Ready to Learn
Activities Guide

Research-based STEM Activities for Grades PreK-3 from the Playful Minds at PBS KIDS
It's all about design!
Engineers who design boats need to explore the right materials and the right shape to make the boat float.

It's all about light!
Whenever there is light, there is a shadow!

It's all about friction!
Friction is a force that occurs when two objects rub together, slowing or stopping motion.

It's all about stability!
When building a structure, it is important to start with a strong and stable base.

It's all about perspective!
Accidents can cause you to look at things in another way. You'll never know what you might find!

It's all about the properties of materials!
A material is what something is made out of. All materials have different properties that can be observed, like color, weight, and texture. The properties of materials can sometimes make those materials useful, and sometimes not.
Materials

**Activity 1: Make a Boat Float**
- Book: *What Floats in a Moat* by Lynne Berry
- Water Table or other container to hold water
- Paper
- Pencils or crayons
- Handout: Sink or Float
- Bouncing Putty
- Aluminum Foil
- Pool noodles (cut into smaller pieces)
- Deli containers or bowls
- Craft sticks
- Foil pie pans
- Rocks
- Wooden blocks
- Tape

**Activity 2: My Shadow Goes Where I Go**
- Book: *The Black Rabbit* by Philippa Leathers
- Shadow Puppet Character Cards
- Toy cars
- Legos
- Small plushies
- A variety of light sources.
  - Suggested options include: Flashlights, Desk lamps, Sunlight
- Markers/pencils
- Butcher paper and/or copy paper
- Non-standard measuring tools
- Shadow theater
  - Make from what you have available: rope, clothespins, bedsheets, wax paper, tent, chairs, table, butcher paper, etc.
Activity 3: Slip or Stick?
- Book: *Oscar and the Cricket: A book about moving and rolling* by Geoff Waring
- At least three cardboard pieces each measuring approximately two feet by four feet, covered in various materials. Suggestions include: Sandpaper, Bubble Wrap, Aluminum foil, Paper bags, Plastic bags, Grippy rubber, Playdough, Fabric
- Objects that will slide and/or roll. Suggestions include: Crayons, Lego blocks, Balls, Wooden blocks, Toy cars, Small foil/plastic containers, Washed recyclable soup cans with duck tape over the sharp edge, Pringle containers, Lids
- Magnifying glasses
- Books, boxes, blocks, or other sturdy materials to construct ramps

Activity 4: Some Assembly Required
- Book: *Iggy Peck, Architect* by Andrea Beaty
- Jumbo craft sticks
- Plastic 3 oz. Cups
- Tin foil
- Pipe cleaners
- Cat in the Hat Engineering Design Process Graphic
- Paper
- Pencil
- Optional: Yard stick, measuring tape, ruler or non-standard form of measurement

Activity 5: Take a Different Look
- Book: *The Beautiful Oops!* by Barney Saltzberg
- Paper
- Marbles/small ball
- Washable paint
- Tray/box lid with sides

Activity 6: Dress for Success
- Book: *Home* by Carson Ellis
- A bunch of household items that kids can use to make costumes.
Ready to Learn Activities Guide
An Introduction

What is the Activities Guide?
The Activities Guide is a set of 6 flexible activities, each 60-90 minutes in length, designed to engage young children, ages 3-8, in hands-on science learning inspired and supported by PBS KIDS media. The activities use guided play to expose kids to developmentally appropriate digital and tangible tools meant to encourage the development of science inquiry and engineering design skills. There are two core pieces of each activity:

The Activity
Six fully sequenced activities have been mapped out for educators to utilize as-is or to adapt as they would like. Each activity introduces the topic, incorporates a clip from a PBS KIDS show to spark children’s interest in that topic, and provides support for a hands-on investigation or engineering challenge, an interactive reading, digital game play, and an included sample letter that educators can send home to support community-to-home connections.

The Resource List
In addition to each fully sequenced activity, a resource list of additional videos, activities, games, and books, all tied to the same topic, has been created to support educators interested in constructing their own activity to meet the unique needs of the children they are working with and the environment they are working within.

This guide offers FLEXIBILITY! The activities are designed to be used as singular experiences that can be brought to kids in a variety of contexts. The sequenced activities can be implemented as designed, or the pieces on the resource lists can be cobbled together to create activities designed to meet the realities of the settings and situations educators are working within.
Using the RTL Activities Guide

Below is list of tips and suggestions to support implementation of the activities in the guide.

♦ Try out all of the elements of an activity before implementing it. Watch the video, play the game, read the books, and do the hands-on piece, to get a sense of all of the moving pieces.

♦ Consider the learners. What are their ages? Interests? Learning styles? Can they read/write? What will they have been doing in the time leading up to the activity? Post-activity? Adapt activities to meet their needs.

♦ Consider the learning environment. What space is available for the activity? How can the space best be set-up to support the activity? Adapt the activity and the space to support engagement.

♦ Consider the materials. Is there access to the needed technology? Is there access to a range of available materials for children to use during the hands-on work? Adapt the activity based on what is available and accessible.

If designing an activity based on the resource list:

♦ What can be used to spark learners’ interest in the topic being explored?

♦ How might the available media help to model children’s engagement with the science inquiry and engineering design practices?

♦ How can the media and other parts of an activity be contextualized with questions and conversation to further support its ability to spark, model, and support learning?

♦ What are the hands-on components of the activity? How does the activity support hands-on/minds-on learning?

♦ How does the activity support the development of observation skills?

♦ How does the activity support connection making?

♦ How does the activity support children’s curiosity? Does it create opportunities for them to ask questions, and investigate those questions?

Visit klruc.org/guideresources for additional resources
Activity 1

Make a Boat Float

It's all about design!

Engineers who design boats need to explore the right materials and the right shape to make the boat float.

TARGET AGE GROUP: PreK-3

TIME: 60-90 minutes
Whatever Floats Your Boat (6:15-8:55)

The Cat in the Hat Knows A Lot About That!

https://pbslearningmedia.org/resource/whatever-floats-your-boat/

Reflect on the ideas being explored by The Cat in the Hat and his friends, Nick and Sally. Here are some places you might pause:

♦ After Nick says, “Maybe only one color floats?” (~7:00), ask the children,
  ▶ “Do you think that the color of the clay will affect its ability to float?”
  “Why do you think so?”

♦ After Nick says, “But, we tried all those colors already,” (~8:27), ask the children,
  ▶ “Why do you think some of the clay is floating now?”
  ▶ “How is the clay different than it was before?”

Let’s investigate how the materials and the shape of your boat affect its ability to float.

EXPLORE

Children will explore the shape and materials of objects to determine the objects’ ability to float.

Materials:

☐ Water Table or other container to hold water

☐ Paper

☐ Pencils or crayons

☐ The Cat In The Hat Knows a Lot About That! Sink or Float Table

☐ A variety of materials to design a boat. Suggested materials include:
  ♦ Bouncing Putty
  ♦ Aluminum foil
  ♦ Pool noodles (cut into smaller pieces)
  ♦ Deli containers or bowls
  ♦ Craft sticks
  ♦ Foil pie pans
  ♦ Rocks
  ♦ Wooden blocks
  ♦ Tape
Instructions:

- Lay out a variety of materials for children to design their boat.
- Have children use their senses to explore and make observations about the property of each material.
- In the video, Nick and Sally made a prediction that only one color of clay would float. Have children predict which materials and shapes will float.
- Use the Sink or Float chart from The Cat in the Hat Knows A Lot About That! activity “What Floats Your Boat” to record children’s predictions.
- After exploring materials and making predictions, it’s time to use their engineering skills to create their boat! Remind children that engineers who design boats need to explore the right materials and the right shape to make the boat float.
- As children finish building their boats, it’s time to test them! Have children place their boat in the water and see if it floats.
- As children investigate ask:
  - What do you observe about each boat’s shape, size, and weight?
  - What materials seem to sink?
  - What materials seem to float?
  - What shapes seem to sink?
  - What shapes seem to float?
- After children have tested their creation, have them refer to the observations they made during the test.
- Have children brainstorm possible ways to improve their design.
- If you have time use it to allow children to iterate on their work. Provide children an opportunity to build, test, redesign and have them further test and redesign before sharing their findings.

**TIP**

For younger children, spend more time and go more in depth. Provide fewer items to play with at a time to help them learn why objects float and sink. You might consider having them play the digital game before their hands-on exploration if you think they need a bit more background knowledge.
More ways to play:

- If Preschool-K children have difficulty creating a boat, encourage the use of different shapes and materials for their boats. Allow children to test their boats by placing them in water and recording the results by placing each boat on the “Sink” table or “Float” table.

- Challenge children to improve the design of their boats to hold more weight such as pennies, counting bears, rocks, etc.

- Test out a paper towel tube. Ask, “Do you think it will sink or float?” “Why do you think so?” After testing, ask, “Can you make something float that sinks?” “Tell me how we can make this paper towel tube float?” Provide a variety of materials for the children to investigate. Ask, “Can you make something sink that floats?” Say, “Show me something that floats.” “What would you do to make it sink?” “Why do you think that will make it sink?” Allow time to investigate.
READ

Bring the whole group together and read *What Floats in a Moat* by Lynne Berry, pausing often to ask questions and connect back to the topic of sink and float.

Before reading:
- Read the title, author, and illustrator.
- Ask:
  - By looking at the cover of the book what do you think the book is about?
  - What is a moat?
  - Do you think the boat will sink or float?
  - Why or why not?

As you read:
- Ask:
  - Why is Archie taking time to doodle and draw, sketch and scrawl?

After the reading:
- Ask:
  - Why do you think the first attempts at crossing the moat failed?
  - What kind of a boat would you have built?
  - What materials would you have used?

Other book suggestions:
*Floating and Sinking (First Facts, Our Physical World)* by Ellen S. Niz
*What Floats? What Sinks? A Look at Density* by Jennifer Boothroyd
*The Magic School Bus Ups and Downs: A Book About Floating and Sinking* by Joanna Cole
*Who Sank the Boat?* by Pamela Allen

PLAY

Play & Learn Science – Water Games: Sink or Float

This game is available within the Play & Learn Science app that is available for free on your tablet or phones app store.

In this game children move objects into a swimming pool and observe whether they sink or float in the water. Children are prompted to make a floating object sink and to observe that sometimes small things sink and big things float.

- Ask:
  - What objects seem to sink?
  - Why do you think they’re sinking?
  - What objects seem to float?
  - Why do you think they’re floating?

SHARE

Send the parent letter on page 17 home with children to encourage at-home conversations with families about this activity.
What Floats Your Boat?

Predict and discover what sinks or floats!

During a trip to the Buoyant Sea, Sally and Nick test what sinks or floats. They learn that materials and shapes matter. What do you think will float? Test out your predictions using items from around the house and the printable Table.

Instructions

1. Print the Sink or Float Table (on the following page). If you are playing with a friend, print two.

2. With the help of an adult, gather ten small household items (rubber band, coin, pencil, sticker, etc.) and fill up a sink or bucket with water.

3. Predict whether the items will sink or float by sorting them into two piles.

4. Test your predictions in the water. Place each item under “Sink” or “Float” on the Table. Were you surprised? Scientists often are!

More Ways to Play

1. Can you change something that sinks into something that floats? Or something that floats into something that sinks? How did you do it?

2. At first, Sally and Nick think certain colors float. What do you think? Find ten, similar-colored items and predict whether they will sink or float. Now test and record your results with the Sink or Float Table. Does color matter? If not, what does?

3. After testing and placing your items on the Sink or Float Table, explain to a friend or family member why you think some items float and others sink.

Find related games in the FREE The Cat in the Hat Builds That app. Download it now!

pbskids.org/catinthehat

To PREDICT is to say what you think will happen before you try it out. I predict you will have a boat-load of fun predicting what sinks and floats!
**Sink** | **Float**
---|---

Does it sink or does it float?
Hello Families:

Today your child worked with others to “Make a Boat Float.” Using their engineering skills, your child investigated how changing the shape or material a boat is made of affects its ability to float. Along with The Cat in the Hat, from the PBS KIDS program The Cat in the Hat Knows a Lot About That!, we discovered that building with the right material is important, and having the right shape can make all the difference.

To find out more about what your child learned, you can ask:

- What materials did you use to make your boat?
- What did you do to change your boat materials?
- Tell me about the shape of your boat.
- What did you do to change your boat shape?
- Did your boat float?
- Why do you think your boat did/didn’t float?
- What do you think would happen if...an elephant sat in your boat? It was windy?

Your child also had the opportunity to listen to What Floats in a Moat by Lynne Berry. Have your child retell the story to you.

Here are some related books to look for at the library:

- *Floating and Sinking (First Facts, Our Physical World)* by Ellen S. Niz
- *The Magic School Bus Ups and Downs: A Book About Floating and Sinking* by Joanna Cole
- *Who Sank the Boat?* by Pamela Allen

Tune into your local PBS station and visit PBSKIDS.org online for more opportunities to learn, watch, and play together with your family. Watching videos and playing games with your child encourages social interactions, bonding, and learning.

You can also access PBS KIDS content free in PBS KIDS Video app and the PBS KIDS Games app.
Hola Familias:

Hoy su hijo/a trabajó con otros para hacer que un barco flotara. Usando sus habilidades de ingeniería, su hijo/a investigó cómo la forma o el material de un barco afecta su capacidad para flotar. Junto con The Cat in the Hat, del programa PBS KIDS, The Cat in the Hat Knows a Lot About That! descubrimos que construir con el material correcto y tener la forma adecuada es importante.

Para saber más acerca de lo que su hijo/a aprendió, puede preguntar:

- ¿Qué materiales usaste para hacer tu barco?
- ¿Qué hiciste para cambiar los materiales de tu barco?
- Háblame de la forma de tu barco.
- ¿Qué hiciste para cambiar la forma de tu barco?
- ¿Tu barco flotó?
- ¿Por qué crees que tu barco flotó o no floto?
- ¿Qué crees que pasaría si un elefante se sentara en tu bote?
- ¿Qué crees que pasaría si hiciera mucho viento?

Su hijo/a también tuvo la oportunidad de escuchar la historia *What Floats in a Moat* de Lynne Berry. Haga que su hijo/a le cuente la historia.

Aquí hay algunos libros relacionados que puede buscar en la biblioteca:

- *Floating and Sinking (First Facts, Our Physical World)* by Ellen S. Niz
- *The Magic School Bus Ups and Downs: A Book About Floating and Sinking* by Joanna Cole
- *Who Sank the Boat?* by Pamela Allen

Sintonice su estación local de PBS y visite PBSKIDS.org en línea para obtener más oportunidades de aprender, ver programas y jugar con su familia. Ver videos y jugar con su hijo/a fomenta las interacciones sociales, la unión y el aprendizaje.

También puede acceder al contenido de PBS KIDS gratis en la aplicación de video PBS KIDS y en la aplicación de juegos PBS KIDS.
Resources to Support Sink and Float Activities

Get children thinking and exploring like scientists using this collection of sink or float resources from Ready to Learn and PBS KIDS. Providing young children the opportunity to participate in simple investigations, inspired by PBS KIDS characters they know and love, where they ask questions, make predictions, collect data, and draw conclusions is a great way to support developing science inquiry skills and practices.

These resources can be used and adapted to meet the particular needs of your learning environment and the children that you are working with. Whether you are a program director, classroom teacher, after-school and summer provider, or any other adult working with young children, these resources are for you!

Resources are grouped by activities, videos, and games (online and mobile), and include a list of books related to the topic of sinking and floating. Resources can be used as-is, adapted, grouped to make a complete lesson, integrated into preexisting lessons, or used as a jumping off point for your own lesson ideas. If you’re looking for an example of a completely sequenced activity on sinking and floating, using resources from the following list, check out the ‘Make a Boat’ activity featuring content from The Cat in the Hat Knows a Lot About That!

Visit klu.org/guideresources for links to each resource

Videos

The Cat in the Hat Knows a Lot About That!
Whatever Floats Your Boat

Join Sally, Nick, and the Cat in the Hat as they go to the Floating Island and learn about why certain objects float and others sink!

