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CC Cycle 2 Science Experiments & Projects: In-Class Lesson Plans & Visuals

I hope these make all the hard work you do a little easier!
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Notes to the Tutor/Teacher:

I have included the Foundations Guide information needed to do each project. My teaching notes are placed within the instructions to help students learn about the topics while they work on the projects.

What to Do Each Week in Class:

Always stress the **Scientific Method** in each experiment by getting the students to orally state what the purpose, hypothesis, materials etc. are in your experiment.

- State the Scientific Method

(ie: sing it to the tune of *Happy Birthday*- "Scientific Method, Purpose, Hypothesis, Materials, Procedure, Results, Conclusion.)

Purpose – stated in the Van Cleeve experiment verbiage

Hypothesis – Typed out as the first of my "More Talking Points".

Materials – Hold them up to the students and ask them to name the materials

Procedure – Go through the steps listed in the experiment together

Results – The "what happened?" of the experiment. Talk about what you saw and if your hypothesis was right or wrong.

Conclusion – The "why did that happen?" of the experiment. Found partially in the Van Cleeve "Why?" segments, and explained more fully in my talking points and images.

Relate it back to Cycle 2: mention how we are studying Ecology, Astronomy and Physics in our experiments and our new grammar pegs. I have done some for you in blue. Find your best way to explain how learning about God's creation is learning more about God's character and what He's done for us.

Weeks 20 & 21
Project: Straw Bridge Construction

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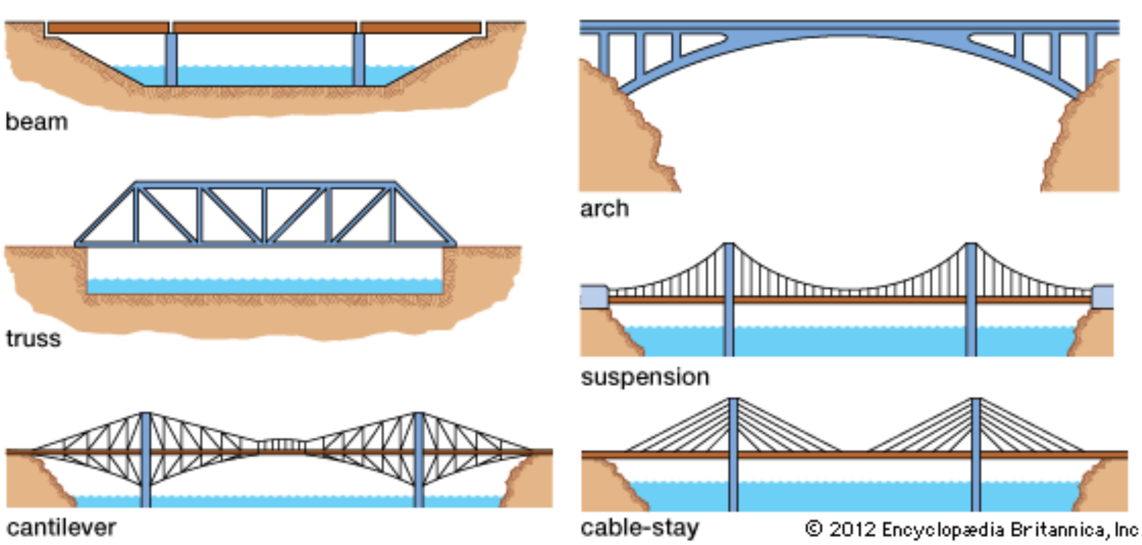
This project will be built over 2 weeks (weeks 21 & 21).
**Try not to show the students sample straw bridges, but rather foster creativity and let them think through it to come up with their own original designs.*
**Find out if you need to bring a bin or if someone else will need to save your students' projects for a community wide bridge and egg drop contest on week 24.*
**Find out the size of the objects that will be used for a weight on the bridge (Something narrower like a round pint container of coins or water bottles filled with liquid or marbles? Or something wider like books?)*
**Find out if the bridges will be placed on 2 chairs with a set amount of space in-between, or if they will be placed flat on a floor/table. This will help them think about how they need to build them.*
**Find out if there is a set number of supplies allowed for each single bridge in the contest, or if you just divvy up the class materials amongst the teams in your class.*

