bridge before testing.
2. **Weigh your bridge** using a balance scale / digital scale / spring scale and record results below:
3. **Predict** what you think will happen during the test, listing specific evidence you may see of fatigue/failure and how much total weight you think your bridge will be able to support before failure in the chart below.

|  |  |  |
| --- | --- | --- |
| **Predicted Evidence of Fatigue:** | **Predicted Evidence of Failure:** | **Prediction for total weight supported:** |

1. **Take a picture** of the bridge after testing is complete.
2. **Record the actual results** of the testing process. Include specific evidence of fatigue and failure, and the actual amount of weight your bridge held in the chart below.

|  |  |  |
| --- | --- | --- |
| **Actual Evidence of Fatigue:** | **Actual Evidence of Failure:** | **Total weight supported:** |

1. Calculate the **structural efficiency** of your bridge in the space below.

\*\*To be completed individually\*\*

**Reflection Questions:**

1. Compare your pictures from before and after testing.

What are some areas of weakness (minimum 2) that you notice on your bridge? Explain how you know, and what you might do differently if you built a similar bridge that would improve these areas specifically.

1. **List & explain at least 3 different forces** that were acting on your bridge during the testing process. Classify each as an internal or external force, and also a static or dynamic force.

|  |  |  |  |
| --- | --- | --- | --- |
| **Force Name** | **Explain (where / how)** | **Internal / External** | **Static / Dynamic** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Group work**:

Explain how you divided the work between the members of the group. List the roles each person had, and why you feel this is a fair way of dividing the work. If it was unfair, this is your chance to explain how much credit each person in your group should receive for the project. \*\* Each person must complete this and hand it in individually.