After the boat they made for Fish sunk, Sally and Nick ride the Thinga-ma-jigger to the Floating Island in the Buoyant Sea to figure out how they can make a boat that will float. But when they step on the island, it takes them across the sea and away from the Thinga-ma-jigger! Now in order to get home, they have to build a boat out of the clay on Floating Island. They find out that while some clay sinks, others stay on top of the water because of their shape!
The Cat in the Hat Knows A Lot About That!

Do Try This at Home! Make a Boat

Grade Level: PreK-3

Will a toy car float? How about a tin pie plate? In this short video from The Cat in the Hat Knows a Lot About That!, Nick and Sally test some objects in their backyard wading pool, to see what will float and what won’t.

Everyday Learning

Sink or Float?

Grade Level: PreK-1

Show students how easy it is to experiment while introducing them to the concept of buoyancy, in this fun video demonstration. Students are asked whether they think an item will sink or float. The item is then dropped into a fish tank, and the results are charted. This resource is part of KET’s Everyday Learning collection.

PEEP and the Big Wide World

Making Things Float

Grade Level: PreK

In this video segment from PEEP and the Big Wide World, real kids explore what types of objects float in water and how to keep sinking objects from staying afloat.

Sesame Street

Tubes Sink or Float

Grade Level: PreK-1

Let’s make a hypothesis! Will the tube sink or float? Abby and Elmo experiment to find out. This resource teaches STEM skills.

Sesame Street

Murray Experiment: Boat

Grade Level: PreK

What helps a boat to float? Let’s experiment with Murray to find out! This resource teaches engineering skills.

Sesame Street

Rocco’s Boat

Grade Level: PreK-1

Elmo and Zoe decide what materials will make a good boat and sing about finding a boat to float.
Activities

The Cat in the Hat Knows a Lot About That!  
What Floats Your Boat?  
Grade Level: PreK-3

During a trip to the Buoyant Sea, Sally and Nick test what sinks and floats. In this activity, have children predict what will sink or float, test out their predictions in water, and then record their observations on the printable Sink or Float Table. Available in both English and Spanish.

Fetch!

Science Activities: Float My Boat  
Grade Level: 1-6

Even large ships weighing hundreds of thousands of tons stay afloat. But how? In this activity, kids investigate floating by building tinfoil boats and loading them with pennies until they sink. Through testing, kids will discover an important pattern: The boat’s size and shape make a difference in how much of a load it can carry. Time to roll up the shirtsleeves and dive in!

Sesame Street Little Discoverers: Big Fun with Science, Math, and More  
Sink or Float  
Grade Level: PreK-1

Use this resource to help discover exciting new ways to build on children's natural fascination with STEM concepts. In this topic, children will investigate which objects sink or float in water.
Games

Play & Learn Science App
Water Games: Sink or Float Grade Level: PreK-K
In this game, children move objects into a swimming pool and observe whether they sink or float in the water. Children are prompted to make a floating object sink and to observe that sometimes small things sink and big things float.

Sesame Street
Underwater Sink or Float Grade Level: PreK-1
When you see something you think will sink, click on it and aim for the treasure chest.

Books

What Floats in a Moat by Lynne Berry
Floating and Sinking (First Facts, Our Physical World) by Ellen S. Niz
What Floats? What Sinks? A Look at Density by Jennifer Boothroyd
The Magic School Bus Ups and Downs: A Book About Floating and Sinking by Joanna Cole
Who Sank the Boat? by Pamela Allen

Find Extra Resources on the next few pages.
Even large ships weighing hundreds of thousands of tons stay afloat. But how? In this activity, kids investigate floating by building tinfoil boats and loading them with pennies until they sink. Through testing, kids will discover an important pattern—a boat's size and shape make a difference in how much it can carry.

**Materials**
- Activity sheet for each kid
- 6–10 six-inch squares of tinfoil per kid
- Pennies (100 per kid)
- 1 dishpan or bucket half-filled with water per two kids
- Towels
- Rulers
- Sticky notes or pieces of scrap paper

**National Science Education Standards**

**Grades K–4**
- Physical Science: Properties of objects and materials
- Science and Technology: Abilities of technological design

**Grades 5–8**
- Science and Technology: Abilities of technological design

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**Activity 3**

**Lead the Activity**

1. **Introduce Ruff's Challenge.** (5 minutes)
   - Explain that today's challenge is to learn more about why things float by making tinfoil boats.
2. **Round 1: Build boats.** (10 minutes)
   - Hand out the activity sheets and have kids do steps 1–4. The exploration in round 1 helps kids figure out the basics of boat building and loading pennies. The activity sheets also prepare them for a discussion of boat design and exploration in round 2. Here kids refer to the boat they made in round 1 and to record on a sticky note or piece of paper the number of pennies each boat held.
3. **Discuss what happened.** (15 minutes)
   - Bring the group together. Have kids put their boats and tally papers in a sequence. Go from the least pennies held to the most, like a number line. Ask: What features do boats that hold a lot of pennies have in common? (Size—big boats hold more pennies; strength—sturdy boats don't crumple under a load; stability—wide boats don't roll over as easily as narrow boats.) Tell kids that when a boat floats, it pushes aside (displaces) water to make room for itself. The more water a boat displaces, the more force there will be pushing back on the boat. This force keeps the boat from sinking. Boats that displace a lot of water can generally carry a heavier load than boats that displace only a little water. Pennies are a heavy load. After Round 1, tell kids to keep each boat they made and pennies. Tell kids to keep each boat they made and pennies. Tell kids to keep each boat they made and pennies. Tell kids to keep each boat they made and pennies. Tell kids to keep each boat they made and pennies.

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**Float My Boat**

[Image of a boat floating on water with a child standing on it]
Activity Tips
• Place towels underneath the water container to minimize mess.
• Remind kids to place pennies gently onto their boats. Dropping them can sink a boat that might otherwise hold a larger load.

What would a tinfoil boat that pushes aside a lot of water look like?
(It would have medium-sized bottoms and medium-sized sides. This combination displaces more water than a boat with a large bottom and small sides or one with tall sides and a small bottom.)

Doing science and engineering involves making predictions, testing them (which includes doing something, making observations, and drawing conclusions), and sharing your results. Give an example of how we did these steps today.
(Aanswers will vary.)

Round 2: Build more boats.
(10 minutes)
Now that kids understand that displacing water is related to how much a boat can carry, have them refine and retest their designs by completing step 5 on their activity sheet. Tell kids to keep their champion boat—the one that carried the most pennies—and to record how many pennies it held.

Share effective designs.
(15 minutes) Gather as a group. Have each kid show the group his or her champion boat. Compare boats that held similar numbers of pennies. How are they alike and different? (Kids may just describe the boats’ features. Remind them about the role of displacement. Boats holding similar numbers of pennies should displace similar amounts of water.)

Award points.
(5 minutes) Time to rack up some points. Gather as a group. Review the activity’s key ideas by asking everyone the following questions. Each question is worth 50 points. Whenever you hear an acceptable answer, award 50 points to the entire group.

• What are some things that happen when you add more pennies to your boat?
(Answers include making the boat weigh more and having it sink lower into the water. Also, tinfoil boats often bend when they’re heavily loaded.)

• Why do boats float?
(Water pushes on the bottom and sides of a boat, holding it up.)

• What kinds of features help boats hold a lot of pennies?
(Answers may include a large size, sturdy construction, and stable shape.)

• What is the relationship between a boat’s size and how much it can carry?

These steps today give an example of how we did science and engineering. By asking everyone the following questions, we have reviewed the activity’s key ideas. How are they alike and different? (Kids may just describe the boats’ features. Remind them about the role of displacement. Boats holding similar numbers of pennies should displace similar amounts of water.)
Float My Boat

Activity Tips

• Place towels underneath the water container to minimize mess.
• Remind kids to place pennies gently onto their boats. Dropping them can sink a boat that might otherwise hold a larger load.

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(It would have medium-sized bottoms and medium-sized sides. This combination displaces more water than a boat with a large bottom and small sides or one with tall sides and a small bottom.)

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• What are some things that happen when you add more pennies to your boat? (Answers include making the boat weigh more and having it sink lower into the water. Also, tinfoil boats often bend when they're heavily loaded and tip when they're unevenly loaded.)

• Why do boats float? (Water pushes on the bottom and sides of a boat, holding it up.)

• What kinds of features help boats hold a lot of pennies? (Answers may include a large size, sturdy construction, and stable shape.)
Float My Boat

Today, your challenge is to build tinfoil boats and test different designs to see how many pennies you can load without sinking your boat. Let’s dive in!

What to Do

   - 6-inch squares of tinfoil
   - Pennies
   - Ruler
   - Container half-filled with water

2. Round 1: Build boats. Make a boat by bending the tinfoil. Draw your design in the data table.

3. Make predictions. On the data table, enter your prediction for how many pennies your boat can hold before it sinks.

4. Test the design. Float your boat. Add pennies one at a time. Keep going until the boat sinks. Count how many pennies your boat held. But don’t count the last one—it sank the boat! Enter this number in the data table. Repeat steps 2–4, making a total of three boats.

5. Round 2: Build more boats. Make new designs, using what you learned about the height and thickness of the sides, the size of the bottom, and how to position the pennies. Record your designs, predictions, and test results in the data table.

Chew On This!

When a boat floats, it settles into the water, pushing the water aside to make room for itself. But it’s a two-way pushing match—the water pushes back on the bottom and sides of the boat. This force, called buoyancy, holds the boat up. The more water a boat pushes aside, the more force there will be pushing back on the boat and supporting it. This is why a boat’s size and shape make such a difference in how much of a load it can carry without sinking.
Oh no! I was filling the tub and fell asleep! Now my entire doghouse is under three feet of water! If I could just get a raft to pile all my precious belongings onto, then they won't get soggy. Wait, that's it! You can help me design a boat that will carry as much stuff as possible. Then, I'll build it and load on the Fetch 3000, and maybe it can save my bark-o-lounger and my collection of squeaky toys. But hurry, my chair's getting ruined! Great! Things will be back to normal just as soon as I wring out my bark-o-lounger!

My Boat

Fetch! My Boat

Try these:

- Can a really big tinfoil boat carry a lot of pennies? Build several boats using 12-inch squares of tinfoil. How many pennies does it take to sink these boats?
- Does the kind of water you float a boat in make a difference? Test to discover if your boat holds more pennies when it floats in fresh water or in salt water. To make salt water, dissolve two cups of salt in a gallon of warm tap water.
- Make an object that doesn’t float or sink—it “flinks!” Get the Flinker challenge from the ZOOM Web site at pbskids.org/zoom/activities.

Dig Deeper:

So, sailor, ready to “sink” your teeth into a few more challenges?

Watch FETCH! on PBS KIDS GO! (check local listings) and visit the FETCH! Web site at pbskidsgo.org/fetch.
Sink or Float

WELCOME, EDUCATOR!
You and the children you work with are about to embark on an engaging multimedia experience exploring concepts in Science, Technology, Engineering, and Math (STEM). Sesame Street Little Discoverers: Big Fun with Science, Math, and More is a resource to help you discover exciting new ways to build on children’s natural fascination with STEM concepts.

In this topic, children will investigate which objects sink or float in water.

HELP CHILDREN TALK ABOUT SINKING AND FLOATING:
» Some objects sink and others float.
» An object that sinks goes below the surface of the water.
» An object that floats stays above the surface of the water.
» Weight is one factor in sinking and floating, but it is not the cause. Some children may think an object sinks or floats because an object is heavy or light. But not all heavy objects sink, and not all light objects float. For example, large ships are very heavy but they float. Also, a pound of feathers will float and a pound of bricks will sink.
» Young children may not be ready to understand why objects sink and why they float, but they can make hypotheses and observe what happens to objects that are placed in the water.

For more fun ideas, videos, and games, check out sesamestreet.org/STEM on your computer or mobile device.

Major support provided by CA Technologies. Generous support provided by the S. D. Bechtel, Jr. Foundation and the Heising-Simons Foundation.
GOAL
Investigate ways to sculpt clay into boats that float.

QUESTION
How can changing the shape of clay affect whether it sinks or floats?

TIME
20–30 minutes

MATERIALS
» 1 water table, basin, or bucket filled with water
» 1 ball of oil-based sculpting clay per child (make sure you’re not using water-based clay)
» View and Do Chart (one per child)
» crayons

LET’S WATCH: “MURRAY EXPERIMENT: BOATS”
In the video, Murray and his friends try to make boats that float. They use aluminum foil to make boats of different shapes and then add large, round, metal washers to see how many washers each boat can hold and still float. Murray and his friends find out that a boat’s shape affects its ability to float.

LET’S TALK ABOUT IT
After you watch the video together, ask some questions to prompt a discussion.
» “What did Murray and his friends try to do with the aluminum foil?”
» “How were the sinking and floating boats different?”
» “If you could design a boat that floats, what would it look like?”

LET’S DO AN ACTIVITY:
1. Give each child a ball of sculpting clay, and ask them to roll the clay into balls.
2. Have children make a hypothesis about whether they think the clay ball will sink or float, then place the balls in the water.
3. Discuss what happens: “Did the balls sink or float?”
4. Say, “I wonder what we could do with the clay to make it float?” Ask for ideas.
5. Say, “Let’s try to make different kinds of boats with our clay. We’ll see if we can create some boat shapes that float.”
6. During the investigation, ask questions:
   » “What do you observe about the boat’s shape, size, and weight?”
   » “What shapes seem to sink?”
   » “What shapes seem to float?”
7. Have children record results on the View and Do Chart.
Have each child draw one boat design that sinks, and one that floats. Check to see that children correctly position their boats on top or below the surface of the water in their drawings.
**Sink or Float**

What Sinks? What Floats?

**Goal**
Observe that some objects sink and some float.

**Question**
What do you notice about objects that sink and objects that float?

**Time**
15–30 minutes

**Materials**
For each small group of children:

- 1 water table or clear basin or bucket of water.
- 1 bag of 6 to 12 different small objects that can get wet (suggested items that sink: rock, metal spoon, clay ball, rubber band, blocks, baseball; suggested items that float: pencil, leaf, popsicle stick, aluminum foil, plastic math counters, paper index card, plastic bottle)
- 2 large containers, one labeled “SINK” and one labeled “FLOAT”
- Activity Chart (one per child)
- crayons

In this activity, children will explore what sinks and what floats by testing different objects.

**Steps**
1. Ask children, “Which items do you think will sink?” “Which do you think will float?”
2. Have children test the objects by putting them in the water one at a time.
3. After an item is tested, have a child put the object into the “SINK” container or “FLOAT” container.
4. After all the materials are tested, count how many objects sink and how many float. Then, have children record the information with pictures onto the chart.
5. Ask, “What did the sinking objects have in common?” “What did the floating objects have in common?” Guide the children to discuss the shape and material of each object.
6. If there is time, help children find other objects to test. Before they put an object in the water, have them make a hypothesis about whether they think it will sink or float based on what they just observed.

**Tube Exploration**
Test a paper towel tube. Will it sink or float? Now wrap another paper towel tube carefully in aluminum foil so that it is watertight. Will it float? What happens if children open the foil-covered tube and place weights inside and rewrap it? Will it still float?
SINK OR FLOAT

What Sinks? What Floats?

Have children draw the objects that sink or float.
Sink or Float

Hello, Families!
Your child is full of curiosity. She is always observing, questioning, testing her thinking, and collecting information. These are important critical-thinking and problem-solving skills that help set her up for success in Science, Technology, Engineering, and Math (STEM).

Help Your Child Talk about Sinking and Floating
» Something that sinks goes below the top of the water.
» Something that floats stays on top of the water.
» All objects are made of different materials.

Try This at Home
Pick and choose the activities that work best for you and your child.

Let’s Talk. Use the words sink, float, and materials as many times as you can this week! Say things like, “I wonder if the soap will float in the tub.” “What material is this toy made of?”

