Science Fair Logbook

Name: Usmaan syed

Topic:

Write about the topic you chose. Why did you choose this topic? What do you hope to find out?

I chose the topic of bridges, because I would like to find out which bridge is most stable and which bridge is able to hold the most weight. Another reason I chose this topic is because it seemed very interesting to research and learn about. I hope to find and collect information about different types of bridges and how they were designed to hold a specific amount of weight!

Testable Question

How does _____ affect _____?

What is the effect of _____ on _____?

Which _____ is/does/makes/etc _____?

.
1.Which bridge is the strongest in holding weight?

Background Information

What questions/information do you need to find out about your topic? What is some important vocabulary?

My three types of bridges are:

1. A **truss** bridge is constructed of small triangles to help with stability.
2. A **beam** bridge has a beam with supporting piers underneath it.
3. A **tied arch** bridge has an arch that is attached to the main beam with chords, all of this is then supported by two main platforms at the bottom.

1. What materials are used for these bridges? Words I can use are:

a. **Compression** - A force that pushes a object together so it has less volume so its stronger.
b. **Tension** -A force that pulls an object apart.
c. **Load** - A object that is lifted up or carried.
d. **Pier** - A structure that is above the water that helps people get in and out of boats.
e. **Beam** - A long structure which is supported on dock.
f. **Arch**- A curved structure which supports a building or a bridge.
g. **Stability** - How well a object or a structure can stay together and withstand forces.
h. **Span** - A stretch between two limits.
i. **Engineering** - Knowledge of math and science used to design structures and machines.

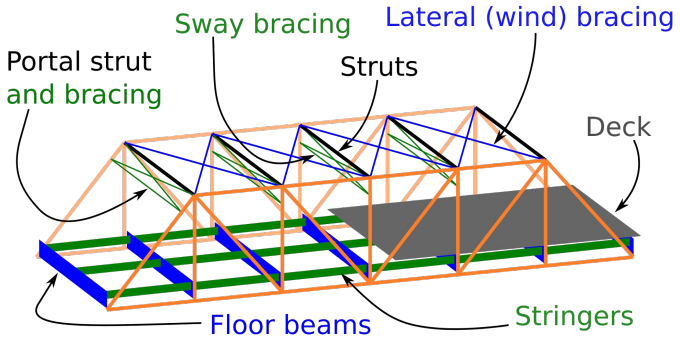
Background Information

Research your topic and write about what you find out IN YOUR OWN WORDS. Add slides as necessary. Make sure to note your sources of information on the Sources page.

My topic is comparing three different bridges to see which one can hold the most weight.

Truss bridge

A **truss** bridge is a strong bridge made of strong triangles the triangles make the bridge very strong these bridges are often made of metal and wood these bridges hold trains and people it also serves as a walkway for the people. Some types of truss bridges are **Warren** truss, **fink** truss, **bowstring** truss and more.What makes a truss bridge strong is it spreads the weight among all of the triangles so it stays strong. Some shapes the truss bridges use are Triangles and squares.

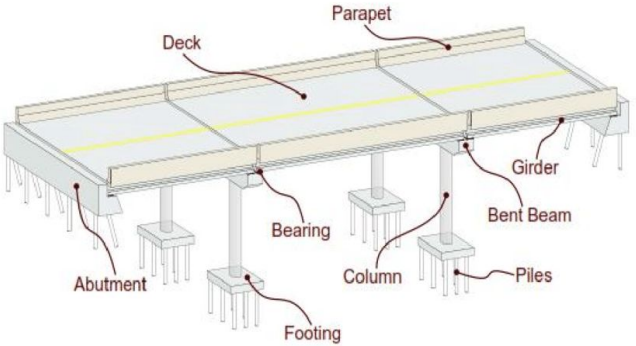


Background Information

Research your topic and write about what you find out IN YOUR OWN WORDS. Add slides as necessary. Make sure to note your sources of information on the Sources page.

Beam bridge

A beam bridge looks simple it's a long plank supported on each end it works by **distributing** the weight among the flat surface and beams.Beam bridges are usually used To cover small distances like small rivers and roads because There easy to build and strong for a everyday use.Some shape That are used in a beam bridge are a rectangles.Some types of beam bridges are **Simple** beam bridge, **Box Girder** bridge, **Cantilever** beam bridge.

