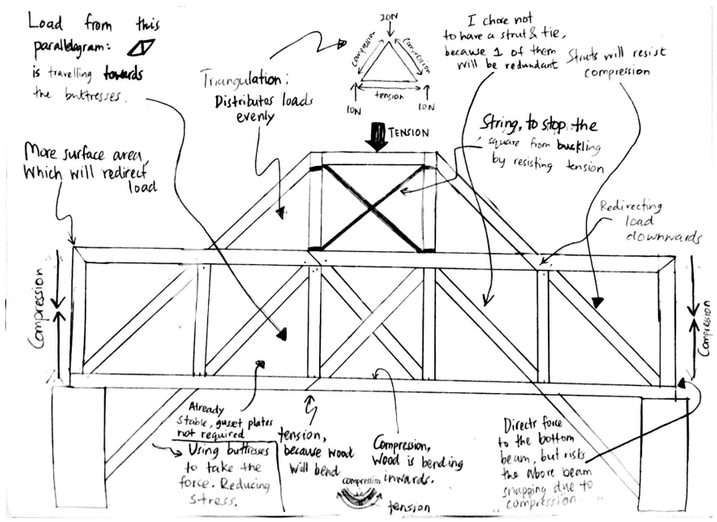
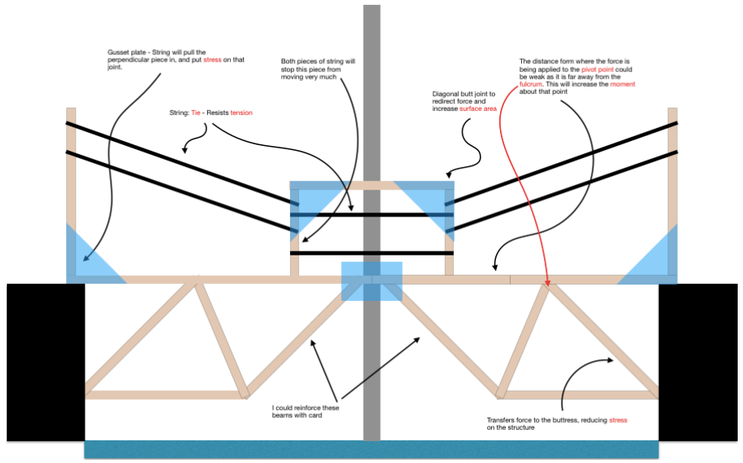
Structures - Bridge Project

Design 1:



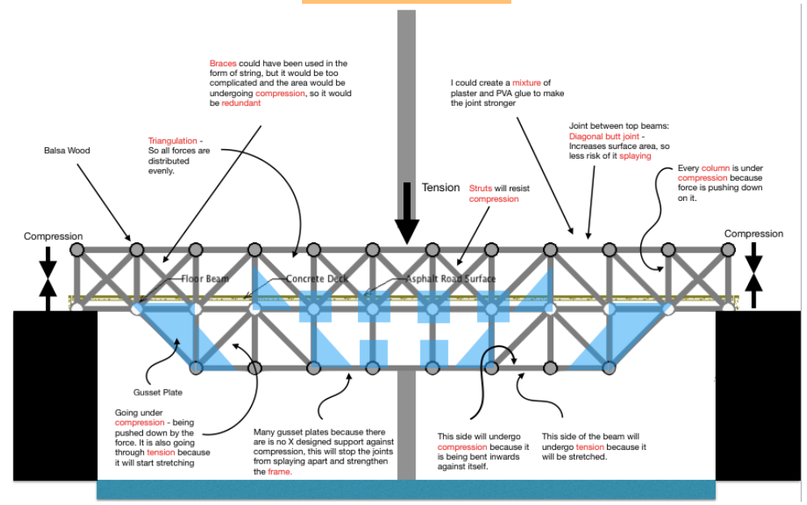
Variety of a Pratt truss bridge, with extra material at the top and bottom which redirect the force. Not too much costs, seems sturdy. Will be able to distribute forces well due to triangulation .