Explore in the Tub. During bath time, provide plastic containers and cups, combs, blocks, metal spoons, and sponges for your child to explore which objects sink or float. Guess which shapes and materials will sink or float before you drop them into the water. Try dropping a cup that’s empty, and then fill it with water to see what happens.

In the Kitchen. Give your child a bowl to help you wash fruits like an apples, oranges, lemons, or limes. Ask your child to make a hypothesis: Which ones will sink and which ones will float? Investigate by placing them in the water.

For more fun ideas, videos, and games, check out sesamestreet.org/STEM on your computer or mobile device.
TUBE EXPLORATION
Use paper towel tubes to explore sinking and floating. Have your child investigate whether a tube will sink or float in water. What happens if he wraps the tube tightly in aluminum foil and then places it in the water? What happens if he unwraps the tube and places it back in the water?

WATCH “ROCCO’S BOAT”
In the video, Elmo and Zoe design a boat to help Rocco, Zoe’s pet rock, float. They test different materials and designs, and eventually solve the problem by combining materials that float to build a boat for Rocco.

ACTIVITY
Try different ways to get a plastic cup to sink.

MATERIALS
» sink, tub, or bucket of water
» large plastic cup
» different items to fill the cup (rocks, cotton balls, water, soap, washcloths)
» Activity Chart
» crayons

STEPS
1. Place the cup in water and observe that it floats. Feel what it’s like to push down on it.
2. Have your child make a hypothesis about which objects will help make the cup sink. Have fun exploring ways to sink the cup! Do any materials make the cup go under the surface of the water part-way? What about all the way?
3. Then, report and record your findings. Ask, “How did we make a floating cup sink?” “What new things did we find out from our test?”

For more fun ideas, videos, and games, check out sesamestreet.org/STEM on your computer or mobile device.
SINK OR FLOAT

Make It Sink!

Have your child draw what she puts inside the cup. Then have her draw a line above, below, or across the cup to show where the top of the water was.
Activity 2

My Shadow Goes Where I Go
It’s all about light!

Whenever there is light, there is a shadow!

TARGET AGE GROUP  PreK-3
TIME  60-90 minutes
My Shadow Goes Where I Go

The Cat in the Hat Knows a Lot About That!

https://pbslearningmedia.org/resource/my-shadow-goes-where-i-go/

Pause the video and reflect on Nick, Sally, and The Cat in the Hat as they play with shadows. Here are some places you might pause:

♦ After Fish says, “Look, Sally’s shadow came back when she did!” (~00:37), ask children, “Where do you think the shadows are coming from?”

♦ At the conclusion of the song, ask the children, “Does everything have a shadow?”

Let’s take a look around and explore the science behind shadows.

EXPLORE

Children will explore shadows with a light source and how the position of the light can make shadows grow or shrink.

Materials:

▌ Objects to create shadows.
   Suggested materials include:
   ♦ Pre-made PBS KIDS The Cat in the Hat Knows A Lot About That! Shadow Puppet Character Cards
   ♦ Toy cars
   ♦ Legos
   ♦ Small plushies

▌ A variety of light sources.
   Suggested options include:
   ♦ Flashlights
   ♦ Desk lamps
   ♦ Sunlight

▌ Markers/pencils

▌ Butcher paper and/or copy paper

▌ Non-standard measurement tools

▌ Shadow theater
   Make from what you have available: Rope, clothespins, bedsheets, wax paper, tent, chairs, table, butcher paper, etc.
Instructions:

Set up makeshift shadow theater with a set of pre-made PBS KIDS The Cat in the Hat Knows A Lot About That! Shadow Puppet Character Cards, several light sources, paper, crayon/pencils/markers, small plushies animals, toy cars, blocks/Legos, and flashlights.

To get started, recap what children learned about shadows from The Cat in the Hat and his friends. Allow the children freedom to create and draw shadows on paper, investigate in the shadow theater, or create a puppet show.

- As the children investigate, ask the following questions about shadows:
  - Can you make a shadow? Great! Tell me how you did it!
  - Can you make a shadow bigger? Smaller?
  - Is there another way to make the shadow change shape?
  - What do you notice if you place the puppet between the light and the wall?
  - What do notice if you place the flashlight high up or down low?
  - What do you notice if you rotate the shadow?

More ways to play:

- Write and perform their own shadow puppet play.
- Become shadow detectives and track shadows on a sunny day. Trace their shadows outside in the morning on a concrete surface. Have them stand in the same spot and track the shadows throughout the day to see the way they change as the sun moves through the sky.
- Investigate rainbow shadows. Have children predict what shadows will look like with colored lights. Tape pieces of colored cellophane over a flashlight so that light will shine through the cellophane. What does this shadow look like?
Bring the whole group together and read *The Black Rabbit by Philippa Leathers*, pausing often to ask questions and connect back to the topic shadows.

**Before reading:**
- Show the cover of the book as you read the title, author, and illustrator.
  While looking at the book cover ask, “Who do you think the Black Rabbit is?”

**As you read:**
- Do you think Rabbit will get rid of the Black Rabbit? Why or why not?

**After the reading:**
- When rabbit goes into the deep, dark woods, the Black Rabbit disappears. Why?
- What happened to make the wolf run away?

**Other book suggestions:**
*Guess Whose Shadow?* by Stephanie Swinburne  
*Light: Shadows, Mirrors, and Rainbows* by Natalie Rosinsky  
*Moonbear’s Shadow* by Frank Asch  
*My Shadow* by Robert Louis Stevenson, Sara Sanchez  
*Nothing Sticks Like a Shadow* by Ann Tompert  
*What Makes a Shadow?* by Clyde Robert Bulla
Play & Learn Science! – Shadow games

These games are available within the Play & Learn Science app that is available for free on your tablet or phones app store.

In these games, children will explore how shadows are created and how the position of the sun (the light source in this instance) influences the size and shape of shadows being created by different objects. They will also make predictions based on shadow observations.

Here are some tips for exploring learning through digital play:

**Exploring Shadows and Shadow Scenes:**
- When children select an object, ask them, “How is a shadow created?”
- Talk about the sun’s position in the sky. Ask, “How does the position of the sun cause the shadow to be a certain size and shape?”
- Encourage them to observe the objects and shadows closely. Ask, “Does everything make a shadow?” and “How is the shadow similar to the object you used to make it?”

**Guess the Shadow:**
- Talk about light source and ask children to make predictions. Ask, “What would happen to the shadow if you move an object closer to the light?”
- Ask, “What about the colors and pattern on the object? Does the shadow have the same colors and pattern?”
- Talk about where the shadow falls. Ask, “If the light is shining on the wall, why is some of the wall dark?”

Send the parent letter on page 50 home with children to encourage at-home conversations with families about this activity.
Shape, Size, and Silhouette Surprises

After Nick and Sally get spooked by some shadows, the Cat sheds light on how they are made. Join the fun! Explore shadow science with The Cat in the Hat stick puppets, a flashlight, and your own imagination.

Materials

- The Cat in the Hat Puppet printables
- Cardstock or paper
- Straws or wooden craft sticks (6)
- Scissors
- Tape
- Flashlight
- Wax paper (optional)

Make the Puppets

1. Print The Cat in the Hat Puppets onto cardstock or paper. If using paper, glue printed puppets onto a second sheet of paper to add more strength.
2. With an adult’s help, cut out the figures. Tape a straw or wooden craft stick to the back of each puppet.

Explore

1. Hold a stick puppet or two in front of the wall.
2. Can you create a shadow with the flashlight?
   - What if you move the light closer to the puppet or farther away?
   - What if you shine the light from high above or down low? What happens?
3. Can you make the shadow almost disappear, even while shining the light on it? How did you do that?

More Ways to Play

1. Now it is your turn to be a puppet! Ask a friend to point a flashlight at you while you make your body, hands, and arms into a shadow figure. A bird? A dinosaur? The Cat in the Hat?
2. Chinese shadow puppetry is one of the oldest forms of puppet art. Create your own screen and stage by taping a long piece of wax paper across the bottom of an open door frame. With the help of a friend, hold a stick puppet behind the paper, and then shine a light on it so the paper catches the shadow (the puppet will be between the light and the paper).
3. Pretend that it is the Cat—and not the children—who is spooked by the shadows. Have Nick and Sally teach him about shadows using the stick puppets and your flashlight.

Find related games in the FREE The Cat in the Hat Builds That app. Download it now!
THE CAT IN THE HAT
FISH
THING ONE
Stick Puppet
Shadow Play

THING TWO
Hello Families:

Today, your child used their investigative skills to learn about shadows with The Cat in the Hat from the PBS KIDS program The Cat in the Hat Knows a Lot About That!

The theme was “My Shadow Goes Where I Go!” After learning that shadows are made by blocking light, children investigated how the position of the light can make shadows grow or shrink, and how to change the shape of a shadow.

Think like a scientist!

► Ask your child to tell you what they learned about shadows from The Cat in the Hat Knows a Lot About That!
► Go for a shadow walk together and explore shadows indoors and outdoors. When your child sees a shadow or makes one, take a picture. Look at the photos together and reflect on the differences your child observed in shadows inside and outside.

Your child also had the opportunity to listen to The Black Rabbit by Philippa Leathers. Have your child retell the story to you.

Here are some related books to look for at the library:

♦ Guess Whose Shadow? by Stephanie Swinburne
♦ Moonbear’s Shadow by Frank Asch
♦ My Shadow by Robert Louis Stevenson, Sara Sanchez
♦ Nothing Sticks Like a Shadow by Ann Tompert
♦ What Makes a Shadow? by Clyde Robert Bulla

Tune into your local PBS station and visit PBSKIDS.org online for more opportunities to learn, watch, and play together with your family. Watching videos and playing games with your child encourages social interactions, bonding, and learning.

You can also access PBS KIDS content free in PBS KIDS Video app and the PBS KIDS Games app.
Hola Familias:

Hoy, su hijo/a usó sus habilidades de investigación para aprender sobre las sombras con The Cat in the Hat del programa PBS KIDS The Cat in the Hat Knows a Lot About That!

El tema fue “¡Mi sombra va a donde voy!” Después de saber que las sombras se crean bloqueando la luz, los niños investigaron cómo la posición de la luz puede hacer que las sombras crezcan o se reduzcan, y cómo cambiar la forma de una sombra.

¡Piensa como un científico!

- Pídale a su niño/a que le cuente lo que aprendió sobre las sombras.
- Exploren las sombras en interiores y salgan a caminar para encontrar sombras afuera. Cuando su hijo/a vea una sombra o la haga, tome una foto. Miren las fotos juntos y reflexionen sobre las diferencias que su hijo/a observa en las sombras en interiores y las de afuera.

Su hijo/a también tuvo la oportunidad de escuchar la historia The Black Rabbit de Philippa Leathers. Haga que su hijo/a le cuente la historia.

Aquí hay algunos libros relacionados que puede buscar en la biblioteca:

- Guess Whose Shadow? by Stephanie Swinburne
- Moonbear’s Shadow by Frank Asch
- My Shadow by Robert Louis Stevenson, Sara Sanchez
- Nothing Sticks Like a Shadow by Ann Tompert
- What Makes a Shadow? by Clyde Robert Bulla

Sintonice su estación local de PBS y visite PBSKIDS.org en línea para obtener más oportunidades de aprender, ver programas y jugar con su familia. Ver videos y jugar con su hijo/a fomenta las interacciones sociales, la unión y el aprendizaje.

También puede acceder al contenido de PBS KIDS gratis en la aplicación de video PBS KIDS y en la aplicación de juegos PBS KIDS.
Resources to Support Shadow Activities

Get children thinking and exploring like scientists using this collection of resources about shadow from Ready to Learn and PBS KIDS. Providing young children the opportunity to participate in simple investigations, inspired by PBS KIDS characters they know and love, where they are ask questions, make predictions, collect data, and draw conclusions is a great way to support developing science inquiry skills and practices.

These resources can be used and adapted to meet the particular needs of your learning environment and the children that you are working with. Whether you are a program director, classroom teacher, after-school and summer provider, or any other adult working with young children, these resources are for you!

Resources are grouped by activities, videos, and games (online and mobile), and include a list of books related to the topic of shadows. Resources can be used as-is, adapted, grouped to make a complete lesson, integrated into preexisting lessons, or used as a jumping off point for your own lesson ideas. If you’re looking for an example of a completely sequenced activity on shadows, using resources from the following list, check out ‘My Shadow Goes Where I Go’ featuring content from The Cat in the Hat Knows a Lot About That!

Visit klr.org/guideresources for links to each resource

Videos

The Cat in the Hat Knows a Lot About That!
My Shadow Goes Where I Go

No matter where you go, you’re shadow will be there! In this short video from, Nick and Sally create shadow puppets and sing a song about where your shadow can go!

Sid the Science Kid
Shadow Smile!

This episode of Sid the Science Kid teaches students all about shadows. Sid and his friends learn how to create shadows by blocking sources of light. This resource group includes seven video segments and an associated activity.
**Full Time Kid**

**How to Make Shadow Puppets**  
Grade Level 2-5  
2:11 min

Make your own shadow theater with just a few household items! Mya shows you how to make some neat shadow puppets and tells the story of the dinosaurs in her own low- lit play.

**Everyday Learning**

**Twinkle Twinkle Little Star**  
Grade Level: PreK-5  
1:47 min

Students are introduced to traditional folk music with an animated rendition of a familiar song, “Twinkle Twinkle Little Star.” The video features shadow puppets and a crankie—a long illustrated scroll, which has been used as a method of storytelling since the 19th century.

**Nature Cat**

**Nature Cat - Shadow Play**  
Grade Level: PreK-3  
1:02 min

This is short video of a father and his child playing with shadows using characters from Nature Cat. Not only do they have a blast, but they learn more about light and shadows too!

**Activities**

**The Cat in the Hat Knows a Lot About That!**  
Stick Puppet Shadow Play  
Grade Level: PreK-2  
PG 43

Make your own stick puppets of the Cat in the Hat, Nick, Sally, Fish, and Thing One and Thing Two. Then find a dark space, and explore shadow science with the puppets, a flashlight, and your imagination.

**Nature Cat**

**Shadow Play**  
Grade Level: PreK-3  
PG 57

In the Shadow Play activity, children will use a flashlight to explore how blocking a light source can create a shadow, and then use this new knowledge of shadows to put on a shadow play
Sid the Science Kid
Shadow Investigation

Children join The Super Fab Lab to investigate how and why a shadow is created and to answer questions such as: Do shadows have a similar shape to the item that blocked the light. If the item is striped or polka-dotted, do patterns show up on the shadow?

Games

Play and Learn Science App
Shadow Play

Shadow Play consists of three games; Exploring Shadows, Shadow Scenes, and Guess the Shadow. Children will observe and investigate relationship between light sources, objects, and shadows while exploring, planning, and carrying out investigations.

Peep and The Big Wide World
Shadow Shapes Game

Children move an object in front of a flashlight and observe how its shadow changes in this interactive game from PEEP and the Big Wide World. As children slide the object closer to and farther away from the light until its shadow matches the size of the object’s outline on the wall, they discover that when an object is moved closer to the light source, it blocks more light and its shadow becomes larger. Children also explore how changing the position of the light changes the direction in which the shadow of the object falls.
Books

The Black Rabbit by Philippa Leathers

Moonbear’s Shadow by Frank Asch

What Makes a Shadow? by Clyde Robert Bulla

My Shadow by Robert Louis Stevenson, Sara Sanchez

Guess Whose Shadow? by Stephanie Swinburne

Nothing Sticks Like a Shadow by Ann Tompert

Find Extra Resources on the next few pages.
SUPER FAB LAB INVESTIGATION:
Shadow Investigation

Episode: Shadow Smile
Cycle: Light & Shadow

Purpose (What We’re Going to Explore and Learn)

When something or someone blocks light, a shadow is created. Shadows have a similar shape to the item that blocked the light. If the item is striped or polka-dotted, though, those patterns do not show up on the shadow.

