



SCIENCE
BOX



Classroom Activity: Building Bridges



One of the best ways to support your student's science learning is to encourage them to think, talk and explore like scientists. Today you will help your students build models of bridges as they engineer and investigate the strength and stability of structures.

Children Are Working On

- Investigating bridge structures.
- Exploring how strength and length can both be factors that make a good bridge.
- Using the Engineering Design Process to plan, create, test and improve their own bridge structures.
- Reflecting on how different materials are suited for different purposes.
- Observing, gathering, and sharing information using direct exploration and media.
- Thinking and exploring like scientists.
- Developing and strengthening positive attitudes toward science and the abilities to play and explore together.
- The following vocabulary:
 - **Engineer:** someone who designs and builds things to solve problems
 - **Bridge:** a structure that allows people, vehicles, or animals to cross over a gap
 - **Long:** distance from one end to the other end
 - **Strong:** something that can hold a lot of weight

Set up the Topic: Read

Read the book, **A Book of Bridges: Here to There and Me to You** by Cheryl Keely. Pause often to ask guided reading questions and connect back to the topic of bridges.

Before reading:

- Show the cover illustration to children. What do they notice? Have them describe what they see.
- Read the title, author and illustrator. What do they think the book is going to be about?
- Have children point to all the different bridges they see on the cover.

As you read:

- For shorter attention spans, read only the large-print text and save the fine-print details for at-home reading.
- Make connections by asking children to share if they have been on similar bridges to the ones pictured.
- Ask children to notice who or what is crossing each bridge or what is under the bridge that needs to be crossed.

After reading:

- Review the names of the different kinds of bridges they remember from the book.
- Encourage everyone to gather in a circle and hold hands to make a hand bridge like the one at the end of the book.



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Classroom Activity: Building Bridges



Watch

Cat in the Hat Knows a Lot About That!: Building Bridges (4:57)

<https://vegas.pbslearningmedia.org/resource/building-bridges-video/the-cat-in-the-hat-knows-a-lot-about-that/>

Before viewing:

- Provide some background information about the video they are about to watch. Say, “Nick and Sally are learning about bridges too! We are going to watch an episode of **The Cat in the Hat Knows a Lot About That!** to discover the problem Nick and Sally are having and how they solve it.”

Guided viewing questions:

- After the Cat says, “To the Thinga-ma-jigger!” (1:42) ask children, “What challenge are Nick and Sally trying to solve?”
 - After the Cat says, “Welcome to Spansylvania,” (2:29) pause and ask, “What did you notice about the bridges? Did you see a bridge like the one in Nick’s drawing?”
 - When Nick and Sally are on the stone bridge, pause after Sally says, “Yeah! Strong enough to hold a great big dragon!” (3:38). Ask children, “I wonder why this bridge is strong enough to hold a dragon?”
 - Make connections between the bridges in the episode and those found in the book, **A Book of Bridges: Here to There and Me to You** (drawbridge, vine and rope bridge, stone bridge).
 - After the dragon falls into the water and fish says, “Let’s go, go, go!” (4:57), ask students what they noticed about the rope and wood bridge. Ask, “What happened to the dragon at the rope bridge? Why?”
- **For shorter attentions spans, stop the video at 4:57, after the characters cross the rope bridge, and proceed to the final discussion questions. Otherwise, continue watching the full 11-minute video.



When the video is over, you may also ask the following questions:

- How would you describe the bridges in Spansylvania? How are they the same and different? Have you ever seen bridges like those before?
- What was Nick and Sally’s solution to their problem in the backyard? (Only ask if entire episode was viewed)
- What did you learn about bridges from the episode? What are important things to remember when building a bridge?
- What do you wonder now about bridges?



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Classroom Activity: Building Bridges



Reinforce Concepts: Digital Game

Bridge-a-rama - *The Cat in the Hat Builds That!* app

Optional: <https://pbskids.org/catinthehat/games/bridge-a-rama>

In this game, the dragon in Spansylvania is trying to get to a birthday party and he has a problem! He can't get across the bridge. Students will play the Bridge-a-rama game and help the dragon build bridges to get to the party.

Guided play questions:

- How is this game like the video you watched?
- Why isn't the dragon able to cross the bridge?
- What materials do you need to use to make the bridges longer/stronger?