Design 2:



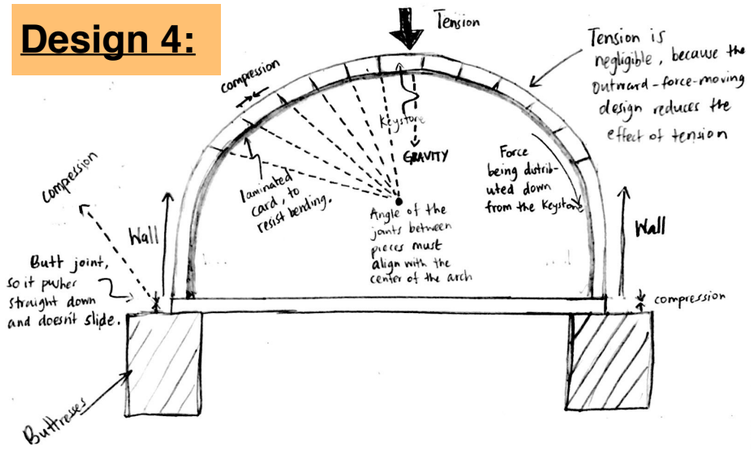
Mix between a suspension and cantilever bridge with a support at the bottom. Cost is minimal, wide range of material. Not very good art resisting compression. If it hold lots of weight (100N), winning factor will be high.

Design 3:



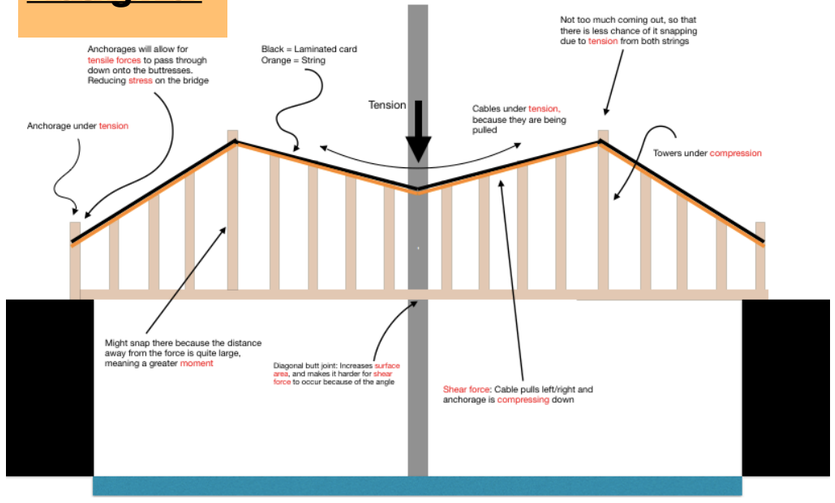
Variation of a truss bridge, With extra support at the bottom. Will resist compression very well, tension will be a problem. Costs a lot, but it is very sturdy.

Design 4:



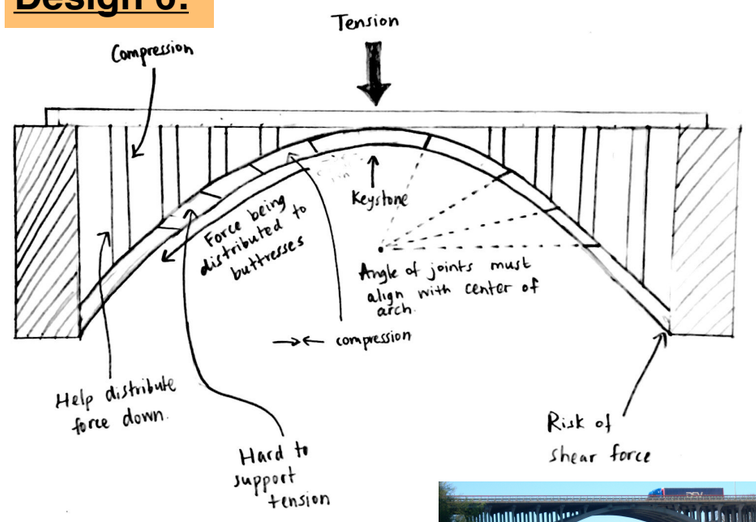
This bridge will be extremely tough to build, because perfecting each and every angle is very hard. It has a low cost, could support lots of weight if it is built to plan.

Design 5:



This bridge focuses on resisting against tension and compression. Cost will be on the higher side, but the sturdiness will make up for that. It will be hard to build.