Materials (The Stuff We Need)

• Stiff paper or thin cardboard cut into different puppet shapes (animals, human faces, stars, etc.)
• Craft sticks and tape
• Markers to draw patterns on the puppets
• Other decorative items for the puppets (optional)
• Flashlight

Procedure (What to Do)

1. Allow children to choose the shape they would like to decorate. Encourage them to decorate their shapes, perhaps by drawing patterns on them.
2. Tape a craft stick to the back of each shape to make the puppet.
3. Explain that you are going to darken the room a little, then shine a light on their puppets to create shadows. Before each child takes a turn creating a shadow, ask the class to predict what the shadow will look like. For example: What shape will it have? Will it be striped like the puppet? Will it have eyes like the puppet? Will it be blue?
4. Turn on the flashlight and check your predictions. Be sure to describe each shadow. What shape is it? Is it patterned? Is it blue?

Other Stuff You Might Want to Know or Do

• Have children draw their predictions of what their puppet’s shadow will look like. Then draw what it actually looked like.
• After children have explored with their basic puppets, you might create some that have simple cut-outs in them. What happens when you shine a light on a shape with a hole in it? What does the shadow look like? Why? Help the children think about the fact that shadows are created when light is blocked. If there’s nothing to block the light, then there’s no shadow.
• On a sunny day, go on a shadow hunt. Talk about where the sun is, what object is blocking the sun’s light, and what the shadow looks like.
• You might add flashlights to your classroom or home toy box so children can continue to explore with shadows.

pbskids.org/sid

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Shadows can be a fascinating discovery for a young child. Some children may try to catch their own shadow, some children may try to run from it, and some children want to know why and how shadows are created. In this activity, your child will use a flashlight to explore how blocking a light source can create a shadow, and then use this new knowledge of shadows to put on a shadow play.

How to Put on a Shadow Play

Shadows can be a fascinating discovery for a young child. Some children may try to catch their own shadow, some children may try to run from it, and some children want to know why and how shadows are created. In this activity, your child will use a flashlight to explore how blocking a light source can create a shadow, and then use this new knowledge of shadows to put on a shadow play.

While You Play

If you are outside on a sunny morning or late afternoon, you may notice that you have a shadow. A shadow is a dark area where light from a light source is blocked by an opaque (not see through) object. In this case, the light source is the sun and you are the opaque object blocking the sun's light from reaching the ground. You may notice that other objects like trees or playground slides also have shadows. They are blocking the sunlight, too. As you complete this activity, talk with your child about the following questions.

1. What light sources can you stand in front of to make your shadow appear? (Examples: Sun, flashlight, lamp, lamppost)
2. Can you see more of your shadow when the light is coming from the side of you or above you?
3. At what time of day is your shadow the longest?

The Science Behind the Fun

Physical Science:
Your child is exploring why we see shadows and how the size of a shadow can depend on where it is in relation to a light source.

Science Inquiry:
Your child is using a tool to sort, compare, and contrast household items based on whether they are magnetic.

Vocabulary:
Opaque pronounced [o-pāk]
If something is opaque, it means that you cannot see through the object. It is the opposite of transparent.

If you are outside on a sunny morning or late afternoon, you may notice that you have a shadow. A shadow is a dark area where light from a light source is blocked by an opaque (not see through) object. In this case, the light source is the sun and you are the opaque object blocking the sun's light from reaching the ground. You may notice that other objects like trees or playground slides also have shadows. They are blocking the sunlight, too. As you complete this activity, talk with your child about the following questions.

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2. Can you see more of your shadow when the light is coming from the side of you or above you?
3. At what time of day is your shadow the longest?
Shadow Play

What you’ll need

• Flashlight

• Printouts of Nature Cat, Hal, Squeeks and Daisy and their support bases

• Cereal box or cardboard

• Scissors

• Glue

Directions

Step 1
Print out the sheet of Nature Cat, Hal, Squeeks and Daisy pictures and their support bases and glue the entire page to a cereal box or other cardboard. Let the glue dry.

Step 2
Cut out the pictures of Nature Cat, Hal, Squeeks and Daisy and their support bases again, with the cardboard. Be sure to cut the small lines in the base and the base support.

Step 3
Slide the base support into the base for each character so that the character can stand up.

Step 4
Go into a room where the lights are turned off and sunlight is limited. Place a flashlight on the floor approximately two feet from a blank wall. Turn on the flashlight so that the beam shines on the wall.

Step 5
Place one of the characters into the beam of light. Can you see the character’s shadow on the wall? Yes! You can see the shadow because the character is now blocking a portion of the light from reaching the wall. The area where the light is blocked creates a shadow and the rest of the light is still reaching the wall.
Step 6
Place a second character between the flashlight and the wall. Can you see both of their shadows? Now try moving one character closer to the flashlight and leaving another character closer to the wall. You will see that the character closer to the flashlight has a bigger shadow. The character further from the flashlight and closer to the wall will have a smaller shadow. This is because the character closer to the flashlight is blocking more of the light from the flashlight and letting less light pass by to reach the wall.

Step 7
Experiment with other light sources. What happens if you have a larger or smaller flashlight? What shadows can you see from an overhead light? What shadows can you see if you take the characters out in the sun during the morning or afternoon? Can you make the shadows bigger or smaller based on where there are in comparison to the light source?

Step 8
Use the characters to put on a shadow play. You can move the characters closer to or further from the light to show them coming towards something or walking away from something.

More ways to play
Nature Cat

• Nature Cat the Groundhog
Visit: pbskids.org/video/nature-cat/2365661731
TALLY HO!

Cut out the pictures of Nature Cat, Hal, Squeeks and Daisy and their support bases. Be sure to cut the small lines in the character base and the base support. Slide the base support into the base for each character so that the character can stand up.
Cut out the pictures of Nature Cat, Hal, Squeeks and Daisy and their support bases. Be sure to cut the small lines in the character base and the base support. Slide the base support into the base for each character so that the character can stand up.
Slip or Stick?
It’s all about friction!

Friction is a force that occurs when two objects rub together, slowing or stopping motion.

TARGET AGE GROUP PreK-3
TIME 60-90 minutes
**Fact and Friction** *(06:11-09:01)*

**The Cat in the Hat Knows a Lot About That!**
https://pbs.box.com/s/mcsz61omfnuie6q0dfbucs7w0a7n10el

Pause the video and reflect on the ideas being explored by Nick, Sally, and The Cat in the Hat. Here are some places you might pause:

 temperatura

- After Nick says, “We must be missing something?” (~07:00), ask the children,
  "Why do you think Nick and The Cat in the Hat did not slide down as fast as Sally?"
- After Thing 2 slides down the slidey-slide and The Cat in the Hat says, “Let’s take a closer look,” (~08:31), ask the children,
  "What is different about the surface of Thing 2’s slide compared to Thing 1’s slide?"

Let’s investigate how different surface materials affect how far an object moves.

**EXPLORE**

Children will test different types of surfaces using a variety of materials that slide or roll.

**Materials:**
- At least three cardboard pieces each measuring approximately two feet by four feet, covered in various materials.
  Suggestions include:
  Sandpaper, Bubble Wrap, Aluminum foil, Paper bags, Plastic bags, Gripply rubber, Playdough, Fabric
- Objects that will slide and/or roll.
  Suggestions include:
  Crayons, Lego blocks, Balls, Wooden blocks, Toy cars, Small foil/plastic containers, Washed recyclable soup cans with duck tape over the sharp edge, Pringle containers, Lids
- Magnifying glasses
- Books, boxes, blocks, or other sturdy materials to construct ramps
Instructions:

- Using cardboard pieces and sturdy materials, construct at least three ramps each covered in different materials.

- Have children feel and describe each surface. Ask:
  - What words would you use to describe each surface?
  - Which surface would you describe as bumpy, rough, fluffy, smooth, slippery, etc.?

- Record children’s observations.

- Let children know they are going to explore friction. Remind them friction is a force that slows the motion of an object.

- Ask: In the video, why did Thing 2 slow down and stop when he tried to slide down the slide? What happened to his slidiness?

- Encourage children to predict which surface will cause the most friction. Record predictions.

- As the children investigate which surface cause the most friction ask:
  - What do you observe as the objects rolled/slide down the ramp?
  - Which objects roll/slide fast? Why do you think it rolls/slides fast?
  - Which objects roll/slide slow? Why do you think it rolls/slides slow?
  - Do any of the surfaces cause the objects to stay put?

- After investigating the surfaces, ask children:
  - Did anything surprise you?
  - Did the object move down the ramp how you thought it would?
  - Why do you think it did or didn’t?
  - What surface caused the most friction?
More ways to play:

- Have children make predictions and measure how far objects roll or slide on each surface using standard or non-standard forms of measurement.

- Have children explore the impact that height makes on the distance that objects slide or roll by having them raise or lower the ramps.

- Have children investigate which objects roll and which objects slide on each surface.

- During outdoor time, have children investigate and test a variety of materials the way Oscar does in the book that you will read together, using sticks, leaves, and grass.

- If you have a playground with a slide near you, go outside to experiment with the slide.

Read **Oscar and the Cricket: A book about moving and rolling by Geoff Waring**, using the following discussion prompts:

**Before the reading**

- Have children look at the cover of the book and predict what they think will happen. Share that Oscar is a cat that finds a ball.
- Ask:
  - What do you think Oscar will do with the ball? What would you do if you found a ball?

**During the reading**

- Have children predict what will happen to the ball throughout the book.
  - Suggested questions include:
    - What causes the ball to move the way it does?

- What do you predict will happen when the ball rolls through the mud?

**After the reading**

- Ask:
  - What finally causes Oscar’s ball to stop?
  - Tell me why you think the ball rolled fast on the path and slow in the grass?

**Other book suggestions:**

- *Move it!: Motion, Forces and You* by Adrienne Mason
- *Newton and Me* by Lynne Mayer
- *Ramps and Wedges* by Ian Smith
- *Roll, Slope and Slide: A Book about Ramps* by Michael Dahl
**Play**

**Slidea-ma-zoo**

This game can be accessed online and within the PBS KIDS Games app and the Cat in the Hat Builds That app, which can both be downloaded for free on your smartphone or tablet’s app store.

Sally and Nick are in Frictionarium and are testing out some of the newest slides! Players can adjust the slide height and texture to achieve the intended goal. They can also observe the slide texture by using the Micro-ma-boodle (a Seussian magnifying glass).

As children are playing the game, have them share their predictions about how the height and/or texture of the slide will affect the intended goal.

**Share**

Send the parent letter on page 67 home with children to encourage at-home conversations with families about this activity.
Hello Families:

Today your child investigated friction with a “Slip or Stick” activity. Through an exploration with The Cat in the Hat from the PBS KIDS program The Cat in the Hat Knows a Lot About That!, we discovered that bumpy or rough surfaces cause more friction than smooth or slippery surfaces.

To find out more about what your child learned, you can ask:

► What words would you use to describe the surface on the ramps you played with today?
► Which surfaces were bumpy, rough, fluffy, smooth, slippery, etc.?
► Did any of the surfaces cause objects to stay put? If so, which objects?

Your child also had the opportunity to listen to Oscar and the Cricket: A Book About Moving and Rolling by Geoff Waring. Have your child retell the story to you.

Here are some related books to look for at the library:

♦ Move it!: Motion, Forces and You by Adrienne Mason
♦ Newton and Me by Lynne Mayer
♦ Ramps and Wedges by Ian Smith
♦ Roll, Slope and Slide: A Book about Ramps by Michael Dahl

Tune into your local PBS station and visit PBSKIDS.org online for more opportunities to learn, watch, and play together with your family. Watching videos and playing games with your child encourages social interactions, bonding, and learning.

You can also access PBS KIDS content free in PBS KIDS Video app and the PBS KIDS Games app.
Hola Familias:

Hoy su hijo/a investigó la fricción con una actividad de deslizamiento. A través de una exploración con The Cat in the Hat del programa PBS KIDS, The Cat in the Hat Knows a Lot About That!, descubrimos que las superficies ásperas causan más fricción que las superficies lisas o resbaladizas.

Para saber más acerca de lo que su hijo/a aprendió, puede preguntar:

► ¿Qué palabras usarías para describir la superficie en las rampas con las que jugaste hoy?
► ¿Qué superficies eran desiguales, ásperas, lisas, resbaladizas, etc.?
► ¿Alguna de las superficies hizo que los objetos se quedarán en su sitio? Si es así, ¿qué objetos?

Su hijo/a también tuvo la oportunidad de escuchar la historia Oscar and the Cricket: A Book About Moving and Rolling por Geoff Waring. Haga que su hijo/a le cuente la historia.

Aquí hay algunos libros relacionados que debe buscar en la biblioteca:

♦ Move it!: Motion, Forces and You by Adrienne Mason
♦ Newton and Me by Lynne Mayer
♦ Ramps and Wedges by Ian Smith
♦ Roll, Slope and Slide: A Book about Ramps by Michael Dahl

Sintonice su estación local de PBS y visite PBSKIDS.org en línea para obtener más oportunidades de aprender, ver programas y jugar con su familia. Ver videos y jugar con su hijo/a fomenta las interacciones sociales, la unión y el aprendizaje.

También puede acceder al contenido de PBS KIDS gratis en la aplicación de video PBS KIDS y en la aplicación de juegos PBS KIDS.
Resources to Support Friction Activities

Get children thinking and investigating like scientists using this collection of resources about friction from Ready to Learn and PBS KIDS. Providing young children the opportunity to participate in simple investigations, inspired by PBS KIDS characters they know and love, where they ask questions, make predictions, collect data, and draw conclusions is a great way to support developing science inquiry skills and practices.

These resources can be used and adapted to meet the particular needs of your learning environment and the children that you are working with. Whether you are a program director, classroom teacher, after-school and summer provider, or any other adult working with young children, these resources are for you!

Resources are grouped by activities, videos, and games (online and mobile), and include a list of books related to the topic of friction. Resources can be used as-is, adapted, grouped to make a complete lesson, integrated into preexisting lessons, or used as a jumping off point for your own lesson ideas. If you’re looking for an example of a completely sequenced activity for friction, using resources from the following list, check out the ‘Slip or Stick?’ activity featuring The Cat in the Hat.

Visit klu.org/guideresources for links to each resource

Videos

**The Cat in the Hat Knows a Lot About That!**
*Fact and Friction*  
11:54 min  
*Grade Level: PreK-K*
Sally loses her ‘slidiness’ and when they visit Frictionarium, they find out about a force called friction that can stop a person from sliding.

**The Ruff Ruffman Show**
*Pulling for the Plushie!*
6:15 min  
*Grade Level: K-2*
Explore sports science as Ruff Ruffman races over different surfaces to rescue his plushie. Ruff’s plushie is buried in a prize load of kibble! To get it back, Ruff will have to get Steve, a very unfriendly llama, to pull him and 200 pounds of kibble over one of three surfaces: sand, grass or pavement.
Sid the Science Kid
Backseat Driving with Grandma – Friction
Grade Level: PreK-1
Learn about friction and his Grandma as they take a car ride discussing the value of friction no friction.

Sid the Science Kid
Slide to the Side
Grade Level: PreK-1
In this episode of Sid the Science Kid, Sid learns all about friction, and how elements such as texture and material play into the resistance created between materials.

Activities

The Ruff Ruffman Show
Friction Racing | Science Crafts for Kids
Grade Level: K-2
Ruff Ruffman loves to explore the world through science and engineering. You and your child can explore the concept of friction by conducting an investigation using a toy car and ramp. See what you need to get racing!

The Ruff Ruffman Show
Bottle Cap Hockey
Grade Level: K-2
Children explore forces, motion, and friction through sports science in the Bottle Cap Hockey activity from the Ruff Ruffman Show. Children try to see how many points they can score with bottle caps as they observe, investigate, predict, reflect, and record their results.

The Ruff Ruffman Show
Ups and Down
Grade Level: K-2
This activity is a collaborative activity for two or more players to build a ramp that will roll a ball to a specific target. The children will build their ramp using their science inquiry and engineering design skills.

