Building Bridges – Grade 3

This lesson will help students explore the profession of engineering by building bridges. Students will learn about different types of bridges and their different features. Students will design and build their bridge in small groups. Complete each section by following the instructions below.

✅	✅	✅
Teacher Led	**Requires Computer OR Mobile Device**	**Requires Spaces**

Spaces Prep	**Create your Activity in Spaces before the lesson. Not sure how to create an Activity? Check out this short video tutorial on assigning and managing Activities.**

Learning Goals

1. Students will **learn** about engineering as a career
2. Students will **engage** in the process of building a bridge, including designing, building and testing
3. Students will **work cooperatively** in teams

Materials

Student Handouts	• **Handout [A] - Types of Bridges** for each student (page 6) • **Handout [B] - Bridge Design** for each group (page 7) • **Handout [C] - Reflection: Success Criteria of Working Cooperatively in a Group** for each group (page 8)

Technology Requirements	• Internet • Mobile device, tablet, or laptop • Smartboard or Projector
Video/Audio Clips	• "What Makes Bridges Strong"
Additional Materials	• Popsicle sticks • Craft glue • Weights to test bridges' strength (1 pound/16 ounces- ex: can of soup or beans/bottle of)

Instructions

Before the lesson

1. Begin the lesson by having students **brainstorm about engineers** in a whole group discussion
    - Ask students if they know an engineer
    - Ask students if they know what an engineer does
        - Write the ideas students share on the board and work towards their understanding of an engineer as a person who designs, tests, and builds structures

2. Explain that the students will be engineers. Describe the scenario:
    - They have been approached by the city, and need to build a strong bridge that can hold the weight of large trucks that are transporting very heavy material

3. Students will learn more about different types of bridges
    - Show students the video "What Makes A Bridge Strong?" (https://www.youtube.com/watch?v=oVOnRPefcno)
        - Ask students to share what they learned about what makes bridges strong. (ex: the structure of triangular frame ensures the force is distributed equally on the frame)
    - Explain the goal: students will design and build a strong bridge by working in a group cooperatively
    - Give each student Handout [A] - Types of Bridges (page 5), and select students to read each type of bridge and the corresponding description
        - Ask students to share which type of bridge they think will be the strongest and why

4. Explain that students will work in groups of 3-4 to design and build their bridge
    - Ask students the importance of working cooperatively as a team

- Brainstorm the success criteria for working cooperatively
    - Write student ideas on large paper or type on a projected document for the class to see
- Explain that each student will have a specific role for the project because having designated roles can help groups work cooperatively
    - One person can be responsible for the materials, one person can be the writer or designer, and one person can be the lead builder

During the lesson

1. Students work at their desks or table space to complete their **Handout [B]** - Bridge Design (page 7)
2. Students get their design approved by the teacher before they begin building
3. Students use the materials to build their design
4. Once the built bridge has been approved by the teacher, students test their bridge with the weight
5. Students adjust their bridge as needed

After the lesson

1. Students showcase their bridges
    - Each group shares their bridge with the class by explaining the type of bridge they built and puts the weight on the bridge to demonstrate its strength
2. Students complete **Handout [C] - Reflection: Success Criteria of Working Cooperatively in a Group** as a group (page 8) and hand it in to the teacher for evaluation

Option 1: Add a Picture

1. **Take a picture** of the completed bridge
2. Log into your Spaces account
3. Click **+Create** > **File** > Click **Select Files to Upload** > **Add Picture** > Click **Upload**
4. Click the **Title** box and write the title **Building Bridges**
5. Click the **Post Description** box and **write a short description** > Click **Next** > Click **Post**

6. In the **Add reflection** box write a reflection answering the following questions:
    - How did we design and make changes to my bridge to improve it?
    - What was my role in the team?
    - How did I succeed in my role?
    - How can I improve in my role next time?
7. Click the send arrow  to post your reflection