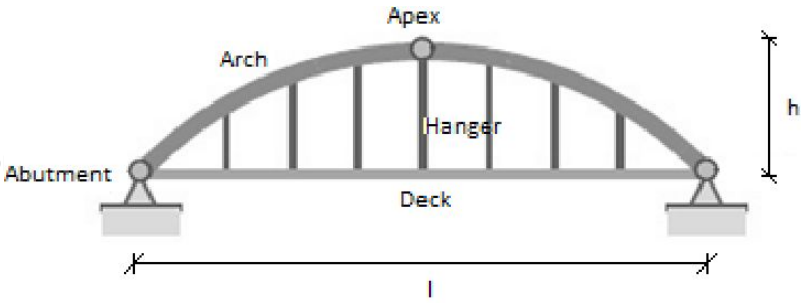


Background Information

Research your topic and write about what you find out IN YOUR OWN WORDS. Add slides as necessary. Make sure to note your sources of information on the Sources page.

Tied Arch bridge

A tied arch bridge is a structure which has a curved shape underneath it the curve or arch helps spread the weight evenly so the bridge stays strong.these bridges are made of stone ,brick or metal they are used to cross rivers, valley o Roads.some shapes the arch bridge uses are arches. the High level bridge is an example of a bridge In calgary.A arch bridge is meant for a sorter span. They are one of the oldest and strongest bridges!



Variables

Manipulated / Independent Variable

ONE thing that you will test/Change :I am changing the bridge design.

Responding / Dependent Variable

The thing I think will change or be affected: The bridges will be affected when i put weight on them.

How will you measure it? : I will measure the bridges by putting weight on them and finding out which one can hold the most weight.I will put weight till two snap.

Sources of Information

Note all sources used - websites, books, experts, etc. (*Google is not a website, follow links to find the page information.) Add slides as needed.

Title	Author	Information (web link, publisher, etc)	Year
Arete structures		https://aretestructures.com/what-types-of-truss-bridges-are-there-which-to-select/	No date
Teach engineering		https://www.teachengineering.org/lessons/view/cub_brid_lesson02	Sept,2024
Britannica		https://www.britannica.com/technology/truss-bridge	Dec,27 2024
Physics forums		https://www.physicsforums.com/threads/bridge-beam-shapes-why-are-they-different.812035/	May,4 2015
Tennessee gov		https://www.tn.gov/tdot/structures-/historic-bridges/what-is-a-truss-bridge.html#:~:text=The%20bridge%20is%20supported%20at,crossing%20it%2C%20and%20wind%20loads.	
Beam bridge		https://www.researchgate.net/figure/Diagram-of-Major-Bri	Nov 2015

Variables

Controlled Variables

Things we have to be very careful to keep the same every time we test so that they do not affect the results/outcome of the experiment:

- The materials we used for each bridge.
- The testing method applied to each bridge -same types of weight, same place for testing.
- The size of the bridges.

Hypothesis

Your prediction, or what you think will happen:

If _____ then _____ because _____.
(I do/change this...) (I think this will happen) (Why?)
*use info from your research or background knowledge to help explain)

If I chose the tied arch bridge **then** the tied arch bridge will hold the most weight **because** the tied arch bridge will spread the weight evenly across the supports.
I believe this because in my research, I found out that the arch bridges are designed to hold most weight and are very stable for shorter span than the beam and the truss bridges.

Materials

What materials will you use for your experiment? Be specific about amounts whenever possible.

- Popsicle sticks
- Hot glue gun
- Glue sticks
- Small weights
- Ruler
- Scissors
- paper

Procedure

List the step-by-step procedure you will follow to conduct your experiment. Be as specific as possible and include exact measurements, quantities, times, etc.

1. Build 3 sets of various types of bridges using popsicle sticks and hot glue.
    a. Truss
    b. Beam
    c. Tied Arch
2. Using weights (g), test and record the weight each bridge withstands and record the data on the table.
3. Analyze and observe The data

Experiment: Trial 1

Date:

Data: (measurements)

Tied arch bridge	62000g
Beam bridge	2060g
Truss bridge	3296g

Observations:/Notes I observed that when applying the weights on the tied arch bridge, the arch shape was very strong. The beam bridge was good, it held a decent amount of weight but it had no special shape that made it stronger. The truss bridge was strong too, the triangles made it more sturdy

