



Bridges

Virtual Instruction Lesson Plan

Episode 1: (13:28–26:46)
bit.ly/steamcamp-waves-bridges

Explore how the Nevada Department of Transportation built the second longest bridge in Nevada.

Related Nevada Academic Content Standards/ Next Generation Science Standards:

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Materials

- Paper/pencil
- An assortment of items to use for bridge-building, such as:
 - Toilet paper or paper towel tubes
 - Boxes
 - Craft sticks
 - Tape
 - Blocks
 - String
 - A toy car or small ball
 - Be creative and see what else you can use!

Tip:

This lesson plan is easily adaptable for face-to-face instruction. Simply conduct the “Explore” portion of the lesson as a hands-on activity in the classroom.

Engage:

Share the beginning of the program with students. After Luis asks, “How are bridges built?,” pause the program and ask your students the same question. Write this essential question down and record student responses to reveal students’ current knowledge, connections to the topic, and further questions they have.

Explain:

Introduce the words: **engineer**, **stable**, and **sturdy**.

- Have students guess their meaning and record their ideas.
- Ask students to listen for the words as they watch the video clip, featuring staff from the Nevada Department of Transportation (14:10 – 17:52).
- When they hear one of words, encourage students to make a gesture, such as wiggling their fingers.





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Explain, continued:

Pause the video at key spots to ask questions that strengthen comprehension and help children make connections.

- Pause after Abid talks about the length of the bridge (14:48). Ask students, “Where is this bridge? What is special about it? How long is it?”
- Pause at (15:10) and ask students, “What does an engineer do? What problem is this bridge going to solve? What is the first step in building a bridge?”
- Pause after Tony introduces columns (15:48). Ask, “Why are columns an important part of the bridge?”
- Pause after Kalee talks about how concrete is poured (16:39). Ask, “What materials were chosen to make the bridge sturdy and strong?”
- Watch the “What did we learn?” segment to reinforce the concepts.

Reflect on the new knowledge students have acquired.

- Revisit the essential question and have children answer it by incorporating the vocabulary words; ask children to share any new information they acquired or additional questions they have.
- Have students practice stability exercise with their bodies (courtesy of the **American Heart Association** – bit.ly/aha-activitybreaks):
 - **A Balancing Act:** Practice balancing on each foot. Have kids lift their foot off the floor at least 5 inches and hold for 30 seconds. Rest and repeat 3 times. Switch legs. Teach kids that they have to tighten their abs and focus on something straight ahead to be able to balance. As students advance, have them keep their arms parallel with their ears and bring palms together overhead.
 - **Yoga-cize:** Have students stand up and get an arms-length distance from their neighbor. Have them place their hands on their hips and position the sole of their foot resting on the inside of the opposite leg (above the knee as they advance). Hold this position for 30 seconds. Then, have them slowly move their arms straight out to their sides while bending forward and extending their foot behind them to land in “airplane” position. Have them hold for as long as possible. Teach the class to engage (tighten) their abdominal muscles and focus on a spot on the floor to help them balance. Repeat on the other side.
 - After doing the exercises, ask students why they think tightening the abdominal muscles makes them more stable. How is their body acting like the columns of a bridge?

Explore:

Share the at-home activity segment in which Jessica outlines directions for creating bridges at home using everyday items (17:51–22:16). While watching, pause the video before Zinnia and Luis test their bridges and have students predict whether they will support their chosen items. After they test their items, pause the video and ask students how they could make their bridges stronger. Then, guide students through the engineering design process outlined in the segment.



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Explore, continued:

Define the Problem: Design a bridge out of materials you find around your house that will allow a small object to cross without breaking.

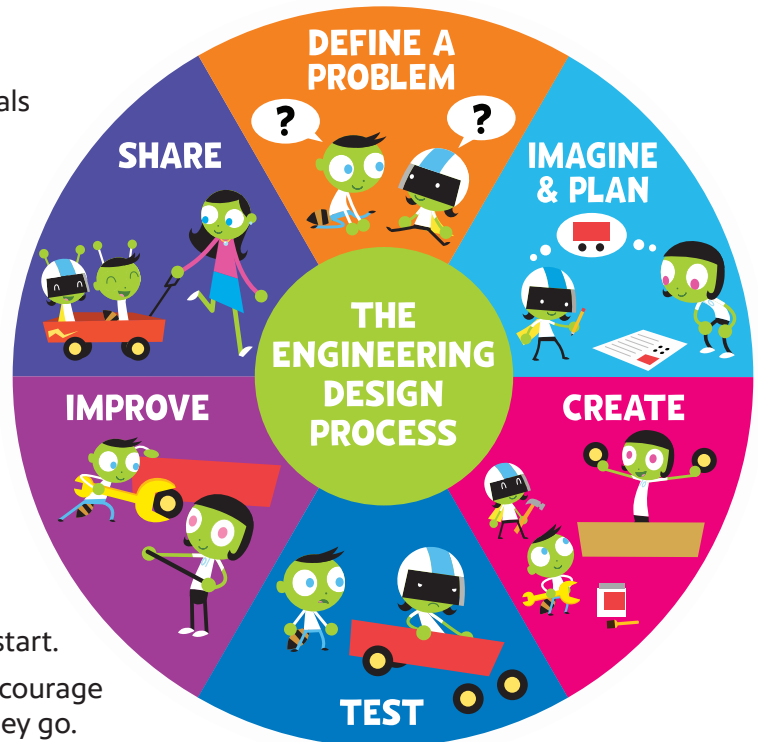
Imagine and Plan: Gather different recyclable materials, like toilet paper or paper towel tubes, cardboard boxes, and shoeboxes. Students might also want to collect legos, tape, blocks, and string. Encourage them to be creative! Students will also need a small object, like a toy car, small ball or blocks. Have them hold the object in their hand to feel how heavy it is. Then, have them compare the strength and weakness of the items they chose. How are they going to use them in their design? Are they going to be strong enough to support their object? Have students draw a sketch of their design before they start.

Create: The next step is to create their bridges. Encourage students to take their time and test the pieces as they go. Testing your project as you go is a good way to save time and fix mistakes if you realize something isn't working.

Test: Have students test their bridges. If it supports their object, see if it can support even more weight. Add some pennies and see what happens!

Improve: If students tested their bridge and it collapsed, have them improve their design and test again.

Communicate and Collaborate: Have students share their designs. Which materials were better at creating a study, stable bridge? Help students make connections between anything they learned in the video and this activity. What new questions do students have? Encourage students to share photos and videos of their at-home challenges with Vegas PBS at bit.ly/steamcamp-share.



Extend:

View the book talk with Noel, a local Young People's Librarian (23:14 – 25:30). If possible, read the story Noel previewed to students, **A Book of Bridges: Here To There and Me To You** by Cheryl Keely. Encourage students to continue exploring bridge building by accessing the following PBS KIDS resources:

- **Ready Jet Go!: The Engineering Song** – bit.ly/readyjetgo-engineeringsong
- **Murray Experiment: Build a Bridge | Sesame Street** – bit.ly/murrayexperiment
- **Zoom: Investigating a Suspension Bridge** – bit.ly/zoom-paperbridge
- **Zoom: Designing a Straw Bridge** – bit.ly/zoom-strawbridge