



Overview

In this lesson, students will explore what makes a bridge strong. Using the Kid Spark Early Inventors STEM Lab, they will test how adding supporting blocks and girders increases strength, then design and share their own sturdy bridges while learning how supports help structures stay safe and steady.

Learning Objective

- I can make my bridge strong by adding blocks and girders.

Curriculum Connections

- Language Development:** Students learn and use new words, describe their bridges, and participate in conversations about how to make designs stronger.
- Engineering:** Students build and test bridges, then add supports to strengthen them, practicing how engineers improve designs.
- Collaboration:** Students work together, share ideas, and reflect on their building experience through guided discussion.

Next Generation Science Standards (NGSS)

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

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.

K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

International Society for Technology in Education (ISTE) Standards

1.4 Innovative Designer

Common Core State Standards (CCSS)

SL.K.1: Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.

SL.K.6: Speak audibly and express thoughts, feelings, and ideas clearly.

Activity Details

- Activity Time:** 35 - 40 Minutes
- Target Grade Level:** Kindergarten
- Grouping and Setup:** Discussion can be done as a whole group. Students can build independently or with a partner, based on your class structure.

Materials

- Kid Spark Early Inventors STEM Lab
- “Make Things Strong” Activity Guide 
Print one per student or pair, or display it
- “Make Things Strong” Slide Companion (optional)



Lesson Vocabulary

The following key terms will be used throughout this lesson.

Strength: Strength means how strong something is. If something has strength, it can hold weight or carry things without breaking.

Test: Test means to try something out to see if it works.

Girder: A girder is a long, strong block that supports and holds together other blocks in a design.

Pre-Lesson Preparation

- Review the “Make Things Strong” Teacher Lesson Plan to become familiar with the lesson flow and key prompts.
- Consider laminating the activity guides for durability and repeated use in future lessons.

Plan for All Learners: Every student deserves access to STEM learning. Before teaching, consider how you might adapt this lesson to meet the needs of students using assistive technology, accessible materials, or other support services. Collaborate with special education staff as needed to align with IEPs or 504 Plans.

Anticipatory Set (5 MINUTES)

- Engage students:** Invite one student volunteer to the front. Say: “We’re going to use our bodies to pretend to be a bridge!”

Ask the student to hold both arms straight out in front of them, like a flat bridge. Hold up a couple of books (or use your hands if you don’t want to use real books). Say: “Imagine these books are cars driving on the bridge. Let’s see if our bridge can hold them up!”

Place one or two books gently on the student’s arms. Say: “This bridge is holding strong for now!”

Add one more book (or just pretend with your hand pushing lightly). Ask: “Oh no—does this bridge feel strong or weak? Is it getting hard to hold up?” The student will likely nod or say it feels heavy.

Call up two more student volunteers. Say: “Engineers help make bridges strong by adding supports underneath. Let’s see what happens if we add helpers.”

Have the two new students stand on either side of the first student, facing each other. Ask them to join hands underneath the first student’s arms, like beams holding up a bridge. Say: “Now our bridge has support underneath! Do you think it will be easier to hold the books?”

Replace the books (or pretend again) and ask the first student: “Does it feel easier now with the support? Is the ‘bridge’ stronger?”

Turn to the class and reinforce: “See how much stronger our bridge was when we added supports underneath? That’s what engineers do when they make real bridges.

- Introduce the essential question:** “How can I make a bridge strong so it doesn’t fall apart?”
- State the learning objective:** “Today, we’ll test our own bridges and see how adding supports can make them stronger too! By the end of our lesson, you will be able to say:
 - ‘I can make my bridge strong by adding blocks and girders.’”

Make Things Strong

Instruction (25-30 MINUTES)

Step 01: Learn & Explore

- Using the “Make Things Strong” Activity Guide, invite students to build a bridge with their blocks. This can be done individually or with a partner, based on teacher discretion or class setup.
- Using the “Make Things Strong” Activity Guide, guide students to build and test a bridge.
 - Slowly model connecting each block.
 - Count out loud together: “One, two, three...” until you reach eleven.
 - Have students use 11 Small Blue Blocks to build a bridge like the one shown in the activity guide. Walk around to help as needed.
- Say: “Now let’s test our bridge. To **test** means to try something out to see if it works. Press down gently on the middle of your bridge. What happens?”
 - Ask: “What happened when you pushed it?”
 - Allow students to respond with answers like, “It broke apart,” or “It fell.”
- Reinforce the big idea: “If it comes apart, that means it’s not strong enough yet. Engineers—people who build things—try their ideas, see what happens, and then find ways to make them stronger.”
- Say: “Next, we’re going to learn a trick to make our bridges stronger, so they don’t break as easily.”
- Point to the “Add Blocks” picture in the activity guide. Say: “The first way to make your bridge strong is to add support blocks to the bottom. The support blocks hold the middle of the bridge up so it doesn’t fall inward.”

Show students how to connect 2 Large Yellow Blocks to the bottom of the bridge, as shown in the activity guide. Say: “Look, I added blocks underneath the bridge. That gives it more strength so it won’t break as easily.”

