

Student Writer’s Notebook:

Building Bridges



Physical Science

Bluefield High School

Kerry Richmond, Teacher

Student Name:

The Task:

After researching informational texts on the structure and function of bridges, developing a hypothesis, and conducting an experiment examining live load forces on bridge stability, write a laboratory report that explains your procedures and results and confirms or rejects your hypothesis. What conclusions can you draw?

Task I: Task Engagement

Generate a list of things that you already know about forces. Include what you know about bridges and the weight they support.

 sto

Task Analysis

1. What are you going to write about?
2. How are you going to get the information?
3. What is the final product that you will turn in to your teacher?
4. What do you want to ask your teacher about the task?
5. Re-write the prompt in your own words.
6. What will your teacher need to teach you before you can work on this task? Be specific!

BRIDGE TYPE:

REAL WORLD EXAMPLE:

LENGTH:

WIDTH:

CONVERSIONS TO METRIC

LENGTH:

WIDTH:

SCALED DOWN RATIO AND MEASUREMENTS

**Web Quest: To be completed before beginning your lab**

Directions: These are two websites you can use in addition to many others. Answer the questions that follow.

SITE I: <http://www.pghbridges.com/basics.htm>

Site II: [http://science.howstuffworks.com/engineering /civil/bridge.htm](http://science.howstuffworks.com/engineering%20/civil/bridge.htm)

For each type of bridge, list the following information:

* Main characteristics (use your own words)
* 2 examples of each type of bridge including the name of the bridge, the location, and the span

Beam and Girder types

Main Characteristics:

Example 1:

 Name:

 Location:

 Span:

Example 2:

 Name:

 Location:

 Span:

 Span:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

us



Arch Types

Main Characteristics:

Example 1:

 Name:

 Location:

 Span:

Example 2:

 Name:

 Location:

 Span:

Truss Types

Main Characteristics:

Example 1:

 Name:

 Location:

 Span:

Example 2:

 Name:

Location:

 Span:

**Suspension types**

Main Characteristics:

Example 1:

 Name:

 Location:

 Span:

Example 2:

 Name:

 Location:

 Span:

USE THIS SITE AS A PRIMARY RESOURCE <http://www.pbs.org/wgbh/buildingbig/lab/forces.html>.

Define the following terms in your own words:

Compression

Tension

Bending

Shear

Torsion

Loads

There are seven different types of loads that can affect a bridge. Name and briefly describe each type of load.

Weight of Structure Definition:

Weight of Objects Definition:

How to reinforce a bridge to support more weight:

Soft Soil Definition:

How to reinforce a bridge to account for soft soil:

Temperature Definition:

How to reinforce a bridge to account for temp. changes:

Earthquake Definition:

How to reinforce a bridge for earthquake protection:

Wind Definition:

How to reinforce a bridge to account for strong winds:

Vibration Definition:

How to reinforce a bridge to account for vibration:

Journal Reading

* Skim through the entire article the first time you inspect it.
* Closely read the abstract, introduction, and conclusion
	+ Underline key phrases and write your thinking notes on the left of the page
		- Remember: thinking notes are used to summarize info. in less than 10 words
	+ State how information is relevant to your investigation on the right side of the page
* Identify vocabulary words that are difficult to understand with your partner.
	+ Type words here
	+ Then write the sentence in which the word was located
	+ Then enter 2 clue words in or around the key term
	+ Lastly write your best “guestimate” of what you think the word means