Design 6:



This bridge distributes forces well to the buttresses, it will be extremely tough to make, but it will not cost too much.

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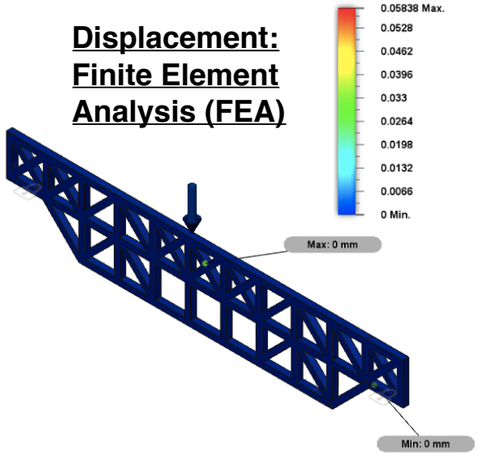
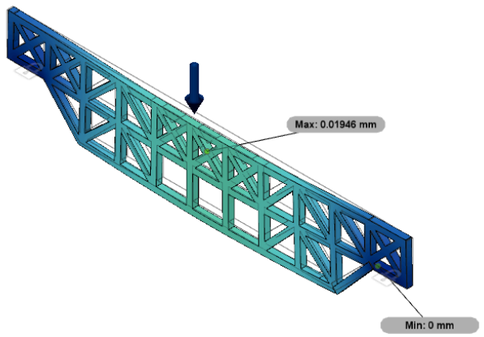
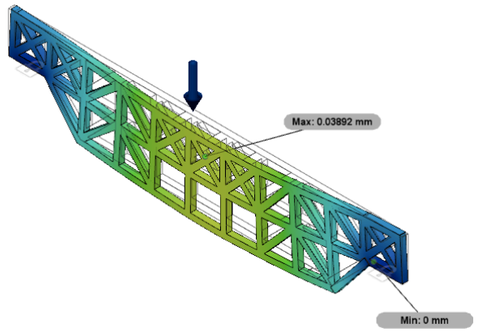
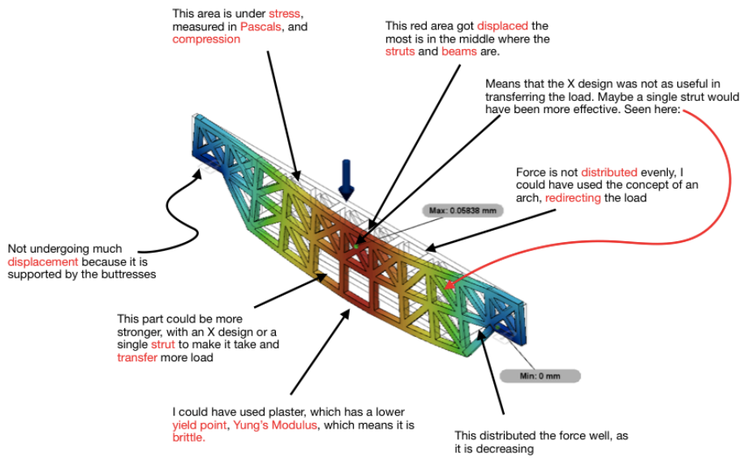
Displacement: Finite Element Analysis (FEA)



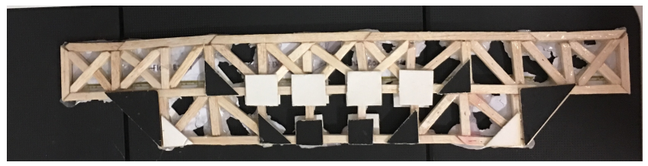




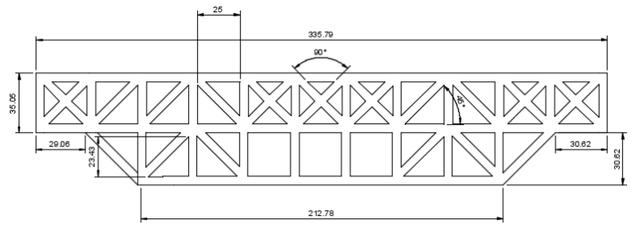


I chose Design 3 because it was not hard to make, very sturdy and would not cost me too much. It consists of 28 gussets, to prevent the splaying of joints.