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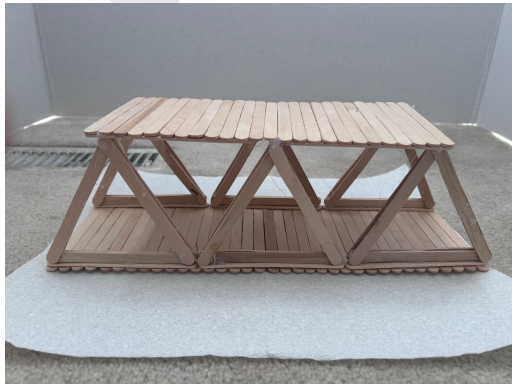
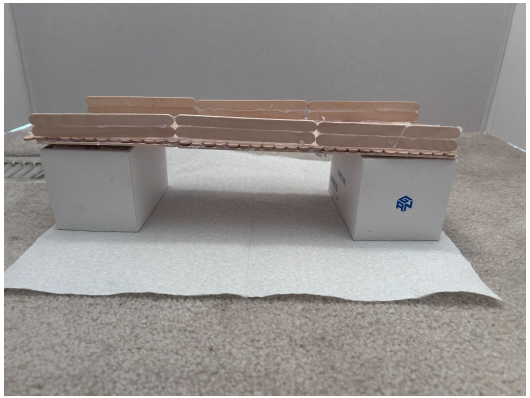
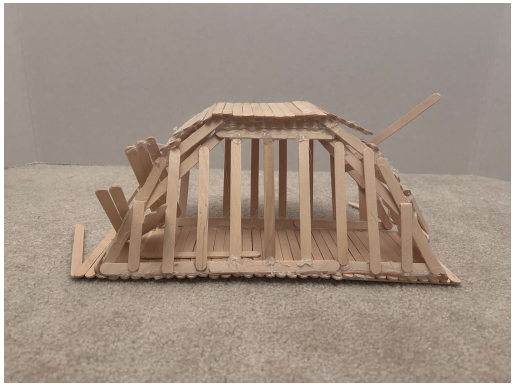
Experiment: Trial 1







Experiment: Trial 2

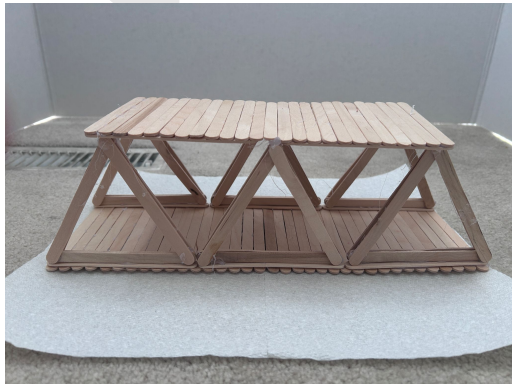
Date:

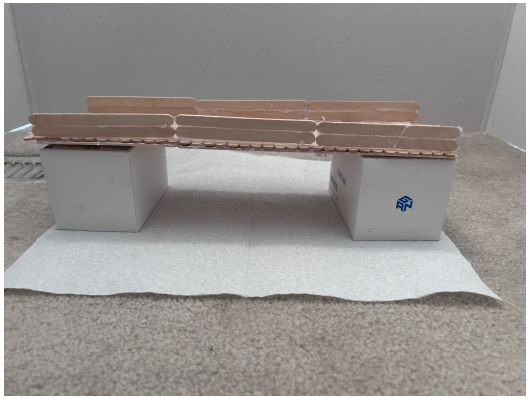
Data: (measurements)

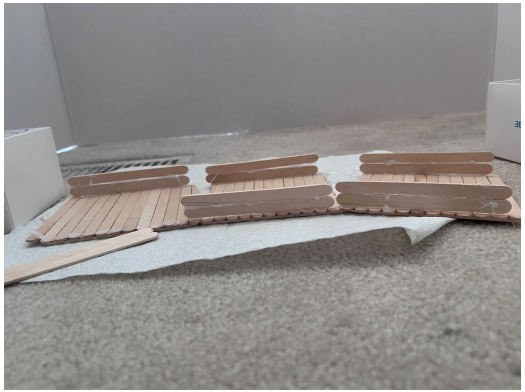
Tied arch bridge	59029g
Beam bridge	2884g
Truss bridge	3296g