Friction Circus!
Grade Level: 3
Learn that life without friction is a 3-ring circus and an accident waiting to happen! A circus dog with lots of tricks will help you learn about compare and contrast, cause and effect, and the importance of friction.
Games

**The Cat in the Hat Knows a Lot About That!**

*Slide-a-ma-zoo*  
*Grade Level: PreK-2*

Have fun exploring the impact of friction and inclines as you make experiment with slides while racing Thing 1 and Thing 2.

**The Ruff Ruffman Show**

*Fish Force*  
*Grade Level: K-2*

Help rescue Ruff’s Toy from the penguins’ ice rink! Use science inquiry to predict and investigate force and motion in this sports science game.

Books

**Oscar and the Cricket: A Book About Moving and Rolling** by Geoff Waring

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

**Newton and Me** by Lynne Mayer

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

**Ramps and Wedges** by Ian Smith

Find Extra Resources on the next few pages.
Friction is a natural, unseen force that slows things down. However, not all surfaces will slow objects at the same rate. If you roll a ball across gravel or a rough sidewalk, it will slow down sooner than if you roll it across a smooth floor or ice. In this activity, your child will build a ramp and then use a toy car to test which of two surfaces has the least amount of resistance or friction.

How to Experiment with Friction

Friction is a natural, unseen force that slows things down. However, not all surfaces will slow objects at the same rate. If you roll a ball across gravel or a rough sidewalk, it will slow down sooner than if you roll it across a smooth floor or ice. In this activity, your child will build a ramp and then use a toy car to test which of two surfaces has the least amount of resistance or friction.

The Science Behind the Fun

Physical Science:
Your child is learning about motion and forces and how different conditions such as surface material and friction can affect an object’s movement.

Scientific Inquiry:
Your child is using measurement tools to gather data and then using a chart to record and compare that data to determine the results of an experiment.

Vocabulary:
Friction pronounced [frikk-shən]
The resistance that one surface or object encounters when moving over another.

While You Play

Scientists conduct investigations and experiments to determine if a hypothesis or prediction is correct. In this experiment, your child will test whether a smoother surface has less friction than a rough surface.

As you complete this activity, ask your child to talk about each surface and predict how far the car will travel.

1. Make a prediction at the beginning of the project: Do you think a toy car will travel farther on a rough or smooth surface?

2. Feel each surface that you are testing. Is each surface rough or smooth?

3. Make a prediction for each surface prior to testing it.

4. Talk about the results. On which surface did the car travel farther? Why?
Friction Racing

What you’ll need

• Books
• Large piece of cardboard or poster board
• A material to cover the surface of the cardboard (Examples: dish towel, t-shirt, denim jeans, sandpaper, bubble wrap)
• A toy car or any kind of toy or object with wheels that can roll across a flat surface
• Ruler or nonstandard measuring device such a block or shoe
• Printable chart
• Pencil
• Masking tape

Directions

Step 1
Print out the Friction Racing Data Chart.

Step 2
Stack several books on top of each other. Place one end of a smooth piece of cardboard or poster board across the top of the book pile. Then stack more books on top of that so that the cardboard is held securely in place. Make a crease in the cardboard at the edge of the books so that the cardboard now forms an inclined plane that reaches to the floor.

Step 3
Draw a picture of your ramp in the materials column on your data chart.

Step 4
Starting at the top of your ramp, release your toy car so that it travels down the ramp and potentially continues across the floor.

Step 5
Use the ruler or a nonstandard measuring device to measure how far the car traveled from the top of the ramp to where it stopped. Record your measurement in the second column of your data sheet.
Directions continued

Step 6
Repeat the experiment twice more on the cardboard, releasing your car at the same point as the first time. Record your results on your chart.

Step 7
Use the masking tape to attach another type of surface, such as the dish towel, to the surface of the cardboard. Be sure to cover any areas where the car will travel. Draw a picture of the ramp as it looks now in the second part of the materials column on your data chart.

Step 8
Perform the experiment three times on this new surface and record your results. You should now have raced the car down the ramp six times (three times on the plain cardboard and three times on your added material).

Step 9
Compare your results. Did the car always go farther on one surface? Did it go a lot farther or only a little? Did the car go about the same distance on both surfaces?

Step 10
Draw a conclusion. Since a car will likely go farther on a surface with less friction, based on your findings, which surface that you tested do you think has the least amount of friction?

More ways to play Ruff Ruffman

• A Plushie for Grandma
  Visit: pbskids.org/video/ruff-ruffman-show/3004252839

• Pulling for the Plushie!
  Visit: pbskids.org/video/ruff-ruffman-show/3004268660

• Music Video: I Won’t Give Up: Ruff Ruffman Action Plushie!
  Visit: pbskids.org/video/ruff-ruffman-show/3004270779
Players can strategically knock an opponent’s puck out of the way. Everyone will try once, and then get a second try. Turn sliding their bottle caps toward the target, and a target is at the other end. The players take

**Explore:** All players stand at one end of a table.

Explain the rules of the game:

To slide a bottle cap across these:

• Ask: Do you think it would be easy or hard
  smooth or rough?
  • Ask: How do each of these feel? Are they
  or ask the kids to walk to the different surfaces.
  Then, pass around the fabric and cardboard.

Which is lighter or heavier?

• Ask: How much does the bottle cap weight?
  or Rough?
  • Ask: How does the bottle cap feel? Is it smooth
  caps. Ask kids to use their senses to investigate it.
  Sit in a circle and pass around one of the bottle

**Ask**

Ask them to be a coach or score keeper.

Kids with motor issues or who otherwise cannot participate.

Every two to three children who are participating. If you have

wide table or on the floor. You should have one grown-up for

This game is for two to six players, and should be played at a

Can you score?

**Kid Description:** Grab a grown-up and some friends.

**Materials:** Gather up as many bottle caps as you can around the house (metal caps, plastic caps, jar lids). Try to find bottle caps that are about the same weight and size. If you don’t have enough, you could try using pennies or other coins.

• Sit in a circle and pass around one of the bottle caps. Ask kids to use their senses to investigate it.

**Materials:**

- Grown-up or coach
- Fabric
- Cardboard
- Bottle caps

**Explore:**

- Forces and motion, friction, inquiry process (predict, investigate, forces and motion, inquiry)
- Time: 45-60 minutes

**Kid Description:** Grab a grown-up and some friends.

**Materials:** Gather up as many bottle caps as you can around the house (metal caps, plastic caps, jar lids). Try to find bottle caps that are about the same weight and size. If you don’t have enough, you could try using pennies or other coins.

- Sit in a circle and pass around one of the bottle caps. Ask kids to use their senses to investigate it.

**Materials:**

- Grown-up or coach
- Fabric
- Cardboard
- Bottle caps

**Explore:**

- Forces and motion, friction, inquiry process (predict, investigate, forces and motion, inquiry)
cap farther away from the target. The player whose bottle cap is closest to the target gets one point. Play twice at each surface for round one.

• For round two, the table will be covered with fabric.
• For round three, the table will be covered with cardboard.
• At the end of three rounds, the player with the most points wins.

Reflect
★ After the game is over, clean off the table and sit together.
★ Ask kids to look at their predictions on the printout.
  • Ask: Let’s reflect on the game we just played. Which surface was easiest or hardest to slide on? Table, cloth, or cardboard? Why do you think so?
  • Ask: What other materials could you use in this game?

Investigate
★ Line the players up at one end of a table, and place the target at the other end. With many players it might be easier to have them sit nearby, and only come to the end of the table when it’s their turn.
★ Put all the caps in a bag or hat and ask the players to take turns reaching into the bag to pick out their caps for the round.
★ Play the first round on an uncovered table. Each player goes twice.
★ After round one, cover the table with fabric (using some tape), and play again. Each player goes twice.
★ After round two, cover the table with cardboard (using some tape), and play again. Each player goes twice.
★ At the end of the three rounds, the player who has the most points wins!

Predict
★ Ask the kids which materials will allow the caps to move most easily: the tabletop or floor, the fabric, or the cardboard?
  • Ask: Do you think it will be easiest to slide a bottle cap across the table, the fabric, or the cardboard?
★ On the printout, have the kids draw their predictions.
  • Ask: Based on your investigation of the materials, do you predict it will be easy or hard for the bottle caps to slide on the three different surfaces? Draw your predictions on the chart.
<table>
<thead>
<tr>
<th>Surface</th>
<th>Target</th>
<th>Target</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table (or floor)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You draw how far you predict your bottle cap will go on each surface.
Ups and Downs

Kid Description: Grab a grown-up and some friends for this building activity. Can you make a ramp that will roll a ball right to the target?

This activity is for two or more players to collaborate (or compete!) to build a ramp. It can be played indoors or outdoors.

Materials:
In addition to a ball (ping-pong, tennis, golf, or bouncy ball), you’ll need a bunch of household items that have different structural elements: wide bases, thin bases, tubes, surfaces, fasteners, heavy things, and light things. If this is a competition, you’ll want to have one set of the same materials for each team.

Here are some suggested materials, but feel free to use your own!

- **Large Objects:** cardboard tubes, cereal boxes, plastic bottles, paper plates, card stock, paper/plastic cups
- **Fasteners:** pipe cleaners, rubber bands, paper clips, tape
- **Long Objects:** straws, popsicle sticks/tongue depressors, toothpicks
- **Wildcard Ideas:** tinfoil, plastic wrap, sandwich bags

Wonder

★ Sit in a circle and pass around the materials. Ask kids to use their senses to explore them.
  - **Ask:** What is this material?
  - **Ask:** How does each material look?
  - **Ask:** How does each material feel?
  - **Ask:** How does each material sound?

Define a Problem

★ Explain the rules for the activity
  - **Explain:** Each team will work together to build a ramp that will send the ball as close as possible to the target. You’ll get 15 minutes to build, test, and improve, and then it’s time to share your ramps!

Note: If you’d like to create your own ramp challenge, or if kids want to define their own goals, go for it! You could try changing the time, distance, or other rules of the game.
Imagine and Plan

Set out the target six feet from the starting line where the kids will build their ramps.

Ask: What materials will you use to make your ramp?

Can you draw what your ramp will look like?

Ask: Let's make a plan for your ramp. The materials they're going to use are:

Ramp design. Sketching it out and listing materials later.

Have the kids use the printout to plan their ramp design, sketching it out and listing the materials they're going to use.

Create

Set up the kids with their building materials at the starting line.

Set the timer for 15 minutes and tell the kids to start building!

If kids get stuck, try giving them a hint.

Test

When time is up, ask players to roll the ball down the ramp towards the target.

Ask: Which materials will you use to make your ramp?

Can you draw what your ramp will look like?

Ask: Let's make a plan for your ramp.

The materials they're going to use are:

Ramp design. Sketching it out and listing materials later.

Have the kids use the printout to plan their ramp design, sketching it out and listing the materials they're going to use.

Create

Set up the kids with their building materials at the starting line.

Set the timer for 15 minutes and tell the kids to start building!

If kids get stuck, try giving them a hint.

Test

When time is up, ask players to roll the ball down the ramp towards the target.
Reflect

★ Have everyone sit in a circle near the starting line.

★ Ask kids to look at their drawing of their ramp, and compare it to the ramp they built.
  - **Ask:** How was the ramp you built different from the one you drew?
  - **Ask:** Which materials worked best to make your ramp? Which materials didn’t work?
  - **Ask:** Are there other materials you would like to try?

Improve

★ Ask kids to improve their ramp designs based on the results of their test.
  - **Ask:** How would you improve, or make your ramp better, so the ball can go farther? Spend a few minutes changing your design, then run the test again and see if you get a different result!
Ups and Downs

Draw your ramp in the space provided, and list which materials you're going to use. What do you predict will happen when you test your ramp?

Prediction:

Materials:
Activity 4

Some Assembly Required
It's all about stability!

When building a structure, it is important to start with a strong and stable base.

TARGET AGE GROUP: PreK-3
TIME: 60-90 minutes
WATCH

Design Time  (4:26 – 8:42)

The Cat in the Hat Knows a Lot About That!
https://pbs.box.com/s/fcz9ycjs59blfma74zfuhtjpdw3jarn

Pause the video and reflect on the ideas being explored by Cat in the Hat and his friends, Nick and Sally. Here are some places you might pause:

♦ After Sally says, “Why are these three things still standing and everything else fell over?” (~7:22), ask the children,
  ▶ “Did the robot bump everything over?” “Do you think the robot can bump some things over but can’t bump other things over?” “Why do you think that?”

♦ At the conclusion, ask:
  ▶ “How did Nick get the robot turned off?” What change did Sally and Nick make to the design of their tower?” “Why did they make that change?” “Did the robot knock over the tower with the large base?” “Why do think the robot was unable to knock over the tower with the new design?”

Let’s design and construct a tall tower with a stable base using our engineering skills.

EXPLORE

Children will use the engineering design process to create a structure with a sturdy base.

Materials:

- Building materials
  - Jumbo craft sticks
  - Plastic 3 oz. Cups
  - Tin foil
  - Pipe cleaners
- Cat in the Hat Engineering Design Process Graphic
- Paper
- Pencil
- Optional: Yard stick, measuring tape, ruler or non-standard form of measurement
Instructions:

Set up an area for children to have space to build their tower.

♦ As a large group discuss the Engineering Design Process Graphic.
  ▶ Explain that engineers use the Engineering Design Process as a way to solve problems.
  ▶ Once an engineer figures out the problem or what they are trying to create, they use their imagination and knowledge about how things work to make a plan, build their design, test it out, and improve it.
  ▶ Ask children, “Tell me about a time when you had a problem and how you solved it.”

♦ Tell children The Cat in the Hat has a real problem and needs their help. He is trying to build a tower, but he can’t get it quite right.

♦ Remind children of what they learned from The Cat in the Hat about the base of the structure.

♦ Allow children to working independently or in groups of two or three, using their engineering skills to imagine and plan, create and test, and make improvements to their tower.

♦ Engage the children in short conversations about their plan as they build their tower. Questions could include:
  ▶ Tell me about your structure.
  ▶ How did you decide to start with that base?
  ▶ Is your base strong enough to support how tall you want your tower?
  ▶ I noticed that your tower fell over. Tell me how you are going to improve it.

♦ Allow children to share their work.

♦ Optional: Children can measure their tower using provided measurement tool(s).

More ways to play:

♦ Using the same materials, build the tallest tower in 5 minutes.
♦ Using the same materials, build a structure using only one cup as the base.
♦ Add small wooden cubes to the materials list.
♦ Have children build a structure with only one cube as the base.
♦ Have children create a structure that appears to defy gravity and is a feat of balance.
♦ Using wooden clothespins, small binder clips, and jumbo craft sticks, build a structure that:
   ▶ Supports the most amount of weight.
   ▶ Is the tallest structure.
   ▶ Is the tallest structure with the fewest clothespins?
Read *Iggy Peck, Architect* by Andrea Beaty using the following discussion prompts:

**Before reading:**
- Show the cover of the book as you read the title, author and illustrator.
- Ask:
  - What is an architect? (a person who designs buildings)
  - What is the boy on the cover doing?
  - What do you think the lady on the cover is thinking?

**As you read:**
- Ask:
  - Why do you think Miss Lila Greer dislikes architecture?
  - How do you think Iggy feels about being in Miss Lila Greer’s 2nd grade class?

**After the reading:**
- Ask:
  - Were Iggy’s parents supportive of his interest in building things?
  - How did things change in Miss Greer’s class after she crossed the bridge the children had built?
  - What are some of the materials Iggy used in his creations?

**Other book suggestions:**
- *Rosie Revere, Engineer* by Andrea Beaty
- *Most Magnificent Thing* by Ashley Spires
- *The Three Billy Goats Gruff* by Stephen Carpenter
- *Twenty-One Elephants and Still Standing* by April Jones Prince

**PLAY**

**Hamster Run**

In this game, available on pbskids.org, children use the engineering design process to build, test, and redesign a structure to help the hamsters reach food!

Engaging the children in conversation during digital play encourages learning.

- Ask:
  - “Did you always get the solution right on the first try in the game?”
  - If no, ask “What did you do on your next try?”
  - “What kinds of things did you notice the structures needed in order to be stable and sturdy?”