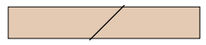
Before Testing



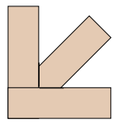
Working Drawing



Joints:

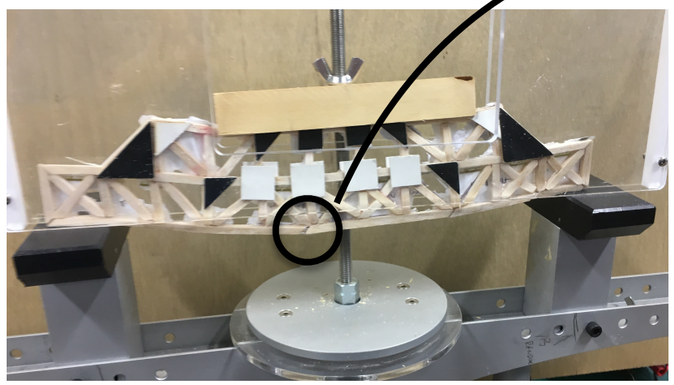


Diagonal Butt Joint - Increases surface area, reduces shear force

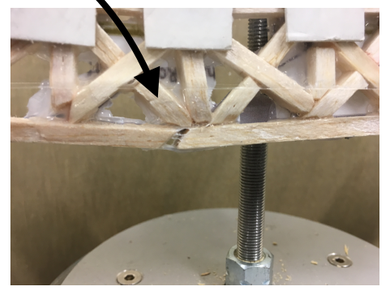


Distributes the force equally between the perpendicular pieces of wood

Results :



This snapped because the bottom of the bridge was going under tension, as the structure was bending.

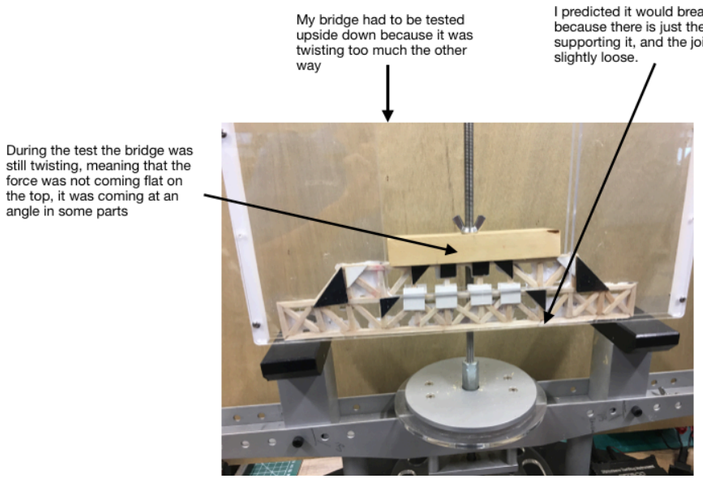


The glue needed to set for longer, you could see that at the point where it snapped. I left it to set for 9 hours, if I do this again I will keep that in mind

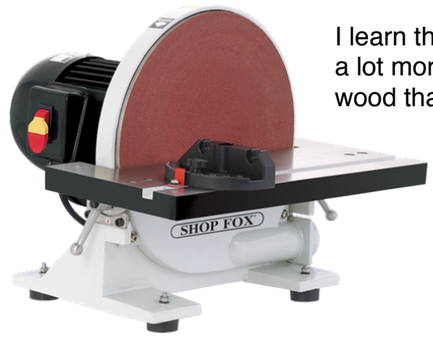
During the test the bridge was bending, which made the results not as accurate.

Add gussets to weak joints, especially if glue has not fully set.

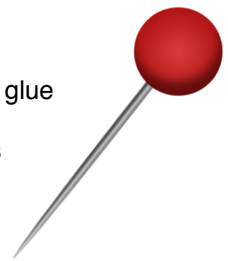
Testing:



I chose not to use the hot glue gun because it is not as strong as PVA glue and is more bendy



I learn that disc sanders are a lot more efficient to cut wood than craft knives



Pins do not make your structure stronger. They put rods in wet cement and then set it. Not set the cement and then put the rod, that is what it is like if you do this in this project.

C1 C2 C3 C4 C5 C6 C7

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