

Name_____

Bridge Building Activity*

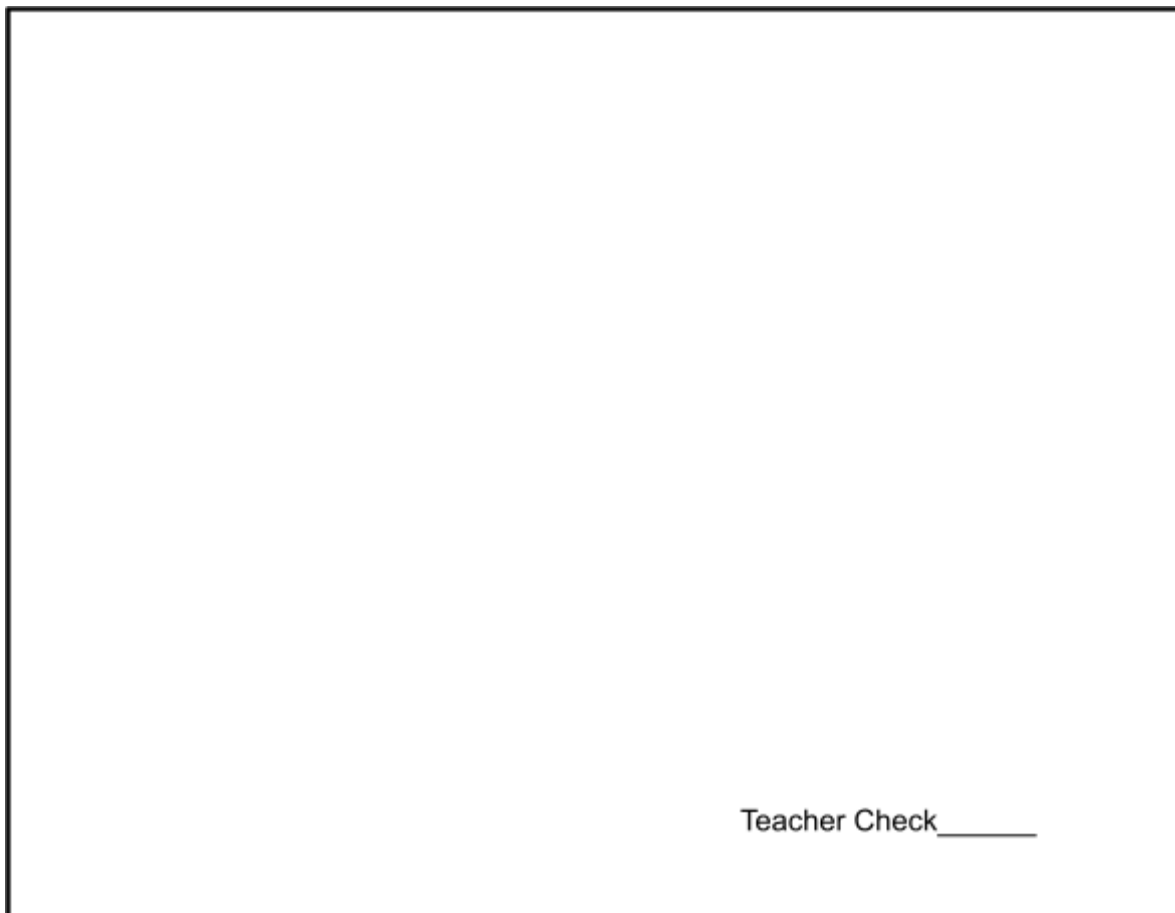
	Level of Understanding Key 3 = Meeting standard 2 = Approaching standard 1= Not meeting grade level standard
Content: Show how the components of a structural system work together to serve a structural function. Provide examples of physical structures and relate their design to their intended use.	
SE -1 Skills of Investigation • Evidence exists that attempts were made to modify design for improvement. • Evidence exists that design was carefully planned, built, tested and redesigned. • Bridge design represents solution to guiding question. • Presentation explains how the bridge structure maximizes the load capacity of the bridge. A discussion of forces is included.	
SE-2 Skills of Analytical Thinking <u>Diagram</u> • -is carefully and neatly drawn with a ruler • -is labeled • -includes labels of materials • -includes top view • -includes side view(s) • Evidence exists that data was analyzed and interpreted during trials to modify prototype	
SE -3 Skills of Evaluation and Communicating • Decision matrix is thoughtfully and correctly filled out • CER contains... ○ an accurate claim ○ evidence from the decision matrix supports the claim ○ reasoning is used to explain how the criteria from the decision matrix supports the claim	
LS - 6 Clearly Explains Thinking	
LS - 7 Attends to detail	

Introduction: Bridges are engineered to withstand weight, while being durable, and in some cases aesthetically pleasing. You will work in teams to design and build your own bridge out of 100 popsicle sticks, 20 straws, 2m of string, tape and glue. Your bridge must have a span of at least 30 cm and be able to hold 1,000 grams. Your team is encouraged to be frugal, and use the fewest amount of supplies while still achieving your goals. Your team will be charged for

additional materials you may need. (Not real money, fake money that will be used to determine how expensive your bridge is.) Your bridge will be evaluated on effectiveness, expense, design and you will present your findings to the class.