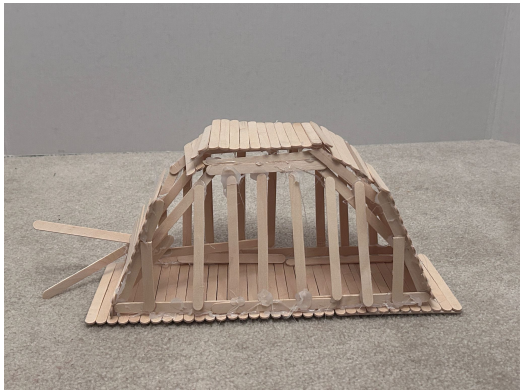
Observations/Notes: The tied arch held more weight this trial. The beam did carry more weight than last time. The truss held the same amount of weight.

Experiment: Trial 2









Experiment: Trial 3

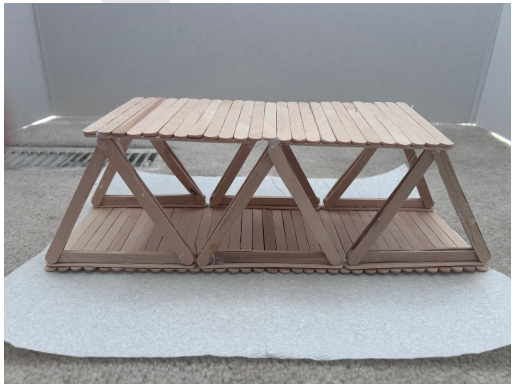
Date:

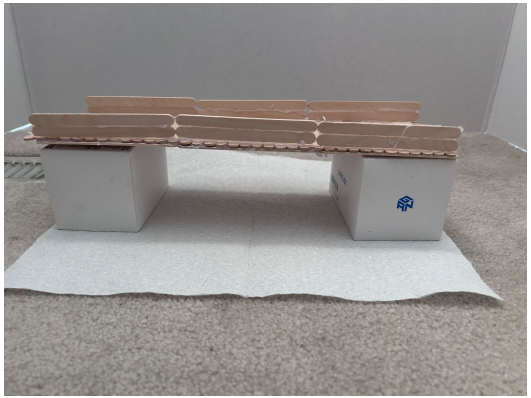
Data: (measurements)

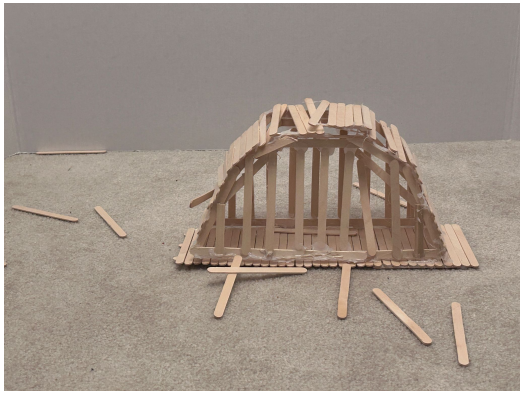
Tied arch bridge	64000g
Beam bridge	824g
Truss bridge	1648g

Observations/Notes: The tied arch held more this weight in this trial. the beam did not carry as much weight as last time. The truss did not hold that much weight either.

Experiment: Trial 3







Results: Chart

Put your data together into a chart.
Example: (you can change the chart)

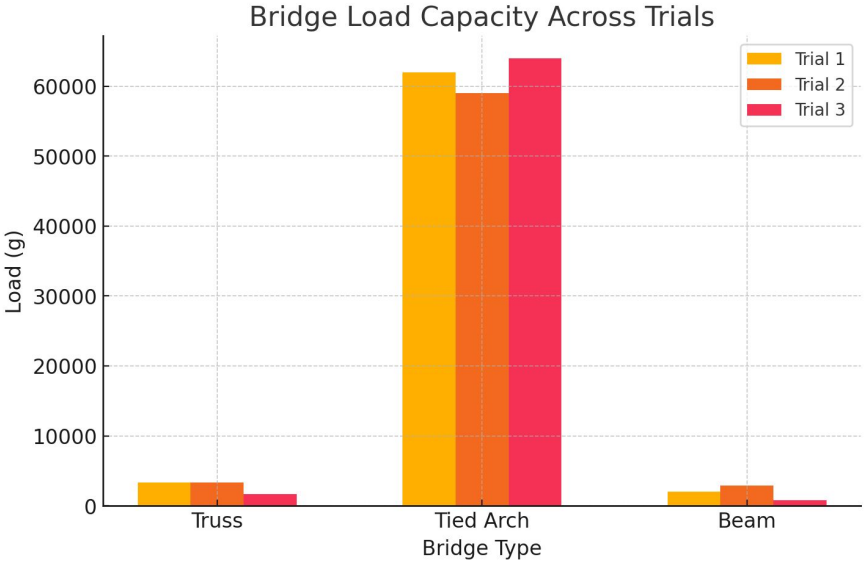
	Truss	Tied Arch	Beam
Trial 1	3296g	62000	2060g
Trial 2	3296g	59029	2884g
Trial 3	1648g	64000	824g