**SHARE**

Send the parent letter on page 89 home with children to encourage at-home conversations with families about this activity.
COMMUNICATE AND COLLABORATE

The Engineering Design Process

- Define a Problem
- Imagine & Plan
- Create
- Test
- Improve
Hello Families:

Today your child used their engineering skills to learn about structures with Cat in the Hat. They discovered that structures need a strong and stable base, so they don’t fall over.

To find out more about what your child learned, you can ask:

- Tell me about the structure you built today?
- Tell me about the base of your tower?
- Why did you decide to start with that base?
- Was your base strong enough to support how tall you want your tower?
- Did your tower fall over? Tell me how you improved your tower to help it stand up?

Your child also had the opportunity to listen to *Iggy Peck, Architect* by Andrea Beaty. Have your child retell the story to you.

Here are some related books to look for at the library:

- *Rosie Revere, Engineer* by Andrea Beaty
- *Most Magnificent Thing* by Ashley Spires
- *The Three Billy Goats Gruff* by Stephen Carpenter
- *Twenty-One Elephants and Still Standing* by April Jones Prince

Tune into your local PBS station and visit PBSKIDS.org online for more opportunities to learn, watch, and play together with your family. Watching videos and playing games with your child encourages social interactions, bonding, and learning.

You can also access PBS KIDS content free in PBS KIDS Video app and the PBS KIDS Games app.
Hola Familias:

Hoy su hijo/a usó sus habilidades de ingeniería para aprender acerca de las estructuras con Cat in the Hat. Descubrió que las estructuras necesitan una base fuerte y estable, para que no se caigan.

Para saber más acerca de lo que su hijo/a aprendió, puede preguntar:

- Cuéntame sobre la estructura que construiste hoy.
- Cuéntame sobre la base de tu torre.
- ¿Por qué decidiste comenzar con esa base?
- ¿Era tu base lo suficientemente fuerte como para soportar la altura que querías para tu torre?
- ¿Se te cayó la torre? ¿Dime cómo mejoraste tu torre para que se quedara parada?

Su hijo/a también tuvo la oportunidad de escuchar a la historia Iggy Peck, Architect por Andrea Beaty. Haga que su hijo/a le cuente la historia.

Aquí hay algunos libros relacionados que debe buscar en la biblioteca:

- Rosie Revere, Engineer by Andrea Beaty
- Most Magnificent Thing by Ashley Spires
- The Three Billy Goats Gruff by Stephen Carpenter
- Twenty-One Elephants and Still Standing by April Jones Prince

Sintonice su estación local de PBS y visite PBSKIDS.org en línea para obtener más oportunidades de aprender, ver programas y jugar con su familia. Ver videos y jugar con su hijo/a fomenta las interacciones sociales, la unión y el aprendizaje.

También puede acceder al contenido de PBS KIDS gratis en la aplicación de video PBS KIDS y en la aplicación de juegos PBS KIDS.
Resources to Support Structure Activities

Get children thinking and exploring like scientists and engineers using this collection of resources about structures from Ready to Learn PBS KIDS. Providing young children the opportunity to participate in simple investigations and engineering challenges inspired by PBS KIDS characters they know and love, where they ask questions, make predictions, plan solutions, build, test, and improve their creations is a great way to support developing inquiry and engineering skills and practices.

These resources can be used and adapted to meet the particular needs of your learning environment and the children that you are working with. Whether you are a program director, classroom teacher, after-school and summer provider, or any other adult working with young children, these resources are for you!

Resources are grouped by activities, videos, and games (online and mobile), and include a list of books related to the topic of structures. Resources can be used as-is, adapted, grouped to make a complete lesson, integrated into preexisting lessons, or used as a jumping off point for your own lesson ideas. If you’re looking for an example of a completely sequenced activity about structures, using resources from the following list, check out ‘Some Assembly Required’ featuring content from The Cat in the Hat Knows a Lot About That!

Visit klyn.org/guideresources for links to each resource

Videos

The Cat in the Hat Knows a Lot About That! 10:58 min
Design Time
Grade Level: PreK-K
Sally is trying to make a vase for her mother but each one she tries falls over. The Cat in the Hat takes Nick and Sally to Blueprintia where designs become real. Through engaging in the engineering design process they discover what they can learn by designing, testing, and improving their ideas, which helps solve Sally’s challenge.
**The Ruff Ruffman Show**  
**Building is a Breeze**  
Grade Level: K-2  
5:00 min

Explore structural science as Ruff Ruffman uses his new service, called “Ask Ruff First” or “ARF,” to help kids looking for a way to keep their mini-golf tower from tipping over in the wind in this video from The Ruff Ruffman Show. Ruff recalls the story of his great-great-grand-uncle Ruffois and his assistant Blossóm, who discovered that cutting holes in a tower can prevent it from falling. This video has been captioned in both English and Spanish.

**The Ruff Ruffman Show**  
**Eye of the Hamster**  
Grade Level: K-2  
4:26 min

Explore structural science as Ruff Ruffman uses his new service, called “Ask Ruff First” or “ARF,” to entertain a bored hamster in this video from The Ruff Ruffman Show.

According to Ruff, building an obstacle course is a great way to entertain a hamster. However, remembering how he’d trained for a dogcathalon, Ruff admits he could never figure out how to build the sky-bridge without it collapsing. This video has been captioned in both English and Spanish.

**Zoom**  
**Columns: Finding the Strongest Shape**  
Grade Level K-8  
3:34 min

The shapes of a structure and its parts are often as important as the materials those parts are made of. In this video segment adapted from ZOOM, members of the cast bend and fold sheets of paper to see which shape is strongest and can best support the weight of a heavy book. This resource is useful for introducing components of Engineering Design (ETS) from the Next Generation Science Standards (NGSS) to grade K-8 students.
Activities

The Ruff Ruffman Show

Teacher’s Guide: Structures

Targeted to students in kindergarten to second grade, this science resource collection from The Ruff Ruffman Show features teacher’s guides, YouTube-inspired videos, digital games, and student activities in English and Spanish starring canine host extraordinaire, Ruff Ruffman. Ruff, along with his trusty assistants Blossom the cat and Chet the mouse, answers questions from kids, takes on challenges, and learns the value of failure—all while modeling science inquiry skills and learning about core science concepts. Bring the fun of Ruff’s scientific investigations into your learning environment and use the letters to families to extend the learning at home!

The Ruff Ruffman Show

Architecture Scavenger Hunt

Explore structural science and look for shapes around your school or in the buildings in your neighborhood.

The Ruff Ruffman Show

Tower Time Activity

Explore structural science and try to stack a tall and stable tower.

The Ruff Ruffman Show

Built It Up, Knock It Down

Explore structural science and compete in a building contest where each team builds a structure without using tape and then tries to knock the other one down using only paper.

The Ruff Ruffman Show

Build a Better Birdhouse

Encourage children to explore core science concepts in this activity based on The Ruff Ruffman Show. After a birdbath mishap, Ruff wonders if a different column would make it stronger. Which shape would support the most weight?

Straw Shapes Activity

Test the stability of a triangle and a square by pressing them against a flat surface, in this activity from Building Big.
Games

The Ruff Ruffman Show
Hamster Run - Ruff Ruffman  Grade Level: K-2
Build structures to help the hamsters reach their food! Use the engineering design process to build, test, and redesign in this structural science game.

Curious George
Build a Bot Curious George  Grade Level: PreK-2
Curious George needs help building robots with different properties.

Books

Iggy Peck, Architect by Andrea Beaty
Rosie Revere, Engineer by Andrea Beaty
The Three Billy Goats Gruff by Stephen Carpenter
Twenty-One Elephants and Still Standing by April Jones Prince
Most Magnificent Thing by Ashley Spires

Find Extra Resources on the next few pages.
Overview

Exploring structural science with Ruff is a great way to engage students in science learning. In this series of episodes, Ruff has a consulting company, “ARF – Ask Ruff First,” that helps people solve building challenges. Ruff learns about properties of materials, force and motion, and stability as he designs, tests, builds (and breaks!) different structures.

This guide will help you bring the fun of Ruff’s scientific investigation to your students. There are four parts:

1. Background Information
2. Science Talk
3. Let’s Investigate: 2D to 3D Challenge
4. Extensions

You can find all the resources referenced below on PBS LearningMedia: www.pbslearningmedia.org/collection/ruff-ruffman-show

Background Information

Bringing Ruff Ruffman into the classroom provides an opportunity for students to investigate and develop a deeper understanding of building materials and forces that affect structures.

As an ARF building consultant, Ruff learned many things about how forces and materials affect a building’s stability. Some of the concepts covered in the videos include:

★ There are lots of different kinds of structures.
★ Different forces, like a weight or the wind, act on structures.
★ The shape, weight, size, and symmetry of a structure affect its strength and stability.
Developing Understanding

Children may have had other experiences seeing structures interact with forces and perhaps falling down, toppling over, or not being able to hold a weight. Some questions you might encounter as they work to reconcile their thinking include:

- Is an earthquake a force?
- Can rain weaken a building?
- What is the best way to hold a building together?
- Can you put heavy things on light things?

Acquiring New Science Words

Young learners can benefit from having Word Walls to help them communicate their developing ideas. Including pictures of the word in context, whether it is a classroom investigation or a media resource like a Ruff Ruffman video, can help students remember the experience that corresponds with the word.

Some of the vocabulary words related to Structures include:

- **Force** – a push or pull
- **Gravity** – a force of attraction between two objects; what causes objects to fall to the ground
- **Model** – a smaller version of an object
- **Observe** – to carefully look at something
- **Test** – to try out an idea or a prediction

Science Talk

Talking about science – by making observations, sharing ideas, and participating in group discussion – is an important science practice. Watch the Ruff Ruffman videos with your students, and use the discussion prompts on the next page to engage in science talk.

As different building problems are presented to ARF, Ruff and the children discover how forces act on structures. Scientists have to solve problems like these on a regular basis. Learning to be resilient can help us be successful in science. A great way to help young students adopt resilient habits of mind is to create “Resiliency Thought Bubbles” filled with phrases they can use when they’re faced with a challenge. Ruff is illustrating how this might work in the image to the right. In That’ll Work! Ruff sings about all he has learned and how he approached each challenge. It’s a fun song to play as you create the thought bubbles as a class!
Discussion Prompt 1

Every time a structure is built, there are forces acting on it. Stack a series of objects, like blocks or empty boxes, to make a tower. Challenge the students to identify the forces that might act on the structure. You can reference examples from Building is a Breeze and Winging It.

Discussion Prompt 2

In Eye of the Hamster and Ruffman Escapes! Ruff uses materials in a new way to create a structure for a specific purpose. Ask students if they have ever used a material or object in a new way. What problem were they trying to solve and why did they choose that specific material or object? How did they test if the material or object was the right solution? Did it behave as they predicted?

Let’s Build: 2D to 3D Challenge

Ask students how many of them have ever heard of 3D and if they know the difference between 3D and 2D. As a class, watch Eye of the Hamster and stop at 1:54 when the drawing comes up and at 2:17 when the children decide to build a test model. Have a brief discussion of how Ruff was pretty certain his drawing for a hamster obstacle course would work, but when they made a 3D model, he was surprised when the spheres rolled away!

Tell students that they will be drawing a dog house and then turning their 2D drawing into 3D creation. If they need a bit of inspiration of how to make something 3D out of paper, they can watch Ruffman Escapes to see how rolled paper and tape made a chair to help Ruff escape!

Ask Questions

★ Have you ever made a drawing into something three-dimensional?
★ How could making a drawing into a three-dimensional structure help us think about building?

Get Set

Materials:

• Paper for drawing
• Scrap paper for building
• Scissors
• Masking tape
• Pencils

Build

Have the students draw their dog house ideas. Remind them to think about what materials they will need to turn the drawing into a 3D model.
When students are finished drawing, invite them to get the materials they’ll need to build their structure.

As they’re building, ask students about what forces might act on their structures and why they think their dog house will be strong.

When they’re done, have students explain what they learned by turning their drawing into a 3D model, and if they would change anything about their design.

Debrief

Gathering students to debrief after an activity is an important part of a science learning experience. Students can use the following sentence starters to help share their learning.

- To communicate their observations: “I saw…”
- To reflect on the process of making something 3D from a 2D drawing: “I thought… but then…”
- To think forward and make improvements: “Next time I might try…”
- To demonstrate science community skills: “I liked...” or “I respected...”
- To make a conclusion: “If Ruff Ruffman wants to build a dog house, he should…”

Extensions

- Students can test their building skills in Hamster Run. Once they have mastered building and seeing how shapes interact, they can then create their own virtual challenge.

- A great next step is to have students do an Architecture Scavenger Hunt to find shapes around the school or their neighborhoods. They can bring their discoveries back to the class and share them in another Science Talk!
Architecture Scavenger Hunt

Can you find these shapes around your school or in the buildings in your neighborhood? Draw a picture of the shape and where you found it.
Activity

Tower Time

Measure the height of your tower. Then draw your finished tower in the space provided.

How tall is your tower? ____________ inches
**Tower Time**

**Kid Description:** Grab a grown-up and some friends for this building game. Can you stack a tall, stable tower?

This activity is best played on the floor with two to four players. If you have more than four players, break up into teams. If you have kids with motor issues or who otherwise cannot participate, ask them to help take measurements or document.

**Materials:**
- Gather up a bunch of household items with different structural elements: wide bases, thin bases, surfaces, heavy things, and light things. Here are some suggestions, but feel free to use your own!
- Building materials: cardboard tubes, cereal boxes, plastic bottles, paper plates, card stock, paper/plastic cups, shoe boxes
- Measuring Tape/Ruler
- If you are playing this as a competition, you'll need a set of duplicate materials for each team.

**Wonder**

- Sit in a circle and pass around the materials. Give everyone one material to explore.
- Ask kids to use their senses to explore each material.
  - **Ask:** What are these materials?
  - **Ask:** Let's investigate how strong these materials are. Try tapping them on the floor. Do they feel strong?
  - **Ask:** Which pieces would make a good base? A base is something wide and strong that goes on the bottom to make the whole tower strong.
  - **Ask:** Based on your explorations, which materials do you predict will work best for a tower? Would you put them on the top or bottom of a tower? Why?
- Put the materials back into a box/bag before explaining the rules.
Define a Problem

Explain the rules of the game

(Choose one version):

• Competitive:
  Each team is going to work together to make a tall, stable tower. You'll have the same sets of materials, and will take turns putting down one piece at a time. We will take turns adding pieces until we have made a tall tower. After three turns each, the game is done! Use your measuring stick or ruler to measure the towers. After measuring, you'll see which team has the tallest tower. You can rebuild the taller tower and see which team has the tallest tower.

• Non-Competitive:
  You are going to work together to make the tallest, stable tower you can! Everyone is going to take three turns putting one piece of the tower down at a time. We will take turns adding pieces until we have made a tall tower, and then we will measure which team has made the tallest tower.

Create and Test

Organize the materials in piles for each team.

Time to start building!

If you have more than 4 kids, split them into teams. You could make it a competition.

Reflect

Have everyone sit or stand together again.

Ask the kids to document the tower that they made by drawing it on the printout. Encourage them to draw what they used for the top, middle, and base of their tower. If the tower falls down, ask the kids to redesign their tower and rebuild their tower.

Ask:
- On the printout, document what your tower looked like. Draw what you used for its top, middle, and base.
- Did your tower fall down? Why do you think that happened?
- Would you improve your tower better for the top or for the middle? Why do you think you need to have a wider, middle-sized object at the bottom of your tower?
- What did you need more support for? Which objects made a good base?
- If you play the game again, use your drawings to help you redesign the towers.

Explain the rules of the game
**Build It Up, Knock It Down**

**Kid Description:** Grab a grown-up and some friends for a building contest! Each team will build a structure without using tape and then try to knock down the other team’s structure using only paper. The last one standing wins!

This game is for four or more players (teams of two to four) and can be played indoors or outdoors. Each team should find a private space so the other team can’t see their structure.