Planning Stage: Meet as a team and discuss the problem you need to solve. Then develop and agree on a design for your bridge. You'll need to determine how many popsicle sticks, straws and how much string you will use and the steps you will take in the manufacturing process. Think about what patterns might be the strongest, but you are also being judged on the aesthetics of your bridge! Draw your design in the box below, and be sure to indicate the amounts of the materials you anticipate using. **Show the design to your teacher.** You may need to revise your team's' plan after you receive feedback.

Sketch Bridge Design Below (include **top view, side view and anticipated materials list**)



Teacher Check_____

Construction: Build your bridge. During construction you may decide you need additional materials that you will have to "buy" from your teacher or that your design needs to change. This is fine, **just make a new sketch and revise your materials list.**

Extra Materials "Purchased":

Material	Provided	Quantity Purchased	Quantity Purchased	Total
Straws	20			
Popsicle Sticks	100			
String	2 Meters			

Testing and Evaluation Phase: Complete two to three trials to discover if your bridge can support a load of 1,000 grams or more for one minute. Record the results for each trial below and note any modifications you need to make in the last column. Sketch the bridge with you modifications in the box labeled **Bridge Design Showing Modifications**.

Trial Number/Type of Bridge	Successfully spans 30 cm Yes or No	Mass it Supports	Extra Cost or Under Budget	Attractiveness of Design Rate 1 to 5 5 being most attractive	Notes for modification/explain
1					
2					
3					

Bridge Design Showing Modifications (include top view, side view and anticipated additional materials)

Teacher Check_____

Teacher Check_____

Questions: Answer the questions below in **complete sentences**.

1. Explain how the structure of your bridge successfully met the requirements of spanning 30 cm and supporting at least one hockey puck (1,000 g).

2. What type **of bridge did you build**?

3. Discuss the **shapes, methods of connection**, and **materials you used in your bridge**.

4. What **forces did you observe** acting on your bridge?

5. How was your bridge **anchored**?

6. The attractiveness of a bridge is another factor in design. Describe how the attractiveness of your bridge compared to the rest of the class? What design elements of other bridges did you like the best?

Bridge Data Table

[illegible]

Name_____

Bridge CER

Question: Which bridge was the most successful according to the class data? Explain using data/evidence (numbers, observations) from the Decision Matrix. Be sure to include the bridge type.

[illegible]

Claim-Evidence-Reasoning (C-E-R)

Student Graphic Organizer

★**Question:** Which bridge was the most successful according to the class data? Explain using data/evidence (numbers, observations) from the Decision Matrix. Be sure to include the bridge type.

C

(Claim)

Write a statement that responds to the question.

E

(Evidence)

Provide scientific data to support your claim. Your evidence should be appropriate (relevant) and sufficient (enough to convince someone that your claim is correct). This can be bullet points instead of sentences.

R

(reasoning)

Use scientific principles and knowledge that you have about the topic to explain why your evidence (data) supports your claim. In other words, explain how your data proves your point? (paragraph format)

Claim-Evidence-Reasoning (C-E-R)

Guidelines for Student Graphic Organizer

★Question:

(provided by teacher)

C (Claim) Write a statement that responds to the question. (Be sure to restate the question)	☐ This is not only yes, or no! Do not start a sentence with yes or no! ☐ Do not use personal pronouns, no I, me, we, or my. ☐ State your claim in a direct way. No probably or maybe. Suggested Sentence Starters • It was observed that.....
E (Evidence) Provide scientific data to support your claim. Your evidence should be appropriate (relevant) and sufficient (enough to convince someone that your claim is correct).	☐ The evidence can be numbers or observations. ☐ Include 2 to 3 pieces of evidence. Suggested Sentence Starters • In the data..... • The data shows that..... • According to the data..... • Evidence that supports the claim includes.....
R (reasoning) Use scientific principles and knowledge that you have about the topic to explain <u>why</u> your evidence (data) supports your claim. In other words, explain how your data proves your point? (paragraph format)	☐ Restate your claim ☐ Provide scientific principles/knowledge ☐ Connect the data from the activity to the scientific principles/knowledge you mentioned in Step 2. Explain how your data can be used to prove your claim. Suggested Sentence Starters • Based on the evidence, it must be concluded that....because.... • The most logical conclusion that can be drawn from this evidence is..... because..... • These facts work together to build a case that..... because ... • All of this proves because..... • The reason this happened is..... ☐ Wrap up your reasoning with a conclusion sentence that begins with a word such as "Therefore," "Hence," "Thus," "So," "In conclusion" and restate the claim.