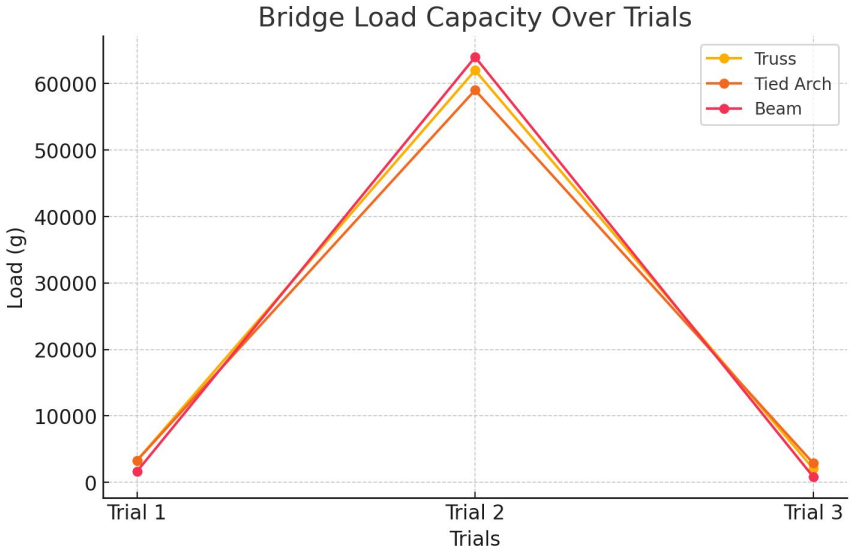
Results: Analyze

Look at your data and observations. Look for patterns and trends. Explain what happened in your experiment and what you found out:

I noticed in my data in the beam bridges data the weight it held was a pattern it went like high low high low also the beam bridges data is the only one with a 3 digit number. I thought that all the data was gonna be the same but no there are some that are the same but others are not.

Results: Graph





Conclusion

My question was: Which bridge holds the most weight and which is most stable?

The answer to my question is: The tied arch bridge held the most weight and was most stable?

My hypothesis was correct because: I researched and found information to gain knowledge off of and the shape is very sturdy. It needs a lot of weight to break.

OR

My hypothesis was incorrect because:

Applications

In what ways are your findings useful?
Who could benefit from your results and how?

Bridges are a cool structure they help us cross rivers, lakes, valleys, and more. Without them we could not get to various places. The people who make them are called civil engineers. This type of engineer designs the blueprint so it's nice and sturdy and so it can support us. In my experiment I tested bridges to see which one can hold the most weight and I think my data can help in the future so they can design more improved bridges.

Sources of Error

Do you think your results were reliable? Were there any other factors or conditions that could have affected the results of your experiment in unexpected ways?
What could have affected your results, that would need to be controlled differently if you were to repeat the experiment?

My experiments data was not the same, some held more weight some held less weight. I could have made the amount of glue for each bridge a controlled variable. I also think I could have done just an arch instead of a tied arch because it has more strength.

Extensions

If you were to conduct this experiment again, what would you do differently?

If I could repeat this experiment, I would change the bridge design and I would also change the type of weight I put on my bridges. I would also change the type of material I used to make my 3 types of bridges. Some of the bridges were sturdier. I believe it had to do with the amount of glue I used to construct my bridge with.

Extensions

Because of the results of this experiment, I wonder...
Describe further experiments that could be conducted to further investigate and understand your topic:

I could look more into how much glue I used and the type of material I used to build my bridges.

CONGRATULATIONS!!

You have completed your experiment!

Make sure that you enter information from this logbook into the CYSF Digital platform.

You are now ready to create your tri fold display and practice your presentation.