Play & Explore

Guide children as they play and explore with bridges.

Included Materials:

- Popsicle sticks
- Pipe cleaners
- Wooden clothespins

Before play (whole group):

Show students the materials so they understand what is available for the hands on activity. Explain that today they are going to build a strong bridge and they are going to test it using items in the classroom like blocks, counters, maybe even a water bottle. Remind them that all great scientists and engineers have failed and they need to try and try again. Ask students:

- Which materials will help your bridge to be strong?
- What problem are you trying to solve with your bridge?

Guided play questions:

- Why did you choose these materials to build with?
- How can you make your bridge stronger/longer?
- How can we test how strong your bridge is?
- How might your bridge be different if you used a different material?

Extension Activity

Display pictures of different types of bridges and have students build similar bridges during centers using Legos, blocks and/or recyclable materials.



Suggested Readings

Bridges are to Cross

by Philemon Sturges

Draw Bridges Open & Close

by Patrick McBriarty

Cross a Bridge

by Ryan Ann Hunter

The Three Billy Goats Gruff

by Stephen Carpenter

Twenty-One Elephants and Still Standing

by April Jones Prince



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SCIENCE BOX



Classroom Activity:

Play and Learn: Ramp and Roll



In this activity, children will explore how objects move, roll, slide and/or stay put on ramps and other surfaces as they build and play with ramp structures. As children play, your role will be to help them notice, connect and wonder around their shared play.

Children Are Working On

- Investigating how objects roll, slide or stay put on different surfaces.
- Exploring cause and effect relationships (for example, how the slope of a ramp influences how an object moves).
- Collaboratively building and playing with ramp structures to investigate how objects move.
- Reflecting on how different materials are suited for different purposes.
- Observing, gathering, and sharing information using direct exploration and media.
- Thinking and exploring like scientists.
- Developing and strengthening positive attitudes toward science and the abilities to play and explore together.
- The following vocabulary:
 - **Ramp:** a surface with one end higher than the other
 - **Roll:** the way a round object moves by turning over and over on a surface
 - **Slide:** when someone or something moves or slips easily along a smooth surface without turning over and over
 - **Surface:** the outside layer of something
 - **Friction:** a force that tries to stop things from moving

Set up the Topic: Read

Read **Oscar and the Cricket: A Book About Moving and Rolling** by Geoff Waring to the whole group. Model question-asking behaviors and the use of a red ball to make connections and further support the storytelling experience.

Before reading:

- Show the cover illustration to children. What do they notice? Have them describe what they see.
- Explain that this is a book about Oscar, a cat who finds a ball and doesn't know what to do with it. Ask kids to wonder what they would do with a ball if they found one?
- Tell children that you'll be asking them to make lots of observations about the characters, setting and events in the book using their five senses (what are they?).

As you read:

- Ask children to describe Oscar, the setting of the book and all of the things that Oscar is doing.
- Before reading the text on a new page, encourage children to predict what's going to happen next. "What do you predict will happen when the ball rolls through the mud? Let's find out!"

After reading:

- Oscar did a lot of exploring and investigating with that ball and the different ways he could make it move and roll. He was acting like a scientist! Scientists investigate to explore and test out their ideas and predictions so they can learn more about how the world works. Today, you will have a chance to investigate rolling and sliding objects just like Oscar!
- Bring out a real red ball. Can it roll? Can you make it roll faster? Slower? How? Encourage children to make observations and predictions about the ball and then investigate by rolling it to each other. Talk about what they notice and make connections to other objects children like to roll.



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Classroom Activity:

Play and Learn: Ramp and Roll



Watch

PBS LearningMedia: Building Ramps (1:27)

<https://vegas.pbslearningmedia.org/resource/rtttec13.ela.fdn.pramp/building-ramps/>

Before viewing:

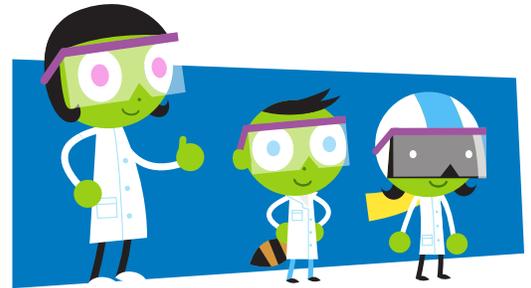
- Provide some background information about the video children are about to watch. Say, “We are going to watch a video where two little girls make a ramp to help their balls roll. A ramp is a surface with one end higher than the other.”