**Materials:**
- Gather up a bunch of household items for kids to build their structures. Each team should have access to the same materials.
- Here are some suggestions for materials:
  - **Large Objects:** cardboard tubes, cereal boxes, plastic bottles, paper plates, card stock, paper/plastic cups
  - **Fasteners:** pipe cleaners, rubber bands, paper clips
  - **Long Objects:** straws, popsicle sticks/tongue depressors, toothpicks
  - **Wildcard Ideas:** tinfoil, plastic wrap, sandwich bags

**Build It Up, Knock It Down**

- **You’ll also need:**
  - Three sheets of paper per team
  - 6 inch piece of yarn per team
  - Tape measure (optional)

**Explore:** A grown-up and kids can explore structural science (shape of structure affects stability), material science, and engineering design process (define a problem, imagine and plan, create, test, and improve).

**Materials:**
- Gather up a bunch of household items for kids to build their structures. Each team should have access to the same materials.
- Here are some suggestions for materials:
  - **Large Objects:** cardboard tubes, cereal boxes, plastic bottles, paper plates, card stock, paper/plastic cups
  - **Fasteners:** pipe cleaners, rubber bands, paper clips
  - **Long Objects:** straws, popsicle sticks/tongue depressors, toothpicks
  - **Wildcard Ideas:** tinfoil, plastic wrap, sandwich bags

**Build It Up, Knock It Down**

- **You’ll also need:**
  - Three sheets of paper per team
  - 6 inch piece of yarn per team
  - Tape measure (optional)

**Wonder:**
- **Brainstorm:** What makes a strong structure?
- **Ask:** What makes some materials better to build with than others?
- **Ask:** Does the shape or size of a structure make it stronger? How?
- **Lay out all the materials on the floor.**
- **Ask kids to use their senses to explore each material.**
- **Ask:** How does each material look? How does each material feel? Are they heavy or light?
- **Ask:** Based on your investigations, which materials do you predict will be the strongest for building?
Define a Problem

Explain the rules:

• Explain: Each team will have 15 minutes to design a structure using only these materials. The tower must be at least six inches tall, and you can’t use any tape. After you build your structure, each team will have two chances to knock down the other team’s structure using only paper.

Create

If kids are working in larger teams, assign a role to each team member:

• Measurer – measures the structure to make sure it is at least six inches tall
• Architect – compares the structure to their plan
• Clean-up Crew – cleans up the materials at the end of the game
• Team Leader – makes sure every team member is helping
• Hint: Use a cup as a base, and put other materials in the cup to make it a stronger base
• Hint: Use rubber bands to group or attach things together
• Hint: Use straws to connect pipe cleaners

Set a timer for 15 minutes. Ready, set, build! An adult should work with each group to help resolve any disputes, facilitate the building process, and offer support when needed. Remind kids to test the stability of their structures as they build so they can improve upon their structures as needed.

Reflect

• Ask: Do you need to change your plan?
• Ask: Could you improve your structure?
• Ask: Which materials could you add to make your structure stronger?
• Ask: Do you think another team would be able to knock your structure down?
• Ask: What materials could you add to make your structure stronger? How else could you improve your structure?
• Ask: Do you need to change your plan?

If kids need more support:

• Hint: Use pipe cleaners. Try poking holes in an object using a toothpick and then threading pipe cleaners through. Knot them at the ends to keep them from slipping through the hole. You can also use straws to connect pipe cleaners
• Hint: Use rubber bands to group or attach things together

After ten minutes, give kids a five-minute warning. Remind them to measure their structure to make sure it’s six inches tall. Time’s up, materials down!

Reflect

• Ask: Which materials are the strongest?
• Ask: What is the shape and size of your structure?
• Ask: How is your finished structure different from the one you planned?
• Ask: Is there anything you would do differently next time?

Imaginate and Plan

Split kids into teams.

Split kids into teams.

Imagine and Plan

Split kids into teams.

Imagine and Plan

Split kids into teams.

Imagine and Plan

Split kids into teams.
Share

★ Optional: Take photos of each structure to document each design before trying to knock them down.

★ Give kids five minutes to tour each team’s structure.

★ Encourage kids to ask other teams about their structure.

• Questions kids could ask:
  • Why did your team choose those materials?
  • How is your plan different from your structure?
  • How would your team improve their structure if they were to build it again?

Test

★ Time to knock it down!

★ Brainstorm devices kids could make to knock down the other team’s structure.
  • Explain: You’re going to work with your team to make a device using only three pieces of paper that will knock down the other team’s structure from five feet away. Each person only gets two tries to knock down the other team’s structure.
  • Ask: What could you make with paper that would knock down the other team’s structure?

★ If kids need some help brainstorming, offer a few ideas. (i.e. crumpled balls, paper airplanes, long skinny tubes)

★ Use a tape measure (or the same person’s footsteps) to set up a marker five feet away from each structure.

★ Give each team three pieces of paper. An adult should help facilitate the paper construction and turn-taking.

★ Have each kid stand behind the marker and each take turns throwing the device. If a kid throws and misses, the adult could move him closer to the structure. Each kid gets two tries (one try counts if it touches the structure).

★ If both structures fall, give teams five minutes (or more, if needed) to reconstruct and improve their designs. Then, get ready to try to knock them down again!

★ The team whose structure remains upright wins! If both structures still remain after each kid has had two tries, both teams win.

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Build It Up, Knock It Down

Draw your structure in the space provided, and list which materials you’re going to use. What do you predict will happen when you test your structure?

Prediction:

8
7
6
5
4
3
2
1

Materials:

Materials: 1. 2. 3. 4. 5. 6. 7. 8.
Build a Better Birdbath

It’s all in the column!

After a birdbath mishap, Ruff wonders if a different column would make it stronger. Which shape would support the most weight?

Help Ruff build a better birdbath. Using paper and books, investigate with three different birdbath models to find the strongest design.

Materials:
- Column templates
- Tape
- Books

Instructions:
1) Print the column templates (on the following pages) and construct three different shaped columns—square, triangle, and circle.

2) On a hard surface, stand the three columns on end. Can you predict which shape is the strongest?

3) Place a book on top of the first column to create a birdbath platform. Now place that same book on the second and third columns. Did any of the columns support the book?

4) Now try placing two or three books on the remaining columns. To keep the weight equal, stack the same books on each column. Which was the strongest? Was your prediction correct?

REMEMBER: Columns are most stable with a balanced load. Place the books evenly on top of each column.

More Ways to Play:
- Can you build a structure that holds three or more books?
- Try using more than one column.
- Try using different types of paper.
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Activity 5

Take a Different Look
It’s all about perspective!

Accidents can cause you to look at things in another way.
You’ll never know what you might find!

TARGET AGE GROUP  PreK-3
TIME  60-90 minutes
Accidents Happen if You’re Lucky

The Cat in the Hat Knows a Lot About That!
https://pbslearningmedia.org/resource/accidents-happen-if-youre-lucky/

Reflect on the ideas being explored by The Cat in the Hat and his friends, Nick and Sally. Here are some questions you might ask:

- Do you think Sally sat on Cat’s hat on purpose or was it an accident?
- What does it mean to do something on accident?
- Did Cat accidently spatter paint on paper or did he do it on purpose?
- What does it mean to do something on purpose?
- What did Cat do on purpose to change the paint spatter into a painting?

After sharing and leading a brief discussion of the book cover of *It Looks Like Spilt Milk* by Charles G. Shaw ask:

- Have you ever looked at a cloud and saw a dog, but your friend saw something different?
- Have you ever heard the word perspective? What do you think it means?

Allow children to express their perspective of a few pictures, then flip the pictures to develop a new perspective. Discuss the meaning of perspective as a way of looking at something and a way to compare something to other things.

Accidents can be a great thing! Through marble painting, let’s look for something new and exciting, just like The Cat in the Hat!

**Materials:**

- Paper
- Marbles/small ball
- Washable paint
- Tray/box lid with sides
- *The Beautiful Oops!* by Barney Saltzberg
Instructions:

♦ Place a sheet of paper in a box lid or tray.
♦ Have children follow these steps to create their art:
  ▶ Place paint colors on a piece of paper.
  ▶ Add one or more marbles in the box.
  ▶ Start painting by tilting the box in various directions.
♦ Ask children to describe what they see in their art.
♦ Have children turn their painting upside-down and take a second look. Ask “What do you see now?”
♦ While the pictures are drying, engage the children in a reading of The Beautiful Oops! by Barney Saltzberg.
♦ Once paintings have dried, take a gallery walk and ask the children to describe what they see in their friends’ art.

More ways to play:

♦ Painting in an enclosed container (such as a pringle can, coffee can, etc.). Have the children a shake, rattle, and roll a marble to create a beautiful painting.
♦ Have children add various collage materials to their painting to create something new.
♦ Work as partners to view clouds and record what they see.
♦ Create ink blot pictures.
Bring the whole group together and read *The BeautifulOops!* by Barney Saltzberg, pausing to ask questions and connect back to the topic of accidents, mistakes, and perspective.

**Before reading:**
- Show the cover of the book as you read the title, author and illustrator. While looking at the book cover, ask:
  - What is an oops?
  - How can an “oops” be beautiful?

**As you read:**
- Have children predict what each “oops” could become before turning the page.

**After the reading:**
- How did you react when you made an “oops”? Did you become frustrated or upset?
- How can changing your perspective turn an “oops” into something beautiful?

**Other book suggestions:**
- *Accident* by Andrea Tsurumi
- *The Dot* by Peter H. Reynolds
- *It Looks Like Spilt Milk* by Charles Shaw
- *Glasses for D.W.* by Marc Brown

Send the parent letter on page 116 home with children to encourage at-home conversations with families about this activity.
Hello Families:

Today, through marble painting, your child learned that accidents can lead to new and exciting discoveries. Along with The Cat in the Hat, from the PBS KIDS program The Cat in the Hat Knows a Lot About That!, we learned that when you take a second look and change your perspective, you’ll never know what you might find!

To find out more about what your child learned, you can ask:

- Tell me about your marble painting. What did you see in your painting?
- Can you tell me what it means to change your perspective?
- What did you see when you changed your perspective of the painting?

Your child also had the opportunity to listen to *The Beautiful Oops!* by Barney Saltzberg. Have your child retell the story to you.

Here are some related books to look for at the library:

- *Accident* by Andrea Tsurumi
- *The Dot* by Peter H. Reynolds
- *It Looks Like Spilt Milk* by Charles Shaw
- *Glasses for D.W.* by Marc Brown

Tune into your local PBS station and visit PBSKIDS.org online for more opportunities to learn, watch, and play together with your family. Watching videos and playing games with your child encourages social interactions, bonding, and learning.

You can also access PBS KIDS content free in PBS KIDS Video app and the PBS KIDS Games app.
Hola Familias:

Hoy, a través de la pintura de mármol, su hijo/a aprendió que los accidentes pueden llevarnos a descubrimientos nuevos y emocionantes. Junto con The Cat in the Hat, del programa PBS KIDS, The Cat in the Hat Knows a Lot About That!, ¡aprendimos que cuando miras por segunda vez y cambias de perspectiva, es sorprendente lo que puedes encontrar!

Para saber más acerca de lo que su hijo/a aprendió, puede preguntar:

- Háblame de tu pintura de mármol. ¿Qué viste en tu pintura?
- ¿Puedes decirme qué significa cambiar tu perspectiva?
- ¿Qué viste cuando cambiaste la perspectiva de la pintura?

Tu hijo/a también tuvo la oportunidad de escuchar la historia The Beautiful Oops! por Barney Saltzberg. Haga que su hijo/a le cuente la historia.

Aquí hay algunos libros relacionados que puede buscar en la biblioteca:

- Accident by Andrea Tsurumi
- The Dot by Peter H. Reynolds
- It Looks Like Spilt Milk by Charles Shaw
- Glasses for D.W. by Marc Brown

Sintonice su estación local de PBS y visite PBSKIDS.org en línea para obtener más oportunidades de aprender, ver programas y jugar con su familia. Ver videos y jugar con su hijo/a fomenta las interacciones sociales, la unión y el aprendizaje.

También puede acceder al contenido de PBS KIDS gratis en la aplicación de video PBS KIDS y en la aplicación de juegos PBS KIDS.
Resources to Support Perspective Taking Activities

Get children thinking and exploring like scientists using this collection of resources about perspective from Ready to Learn and PBS KIDS. Providing young children the opportunity to participate in simple investigations, inspired by PBS KIDS characters they know and love, where they ask questions, make predictions, collect data, and draw conclusions is a great way to support developing science inquiry skills and practices.

These resources can be used and adapted to meet the particular needs of your learning environment and the children that you are working with. Whether you are a program director, classroom teacher, after-school and summer provider, or any other adult working with young children, these resources are for you!

Resources are grouped by activities, videos, and games (online and mobile), and include a list of books related to the topic of perspective. Resources can be used as-is, adapted, grouped to make a complete lesson, integrated into preexisting lessons, or used as a jumping off point for your own lesson ideas. If you’re looking for an example of a completely sequenced activity to support perspective, using resources from the following list, check out ‘Take a Different Look’ featuring content from The Cat in the Hat Knows a Lot About That!

Visit klru.org/guideresources for links to each resource

Videos

The Cat in the Hat Knows a Lot About That! 3:11 min
Accidents Happen, If You’re Lucky!
Grade Level: PreK-2

Accidents can cause you to look at things in another way, and you never know what you might find! In this fun song from The Cat in the Hat Knows a Lot About That! Nick and Sally learn to keep an open mind about accidents, and all the new discoveries they can lead to!
Pinkalicious & Peterrific  
**Best Pink Present**

Art can be made in unexpected ways, as Pinkalicious learns in this video clip. It’s her father’s birthday, and she uses paint and paper from her ‘make things’ box to make some very special wrapping paper. When her brother Peter bumps into her and the paint splatters, Pinkalicious thinks her art project is ruined. She soon discovers that creativity and an open mind can turn ‘mistakes’ into something wonderful.

Ready Jet Go!

**The Moon and Its Shapes**

Why does the moon look different sometimes? In this clip from Ready Jet Go!, Jet and his friends and parents take a fantastic journey to the Earth’s moon. They discover that the moon doesn’t actually change shapes -- it’s all a matter of perspective! From Earth, the moon will appear to have different shapes depending on where it is in the Earth’s orbit.

Cyberchase

**A Different Point of View**

In this video clip, students will look at Sleight and Presto from different points of view to see different geometric shapes. The video helps students to see which points of view Sleight and Presto look the same (front and side) and different (top) from.

Daniel Tiger’s Neighborhood

**Daniel’s Ruined Picture**

Daniel and Miss Elaina are painting pictures of themselves. They both need the red paint, but Miss Elaina had it first. Then, she accidentally spills paint on Daniel’s picture. That makes Daniel mad! He stomps and accidentally rips her picture. Now Miss Elaina is mad too! But that’s okay. You can be mad at someone you love. When you are ready, give them a hug.
Activities

**Pinkalicious & Peterrific**

*Accidental Art*

In this activity, children explore how to develop flexibility and to exercise their creativity while expressing themselves through art and experimenting with different painting techniques and materials. They learn that mistakes can be opportunities.

**Spilt Milk Blob Paintings**

In this activity, kids create blob art using white paint on black construction paper, and then use their imaginations and own unique perspective to identify what they see on the page.

**Marble Painting Activity by PBS SoCal**

In this activity, young children use marble painting to engage their science inquiry skills as they make observations, ask questions, and make predictions.

Books

*The Beautiful Oops!* by Barney Saltzberg

*Accident* by Andrea Tsurumi

*The Dot* by Peter H. Reynolds

*It Looks Like Spilt Milk* by Charles Shaw

*Glasses for D.W.* by Marc Brown

Find Extra Resources on the next few pages.
Inventing Art Lesson Plan | PINKALICIOUS & PETERRIFIC®

Children practice how to work cooperatively and exercise their creativity while expressing themselves through art in this PINKALICIOUS & PETERRIFIC® lesson plan. After watching video excerpts from the PBS KIDS series PINKALICIOUS & PETERRIFIC®, they experiment with different painting techniques and materials, create cloud-inspired and mixed-media collage art, and explore the idea that mistakes can be opportunities. In addition to creating a class collage or quilt, students help develop a “make things” box to be used for future projects. Find out more about PINKALICIOUS & PETERRIFIC® on the series website.