- **Purpose**– To use teamwork to build a bridge over 2 weeks and learn how bridges work. To build the longest, strongest, self-supporting bridge.
- **Hypothesis**- Which team bridge will hold the most weight?
- **Materials**- Use the materials provided for your class. Typically you divide among 3 or 4 groups of students:
  -50 Straws -200 rubber bands -1 jar of Modeling Clay/Playdoh
- **Procedure**- Group the students into teams. Let them work together to build a bridge. Some students might even get together over the week to further work on it. Read the following pages about types of bridges. (The strongest real-world bridges are not necessarily the best bridges to choose for this class project, given the materials the students are provided.)
- **Results**- Encourage students by telling them that scientists work by trial and error. Encourage patience, perseverance, and politeness in their teams. If their bridge doesn't win the contest, they can learn from the winner and make modifications.
- **Conclusion**- See the following pages and discuss what about each bridge makes it work, how each deals with compression and tension, and what situations each bridge is best used for. Either show students the pictures or draw them on the whiteboard.



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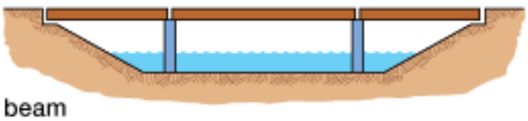
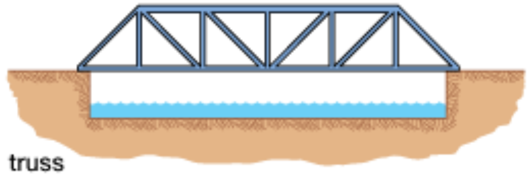
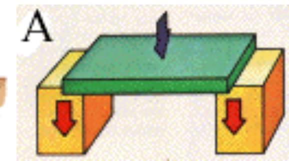
BEAM BRIDGES

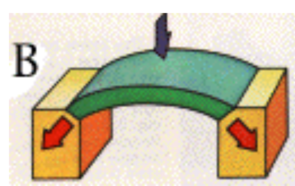


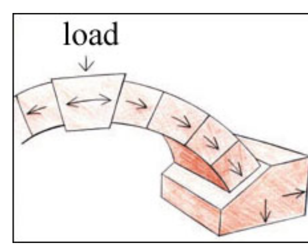


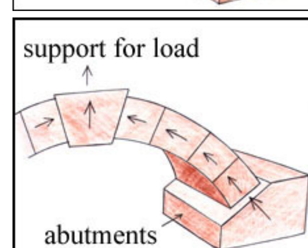


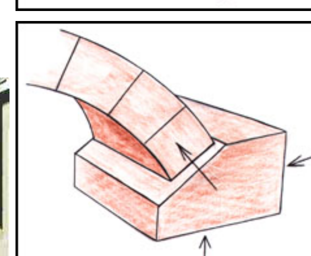
Beam bridges, sometimes known as "girder" bridges are the simplest types of bridges. Examples range from a log across a stream to a modern steel version. Weight pushes down from on top (or "compresses"), and the bottom of the beam is stretched (under "tension"). With too much weight, the top buckles and the bottom snaps. Concrete or steal beams are used for bridges needing to hold heavier loads. A lattice work "truss" is added over very tall beams to add rigidity. When the beam compresses, the force is dissipated into, or shared with, the truss.

ARCH BRIDGES









Arch bridges don't have pressure of the load pushing straight down, but rather carried outward from the top keystone along the curve of the arch down to end supports, or abutments embedded in the ground. The ground squeezes back around the abutments and push back up to support the load. This is Newton's 3rd Law of Motion: "For every action, there is an equal and opposite reaction." The compression is dissipated outwards, so there is very little tension that arch bridges need to worry about. An arch made of stone doesn't even need mortar. Ancient Roman arch bridges, like the aqueducts that carried water, are still standing today. Though they are used for their strength and for their beauty, they are not used today over long distances. The amount of arches needed to span those distances would block traffic, and they are not always cost effective.