Guided viewing questions:

- Which ball is going to win the race, the heavy ball or the light one?
- Why do you think the heavy ball won the race?
- Why do you think the bigger ball went further than the little ball?

When the video is over, you may also ask the following questions:

- What materials did the girls use to build their ramps?
What other materials could you use?
- Where do we find ramps in our environment?



Reinforce Concepts: Digital Game

PBS KIDS Play & Learn Science! App

Choose one of the “Ramp-and-Roll” games in the PBS KIDS Play & Learn Science! app. In these games, children play and explore with ramps and object properties that influence force, distance, and motion. Make this a multi-day, center-based experience.

Guided play questions:

1. Explore The Roll game

- Predict if an object will roll or slide. What did you notice about the ways objects go down the slide?
- How do different balls roll differently? What do you notice about the shape of the objects that roll?

2. Hit The Target game

- Do you have any ideas about why sometimes an object reaches the target and sometimes it doesn't?
- How are the objects the same? How are they different? Talk about how the size of an object makes a difference in how far it rolls.

3. Surface Challenge game

- Help your student describe what surfaces on the course might feel like. Have your student predict and explain why some surfaces might slow down or speed up the ball as it rolls on the course.
- Talk about friction and how it is a force that tries to stop things from moving. Ask children which surfaces have more or less friction and how that affects the ball reaching the hole.



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SCIENCE BOX



Classroom Activity:

Play and Learn: Ramp and Roll



Play & Explore

Guide children as they play and explore with ramps!

Included Materials:

- | | | |
|---|---------------------------------------|---|
| <input type="checkbox"/> Cardboard tube | <input type="checkbox"/> Cookie tray | <input type="checkbox"/> Grippy rubber sheets |
| <input type="checkbox"/> Toy car | <input type="checkbox"/> Binder clips | <input type="checkbox"/> Play dough |
| <input type="checkbox"/> Ping pong ball | <input type="checkbox"/> Bubble wrap | |
| <input type="checkbox"/> Measuring tape | <input type="checkbox"/> Sandpaper | |

Extra Materials Needed:

- Books for stacking

Make this a multi-day, center-based experience:

1. On the first day, have children explore ramps using only cardboard tubes, ping pong balls and/or toy cars to learn how an incline affects the movement of rolling objects. Encourage children to make predictions, test, and observe.

Guided play questions:

- Notice: Using your senses, make observations and discuss what you notice as objects move down the tube ramp. Are they rolling or sliding? Do they move fast or slow?
- Connect: Compare and contrast the objects that go down your ramp. What do you notice about how different objects move down a ramp? Do some objects move faster or slower?
- Wonder: How far do objects roll or slide once they reach the bottom of your ramps? Use your measuring tape to find out! What happens to the rolling object when you raise or lower the ramp?

2. On the second day, attach textured materials to a cookie sheet to investigate how different materials affect the objects rolling down the ramps.

Guided play questions:

- Notice: Use your senses to observe the different textures of the materials. What words would you use to describe the surfaces? Are they bumpy, rough, smooth, slippery or something else?
- Connect: How do the materials affect how far the ball rolls? Use your measuring tool to investigate.
- Wonder: What other kinds of surfaces can we use? Can you find other objects to test the ramps? What other tools can we use to measure distance?

Extension Activity

On another day, roll play dough into “snakes” and help children build pathways for the ping pong balls to roll down the cookie sheet ramps!

Suggested Readings

Move it!: Motion, Forces, and You by Adrienne Mason

Newton and Me by Lynne Mayer

Roll, Slope, and Slide: A Book About Ramps by Michael Dahl

Ramps and Wedges by Sian Smith

Sloping Up and Down: The Ramp by Felicia Law and Gerry Bailey

Inclined Planes in My Makerspace by Tim Miller

El movimiento: Tira y empuja, rápido y despacio by Darlene Stille

Empujar y jalar by Sharon Coan



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Classroom Activity: Structures



Today your students will explore structures using the engineering design process. They will watch and play with media and work together on a hands-on activity in which they will define a problem and plan, create, test, and improve upon their solution.