Option 2: Add a Picture

1. **Take a picture** of the completed bridge
2. Log into your Spaces account
3. Click **+Create** > **File** > Click **Select Files to Upload** > **Add Picture** > Click **Upload**
4. Click the **Title** box and write the title **Building Bridges**
5. Click the **Post Description** box and **write a short description** > Click **Next** > Click **Post**
6. In the **Add reflection** box write a reflection answering the following questions:
    - Why/how did your group choose the design of your bridge?
    - How many popsicle sticks did we use to create our bridge?
    - How much weight did our bridge hold?
    - What was your favourite part of building a bridge?
    - What was the most challenging part of building a bridge?
7. Click the send arrow  to post your reflection

Option 3: Work Habits

1. **Take a picture** of the completed bridge
2. Log into your Spaces account
3. Click **+Create** > **File** > Click **Select Files to Upload** > **Add Picture** > Click **Upload**

4. Click the **Title** box and write the title **Building Bridges**
5. Click the **Post Description** box and **write a short description** > Click **Next** > Click **Post**
6. In the **Add reflection** box write a reflection answering the following questions:
    - Why/how did your group choose the design of your bridge?
    - What is one way you worked well with your team?
    - What is one challenge that your team experienced
    - How did your team overcome this challenge?
7. Click the send arrow  to post your reflection

Option 4: Career Exploration

1. Find a picture of a **Civil Engineer**
2. Log into your Spaces account
3. Click **+Create** > **File** > Click **Select Files to Upload** > **Add Picture** > Click **Upload**
4. Click the **Title** box and write the title, **Civil Engineer**
5. Click the **Post Description** box and **write a short description** > Click **Next** > Click **Post**
6. In the **Add reflection** box write a reflection of the following:
    - Describe what someone in this career does
    - Describe the process of designing, building and testing your bridge
    - Is this career a good fit for you? Why or why not?
7. Click the send arrow  to post your reflection

Worksheet

HANDOUT [A]: Types of Bridges

Arch

Arch bridges are arch-shaped and have supports at each end.

◆Beam

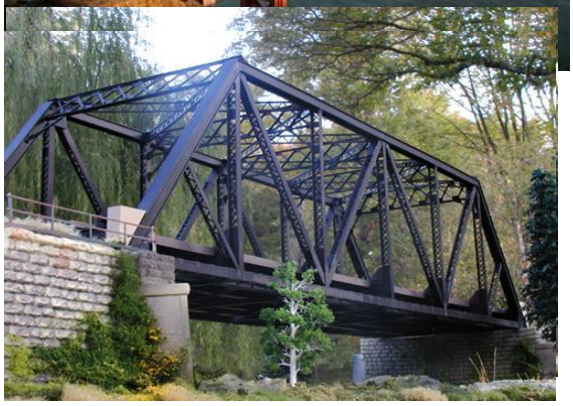
Beam bridges are horizontal beams supported at each end by piers. The earliest beam bridges were simple logs. Now beam bridges are made of steel. Weight on top of the beam pushes straight down on the piers at either end of the bridge.

◆Suspension

Suspension bridges are suspended from cables. The earliest suspension bridges were made of ropes or vines covered with pieces of bamboo. The cables are entrenched deep in the floor of a lake or river.

◆ Truss

Truss bridges are made of a triangle frame. Early truss bridges were made of wood, but modern truss bridges are made of metals such as iron and steel.



Worksheet

HANDOUT [B]: Bridge Design

Group Members: _____

We are going to design a _____ bridge.

Bridge Design:

Worksheet

HANDOUT [C]: Reflection: Success Criteria of Working Cooperatively in a Group

Group Members' Names:

_____

_____

As a group, we:

- ☐ Decided on a role for each person in the group
- ☐ Used kind and encouraging words
- ☐ Listened to each other
- ☐ Helped each other with challenges

Our **Strengths** as a group:

_____

Our **Challenges** as a group:

_____