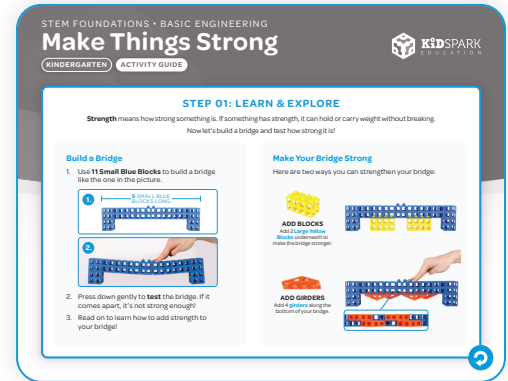
Invite students to add support blocks to their bridges. After they finish, say: “Press down in the middle again. Is it harder to break now?”

- Point to the “Add Girders” picture in the activity guide. Hold up a girder block. Say: “Another way to make a bridge strong is to add these special blocks called girders. A **girder** is like a helper that holds blocks together—kind of like a band-aid.”

Show how to place the girder along the bottom of the bridge where the blocks connect, as shown in the guide. Say: “The girder helps stop the bridge from breaking apart. Let’s try it!”

Let students add girders to their bridges.

- Walk around and give feedback:
 - If a bridge is still weak when they test it, say: “What if we add another girder here?”
 - If a student adds one girder, encourage: “Can you press down again and find the weak spots? Add girders underneath where it breaks.”
- Reinforce the big idea: “When we add support blocks and girders, our bridges don’t break as easily. Engineers use tricks like these to make sure real bridges stay strong and standing!”



Make Things Strong

Step 02: Invent

- Students will design their own bridges using the Kid Spark Early Inventors STEM Lab. This can also be done individually or with a partner, based on teacher discretion or class setup.

Say: "Now it's your turn to be an engineer! Use at least 13 Small Blue Blocks to design your bridge. Then, use what you know about adding support blocks and girders to make your bridge strong, so it doesn't break when you press down on it."

Point to the example in the activity guide to model. Remind students that support blocks help hold the middle of the bridge up, and girders connect pieces together so they don't come apart.



Teacher Tip: Awareness of self and others is an important part of working with a partner. If students choose to work in pairs, consider introducing simple community agreements before building, such as:

- Inventors share.
- Inventors listen.
- Inventors build together.

You can also support conversations with sentence stems like:

- Sharing an Idea: "I have an idea."
- Asking a Partner: "What do you think?"
- Taking Turns: "Your turn, then my turn."
- If You Don't Agree: "Let's try something else!"

- Before building, ask students questions to help them plan. Partners can talk together; ask individual students directly:
 - "How will you make sure your bridge uses 13 blocks?"
 - "Where will you add support blocks to make it stronger?"
 - "How will you decide where to place girders?"
 - "When will you test your bridge?"

Let students know: "After we build, we'll share our strong bridges with the group—so be ready to tell us about your design!"

- Whether students are working with a partner or on their own, support their thinking by encouraging conversation, observation, and expression.

Provide flexible ways for students to express their thinking:

- Talk with their partner or teacher about what they are building
- Point to or describe materials
- Use hand motions or build something to show their idea

- Support students based on what you observe:

If a student's bridge keeps collapsing: Point to the middle.

Say: "I see your bridge fell down here. What could you add underneath to help it stay up?"

Prompt: "Would adding support blocks under the bridge make it stronger?"

If a student's bridge breaks apart where blocks connect: Point to the loose blocks.

Say: "I see some blocks came apart here. What could you add to hold them together?"

Prompt: "Could a girder help connect these blocks so they don't fall apart?"

If a student finishes quickly and needs a challenge: Encourage them to extend their build.

Say: "That's a strong bridge! Can you make it even longer and still keep it strong?"

Prompt: "Can you add more blocks or girders to strengthen it as it gets longer?"

- While students are building, read the **Real-World Connection** aloud on the activity guide.

Make Things Strong

Closure & Reflection Questions (5 MINUTES)

1. Let students know they will share their bridges and what they learned.
Say: "Now we're going to share about the strong bridges we built today!"
2. Invite students to share their designs with the whole class. Consider using a simple show-and-tell format, in which students hold up their designs and describe them.

If a student is quiet or unsure, help them share by describing their design based on what you've seen or talked about together.

3. Use the following discussion questions to guide whole-group reflection:
 - "What did you do to make your design stronger? What happened when you tested it?"
 - "How did you know your bridge was strong?"
 - "Where did you add girders or blocks to support your bridge, and why did you choose those spots?"
 - "How is your bridge like or different from real bridges you've seen?"
 - "If you designed something new, what would you do to make it strong?"

STEP 02: INVENT

Now it's your turn to design your own strong bridge!

Use at least 15 Small Blue Blocks to design your bridge. Press gently to test—does it stay strong?

Remember to place blocks and girders in weak spots to help make your bridge strong!

Real-World Connection

Bridges must be strong to hold people, cars, and trucks. Engineers add supports under bridges to help hold them up. Supports spread out the weight so the bridge doesn't bend or break. Before anyone uses a bridge, engineers test it to make sure it is safe and strong.

Reflection Questions

1. What did you do to make your design stronger? What happened when you tested it?
2. How did you know your bridge was strong?
3. Where did you add girders or blocks to support your bridge, and why did you choose those spots?
4. How is your bridge like or different from real bridges you've seen?
5. If you designed something new, what would you do to make it strong?