Children Are Working On

- Exploring how different materials and design choices could affect the strength and sturdiness of a structure.
- Communicating observations of the properties of structures to others.
- Engaging in discussions about structures and their properties to connect previous knowledge with new concepts explored through media and hands-on investigations.
- Thinking and exploring like engineers!
- The following vocabulary:
 - **Structure:** something that is built
 - **Base:** the bottom of something
 - **Sturdy:** strong

Set up the Topic

This discussion will be a time to preview the day's activity and learn more about structures. Start the conversation by asking the children what they already know about structures.

- Think about a tower, which is a type of structure. What kind of materials do you think you could use to build a tower that is sturdy and strong?
- If a structure is stable, it does not move easily. What are some things a structure might need so it is stable and won't move easily?

Read

Read the book **Young Frank, Architect** by Frank Viva to the children, pausing often to ask guided reading questions.

Before reading:

- Show the cover illustration to children. What do they notice? Have them describe what they see.
- Read the title, author and illustrator. What do they think the book is going to be about?
- Have you ever heard the word "architect"? Does anyone know what an architect does?
- Explain that this book is about a boy who is always building and creating things, he is a young architect. Ask the children what they like to create.

As you read:

- Why do you think Young Frank uses macaroni, spoons and even his dog Eddie to make things?
- What kinds of things did Young Frank create?
- I wonder if we could sit in a chair made out of toilet paper rolls?
- How would you feel if someone always told you that what you created was not going to work?

After reading:

- Why do you think Old Frank took Young Frank to the museum?
- By the end of the story, Young Frank felt like a REAL architect and today you will all be architect too! You are going to create a playground for Ruff.



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Classroom Activity: Structures



Watch

The Ruff Ruffman Show: Eye of the Hamster (4:36)

<https://pbskids.org/ruff/structures/videos>

Before viewing:

- Provide some background information about Ruff and the video they're about to watch. Say "In this video, you'll see Ruff's friends build an obstacle course for a hamster! Let's find out how they do this."

Guided viewing questions:

- After Ruff falls off the sky bridge (the platform with balls under it), ask why they think it didn't work for him. You may also, depending on the age of the students, pause before Ruff falls and ask if the creation will be sturdy enough.

When the video is over, you may also ask the following questions:

- Some objects stack more easily than others. What kinds of things are easy to stack, and why?
- What kinds of things are hard to stack, and why?
- What kinds of shapes are better for building a stable structure?



Reinforce Concepts: Digital Game

Hamster Run

pbskids.org/ruff/structures/game

In this game, students will experiment with a variety of building pieces to construct stable and sturdy structures that help the hamster get to its carrot.

Guided play questions:

- How is this game like the video you watched?
- As the child plays, if they aren't sure about their decision, encourage them to "test" it! They can always use the "undo" button if they don't like where they've placed a block.
- Which blocks make your structure more stable?



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Classroom Activity: Structures



Play & Explore

Guide children as they play and explore with structures!

Included Materials:

- Toilet paper tube
- Tape
- Ruff Ruffman Action Plushie

Extra Materials Needed:

- A variety of recyclable materials such as:
 - Cardboard pieces of various sizes
 - Cardboard tubes of various sizes (poster tube, paper towel tube)
 - Construction paper
 - Wooden blocks
 - Rope
 - Plastic cups



Before play (whole group):

Show students the materials so they understand what is available for the hands on activity. Ask students:

- How could you use these materials to make a base for a structure like a tower?
- How could you use these materials to create ramps or platforms?
- Not all structures are towers. What are some other structures you might create with these materials?

Explain the challenge:

Tell students to use what they know about building structures to design and create a playground for their Ruff Ruffman Action Plushie to play on! Be sure to have students draw what they want to create first. Depending on the ages you may have students work in pairs or alone.

Guided play questions:

- Why did you choose these materials to build with?
- How can you make your structure more stable or sturdy?
- What kinds of changes did you have to make to get the design just right?

Extension Activity

Combine background knowledge from the “Building Bridges” and “Ramp and Roll” VEGAS PBS KIDS Science Box Lessons to create specific challenges, such as designing an obstacle course using bridges and ramps, cars and plushies.

Suggested Readings

How a House Is Built
by Gail Gibbons

If I Built A House
by Chris Van Dusen

Changes, Changes
by Pat Hutchins



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