**Video: Modern Marvals-The Golden Gate Bridge**

**Watch the video and answer the following questions:**

**1. What was the purpose of building the bridge?**

**2. What were the safety concerns while the bridge was under construction?**

**3. What is done to keep the bridge updated and up to safety regulations?**

**4. What structural changes have been made to the bridge?**

**5. Why is the bridge painted? How was the color chosen?**

**6. What information from the video will assist you in building your bridge?**

**What’s Going to work? TEAMWORK!!**

* At this point in the module, you need to collaborate with you team and delegate tasks. Consider the following:
	+ What roles will each of you play in constructing the bridge?
	+ Who will record the steps taken as you build? Who will take pictures?
	+ Who will be present for bridge force testing?
	+ Who will ensure that you are collecting enough information to write your formal lab report?
	+ Who will type the report?
	+ Who will proofread the report?
	+ Who will submit the report? (MUST be submitted by email or share on google drive or presented to teacher on flash drive)
	+ Who will revise the report upon receiving feedback from the teacher?
* Use the space below to write your collaboration notes and answer the questions above:

**The Lab Report**

In this experiment your will have an opportunity to apply what you have learned about bridges and forces. The objective of this experiment is to build the strongest bridge possible given a set of predetermined constraints. Each group will present their design to the class and then test the maximum weight that the bridge can hold.

***Constraints:***

* Bridges can not be longer than 55 cm and width must be 10 cm wide. The bridges must be less than 33 cm high.
* The only materials you will have are a knife, working surfaces, ruler, wood, and glue.

***TITLE***

Consult with your group and decide on a title for your report. Write the title in the space below:

*Hypothesis*

 Write the hypothesis for your inquisition in the space below. The hypothesis must include the type of bridge you are building and the relevant terms that you learned from doing the web quest. An *example* of a hypothesis would be “After researching the types of bridges and the forces that they can support, a truss type bridge will support the most weight given the dimensional constraints of construction provided by the teacher. “ (do not copy this hypothesis as it is written)

**Describe the Problem:**

**Entity to be Studied:**

**Independent Variable:**

**Dependent Variable:**

**Overview of Method used to test the hypothesis:**

*Methodology*

What materials will you use for your investigation? Be very specific. Include units if applicable.

\*\*\*NOTE: MAKE SURE THAT EACH MATERIAL IS INCLUDED IN THE METHODOLOGY SECTION

METHOD: How *exactly* will you conduct the investigation from beginning to end? Write this as though someone else is going to replicate your investigation.

Steps:

How will you collect data? (Do not include the data table in this section-just describe *how* the data was collected.)

What photographs can you include in this section? Label each photo as a figure. Assign a number and a title to each figure (i.e. Figure 1 Completed Bridge)

**Use this page to draw your data table**

**Class Data**

Name Location Weight Held (N) Time Held

|  |  |  |  |
| --- | --- | --- | --- |
| 1:  |  |  |  |
| 2:  |  |  |  |
| 3:  |  |  |  |
| 4: |  |  |  |
| 5: |  |  |  |
| 6: |  |  |  |
| 7: |  |  |  |
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| 13 |  |  |  |
| 14 |  |  |  |
| 15 |  |  |  |

**Graph of Class Data**

***Results***

 Summarize your data in paragraph form. Include information relevant to the following talking points:

* Begin with main findings and then describe other relevant results.
* Round numbers to the nearest hundredth (two decimal points).
* As a result of \_\_\_\_\_\_\_\_\_\_\_ force being added to the bridge, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ was observed.
* What was the force required to break the deck of the bridge?
* When you use any tables or figures, refer to them in the text of the results section: e.g., “see Table 1” or “as shown in Figure 1.”
* NOTE: Do not discuss the implications of your results in this section

*Conclusion/Discussion Section*

First, summarize the results and state whether or not they support your hypotheses.

Relate the results to previous research, discussing whether they are similar or dissimilar to previous findings.

Discuss any weaknesses in the design or procedures and how this may have affected your results.

End this discussion by commenting on the significance of your research.

Lab Report Revision Questions

1. Are all parts of the report included (abstract, introduction, methodology, results, conclusion)? Does each section make sense?

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2. Should the order of any sentences be changed?

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3. Are pictures and tables labeled correctly? Are they relevant to the report or do they just take up space?

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4. Does the writer state whether the data supported or rejected the hypothesis?

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5. Do all facts stated appear to be correct?

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6. Has information used from other sources been cited correctly?

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