Lesson Summary

In this lesson, children watch three video excerpts from the PBS KIDS series PINKALICIOUS & PETERRIFIC® that focus on creativity and the visual arts. Like the characters in the videos, children are encouraged to experiment with different painting techniques and materials. In addition to standard supplies, such as paper and paintbrushes, they use other implements, from sponges to eyedroppers to toothbrushes. They also make cloud-inspired works of art. After learning about mixed-media art from the artist Chanel Thervil, they come together to create their own mixed-media artwork and then a class collage or quilt. Finally, they help develop a “make things” box to be used for future projects.

See Get Smart with the Arts! for more information about how the arts can enhance children’s cognitive, social, emotional, and academic skills.

Time Allotment

Three or more class periods

Learning Objectives

• Students will experiment with different art media.
• Students will use their imagination to create art.
• Students will work together to create a collaborative work of art.

Prep for Teachers

Set up painting stations that feature each kind of painting implement as well as materials for a mixed-media art station. Children will rotate in pairs or small groups to try out the various methods and materials.

Supplies

Materials

• Items that can be used instead of paintbrushes, such as:
  – Small sponges (cut-up kitchen sponges or makeup sponges)
  – Plastic eyedroppers
  – Used toothbrushes
- Cotton swabs
- Feathers
- Paper straws (you will need to put a drop of watered-down paint on the paper and have children blow gently through the straw to make swirls)
- Sticks or twigs
- Toothpicks

- Different sizes and types of paper (be sure to have same-sized paper for the end project)
- Paints, preferably acrylic (you can also use tempera)
- Paintbrushes (different sizes)
- Variety of materials for mixed-media art, including pens, pencils, markers, glitter, feathers, fabric scraps, pom-poms, stickers, wooden craft sticks, and paper scraps
- Cotton balls, glue, and sturdy paper (for the cloud and mixed-media paintings)
- Aprons or smocks to protect children’s clothing
- Cardboard box or plastic crate (with a cover)

**Handouts**

*For Teacher*
- Get Smart with the Arts!
- Picture Book Biographies of Visual Artists
- Recommended Reading List

*For Students*
- Create Your Own Accidental Art!

**Multimedia Resources**

Best Pink Present | PINKALICIOUS & PETERRIFIC®

Cloud Art | PINKALICIOUS & PETERRIFIC®

Mixed-Media Art | PINKALICIOUS & PETERRIFIC®

**Introductory Activity**

- Begin a brief discussion about art by asking, “What is art?” Talk about how art helps us express our feelings and ideas. It also comes in many forms. Encourage children to expand their definition by including as many types of art as possible: visual arts (painting, drawing, sculpture, printmaking, collage), dance (ballet, jazz, modern, country), dramatic play (pretending, acting, storytelling), and music (classical, folk, rock, reggae).
- Explore the idea that anyone can be an artist. You may want to talk about past art projects that children have done, point out art that is on display in the classroom, or refer to artistic activities that children do outside of school.
• Discuss some of the materials that visual artists use in their work. Ask children for their ideas and write them on chart paper or a whiteboard. If possible, collect samples of the materials for the list. Add other ideas from what you have brought in for the cloud and mixed-media projects.

Learning Activities

1. Watch the Best Pink Present video excerpt.
   • Tell children that now they are going to watch Best Pink Present | PINKALICIOUS & PETERRIFIC®, an excerpt from an episode called Best Pink Present. Explain that Pinkalicious is a girl who loves to use her imagination to make all kinds of art, including painting. Her brother, Peterrific, often joins in the fun, but sometimes he can be a little annoying.
   • After watching, check for understanding by asking students to recount what happened in the video. What was Pinkalicious planning to do? What happened when Peter bumped into her with his scooter? What happened after that? Correct any misunderstandings.

2. Accidental Art Activity
   • Tell the children that they will now do some painting. However, instead of using brushes, they are going to experiment! (Note: You may want to use larger paper for this activity.)
   • Show and name the tools that you have brought.
   • Divide the class into pairs or small groups. Give each group a few minutes at each painting station to try out the implements.
   • After children have completed their tour of the painting stations, gather them back into their pairs or small groups.
   • Have one child from each pair or small group choose one of the painting implements (you can now add brushes to the mix). On a clean piece of paper, have the child begin a new work of art. Give students a moment to think about what they would like to show in their painting. You may want to circulate through the class and help children as needed. You can also brainstorm some ideas as a class to get the process going. For instance:
     – You can talk about making shapes, lines, patterns, or marks that overlap.
     – You can suggest that children make a drawing of something they have seen before: an animal, landscape, object, person, etc. They can also invent an animal or a make-believe place.
   • After a few minutes, have the children stop and pass their paper to their partner or the next person in the group. Give that child a chance to choose an implement and add to the painting.
   • Have the pairs or small groups view the painting together. How did it change? What colors or shapes were added? What happened to the original idea of what the picture was going to be? What does the painting look like it’s about now? (If there’s time,
repeat the process by having the second child begin a painting and then have the first child add to it.)

- How did Pinkalicious feel at first when Peter bumps into her and “ruins” her original idea? What does she think about the final result? Have children talk about how they felt when their drawings changed.
- Have children sign (or dictate) their names to the shared painting.

3. **Watch the Cloud Art video excerpt.**

- Gather children to watch the Cloud Art | PINKALICIOUS & PETERRIFIC®️, an excerpt from an episode called Cloud-O-Matic. Before they watch, explain that Pinkalicious’s mother is an inventor. You may want to review the definition of inventor.
- After watching, discuss what happened in the excerpt. Ask: *What did Mom invent? What kinds of cloud creations did she make?*
- Watch the video again, if needed, to examine how Mom and then Peter made their flowers—by drawing a circle and then ovals all around for petals. Talk about the difference between a circle shape and an oval shape.
- If you can, go outside and look at clouds together. Ask: *What kind of weather is it outside? What color are the clouds? Are there a lot of clouds or just a few? Talk about the different shapes you see. Do any of the clouds resemble animals or things?* Have children share what they observe.

4. **Cloud Art Activity**

- Tell children that even though they don’t have a Cloud-O-Matic machine, they can make their own cloud-inspired art!
- Discuss the idea that in this excerpt, the art that Mom, Pinkalicious, and Peter made was *not* accidental. It was based on a specific design.
- Have children design their own cloud art, using pencils to draw their ideas.
  - Encourage them to sketch more than one idea of what they might want their clouds to be.
  - Consider having them practice using circles and ovals by making flowers like Mom and Peter did in the video.
  - Remind children that Pinkalicious drew a unicorn for her cloud art. What shape or figure would they like to make? Their drawings can be realistic or fantastical, shapes, or abstract forms.
- After children have decided on their design, do one of the following:
  - Option 1: Have them use a pencil to draw their clouds. Once they are satisfied, they can outline their drawing using markers. Have children fill in their drawings by gluing on cotton balls or layers of paper scraps or crepe paper of various colors. Children can pull and stretch the cotton to create different types of textures for the clouds.
  - Option 2: Have children paint or use colored pencils to draw and color in their clouds, experimenting with different color shading or patterns.
- Display the finished cloud art in the class.
STEM Extension

• In the video, Pinkalicious says that clouds are made from water, and Peter notes that “that’s where rain comes from.” Use these science facts to extend the lesson or to introduce a unit on weather.

• Explore how clouds are made and what they indicate about weather. You may want to use books or additional videos, such as Clouds and Weather: Everyday Learning or PEEP and the Big Wide World: Stormy Weather

• If you want, go outside and observe clouds with the class (see above). Have children write or draw what they see.

• To help children observe weather and weather patterns, have them look at the clouds for five days in a row. Make a weather and cloud chart to record their findings or have them create pictures each day based on what they see. Create a chart with the days of the week and the accompanying pictures. Next to the chart, have children help you summarize what they have learned about clouds and weather. (See the What Is Weather | Lesson Plan for more activities and ideas.)

5. Watch the Mixed-Media Art video excerpt

• Explain to students that now they are going to watch Mixed-Media Art | PINKALICIOUS & PETERRIFIC®, an excerpt about children working with a mixed-media artist named Chanel Thervil. Preview the term mixed media. Explain that the term is used to describe art that is made using different methods (mixed) and materials or formats (media).

• After watching the video, encourage children to share their reactions and thoughts. What did they think of Ms. Thervil’s mixed-media art? Did her studio look like a fun place to work?

• Talk about the word collage. Do students know what it means? Ask for suggestions and then explain that a collage is a work of art made up of many different pieces. Point out examples of collages that children may have previously made.

• Toward the end of the video, one of the children comments, “We all started with many (of the) the same things. Once we made our art, it became different.” Ask students to think about the art they’ve made so far. Did the same thing happen? How can art help each of us express our own thoughts, feelings, and ideas?

• Have children review the art they have created so far. Could any of their creations be called mixed media? Why or why not?

• To extend this activity (and to add a mixed-media experience if children haven’t already done so), invite children to experiment with a variety of materials to create their own mixed-media work of art.

Culminating Activity

1. Create a Collaborative Collage

• Remind students about the meaning of the word collage. Explain that now they are going to create a class collage from their own works of art! Have students choose one
piece of art from the various works of art they’ve created—accidental art, cloud art, or mixed media. Make sure each piece has the artist’s name on it.

- Help students tape or staple their pictures together. Then step back and take a look. Ask students: *What patterns can you see? How did the collage, made up of different elements, become its own piece of artwork?* If you want, have the class think up a title for the collage. Display it on a wall or bulletin board.
- Congratulate the class on their artistic talents!

2. "Make Things" Box

- Together, watch *Best Pink Present | PINKALICIOUS & PETERRIFIC®* again. Notice when Pinkalicious takes out her “make things” box. What is in it?
- As a class, brainstorm ideas for a class “make things” box. If possible, go around the room and collect supplies to put in the box (pencils; colored pencils or crayons; markers; pens; stapler; glue; glitter; tape; cloth scraps; recycled items, such as paper towel tubes; and so on). If extra supplies are not available, make a wish list with the class and gradually fill the box over time.

3. Read All About It

- Gather books about various painting styles—realism, impressionism, pop art, folk art—and share them with the class. Include books by or about collage artists such as Henri Matisse and Romare Bearden. You may also want to use picture book biographies of artists (see *Picture Book Biographies of Visual Arts*) to introduce a variety of techniques. Invite children to create another painting on their own, experimenting with their choice of tools.

Home-School Connection

- Send home the essay *Get Smart with the Arts!* so that families can support what children are learning. If you have a class website or newsletter, you may want to post a picture of the class quilt or collage.
- Invite families to make their own “accidental art” painting or drawing by sending home the *Create Your Own Accidental Art! handout*. Encourage families to send the finished art to class and, if possible, to write a short caption on it about who made it and what the painting is about.
Marble Painting
Primary Content Area: Science
Time: 30 minutes

Materials
• Large pans or box lids
• Marbles
• White paper
• Paint
• Muffin tins
• Plastic spoons
• Tape
• Saran wrap (optional)

Preparation
• Place a sheet of paper inside each lid. Tape the back of the paper to the bottom of the lid. Optionally seal lids with saran wrap and tape.
• Fill muffin tins with paint and marbles.

Lesson Plan
Small Group Activity (10 minutes)
1. State learning objective: Today we are going to make observations, ask questions, make predictions, and experiment like scientists!
   • Create a gesture or movement for key science words (observation, question, prediction, experiment). Example: “observation” make hand binoculars.
2. Scientists make observations.
   • Children take turns using sense of touch, smell, sight, and hearing to describe the marbles inside a lid (round, cold, smooth, hard, colorful, clear, small).
   • As the marbles move, ask children to observe what the marbles are doing (rolling, hitting each other, hitting the edge of the lid).
3. Scientists ask questions.
   • Model with a sentence stem: “I wonder how we could use these marbles to____.” (make music, race, play in water, paint)
   • State the question: “Our question is how can we use these marbles to paint? Let’s find the answer together!”
4. Scientists make predictions.
   • Helpful question stems to prompt child predictions:
     o “How would you use ____ to do ____?”
     o “What do you think will happen if ____?”
     o “If you do ____, what will happen?”
   • State the prediction: “We predict we can dip the marbles in paint and let them roll over the paper. Let’s experiment to see if it works!”

Marble Painting Activity (20 minutes)
1. Distribute a lid with paper to each child. Before getting started, discuss proper lid handling (keep the lid in front of you, hands only touching your own lid, side to side not up and down).
2. Children pick 3-4 colors of paint. Remove saran wrap from one corner of the lid and use a plastic spoon to place paint-covered marbles in lid. Reseal the saran wrap.
3. Children tilt the lid to roll marbles around the paper, practicing coordination and making art!
4. Children may wish to add more marbles if they run out of paint or wish to add more colors.

More Ways to Explore with Technology and Media
• Watch: Watch Pinkalicious and Peterrific media clip “Best Pink Present”. In this clip, Pinkalicious uses her creativity to turn a paint spill into art.
• Play: Download and play the PBS KIDS Play & Learn Science app Ramp and Roll game.
Dress for Success
It’s all about the properties of materials!

A material is what something is made out of. All materials have different properties that can be observed, like color, weight, and texture. The properties of materials can sometimes make those materials useful, and sometimes not.

TARGET AGE GROUP  PreK-3
TIME  60-90 minutes
A Dry Pet is a Happy Pet
The Ruff Ruffman Show
https://pbslearningmedia.org/resource/ruffruffman-sci-wearable/

Reflect on the ideas being explored by Ruff and his friends. Here are some places you might pause:

- After Ruff and Fluff head back inside because it’s raining (“00:54), ask children to describe some of the properties of Fluff’s mop costume.
- Before Ruff calls his friends to investigate (“1:22), ask children what ideas they have for covering Fluff to keep him dry on his walk.

Let’s investigate the different properties of materials!

Children will engage in the engineering design process as they use common materials to dress-up a ‘mini Ruff’ based on different challenges and scenarios.

Follow the instructions on the ‘Showtime’ activity handout.

More ways to play:

If you have enough materials, instead of dressing up a small object or stuffed animal, challenge children to dress each other up to address the challenges in the activity. Afterwards, host a fashion show where everyone shows off and shares their creations.
**READ**

Bring the whole group together and read *Home by Carson Ellis*, pausing often to ask questions and connect back to the topic of the properties of materials.

**Before reading**
- Read the title, author, and illustrator.
- Ask:
  - By looking at the cover of the book, what do you think the book is about?

**As you read**
- Pause often to discuss what types of materials children see on each page and why those materials might be a good choice for that type of home.

**After the reading**
- Ask:
  - What did you notice about the different materials used for different homes?
  - How were homes in the books similar? How were they different?

**Other book suggestions:**
- *Beautiful Oops!* By Barney Saltzberg
- *The Most Magnificent Thing* by Ashley Spires
- *Soft and Smooth, Rough and Bumpy: A Book About Touch* by Dana Meachen Rau
- *Rocks: Hard, Soft, Smooth, and Rough* by Natalie M. Rosinsky
- *Sam Sorts* by Marthe Jocelyn

**PLAY**

**Photo Stuff with Ruff App**

This app is available for free through the default app store on your smartphone or tablet.

Use the app to inspire children to discover what the ‘stuff’ in their world is made of. As children explore their surroundings they will take pictures of different materials to complete silly scenes based on prompts from Ruff.

As children explore and take pictures using the app, ask them about why they are choosing the materials they choose. Challenge them to find additional materials that also match Ruff’s prompts.

**SHARE**

Send the parent letter on page 137 home with children to encourage at-home conversations with families about this activity.
Showtime

**Kid Description:** Grab a grown-up and some friends to create costumes for Ruff’s next show! You’ll use materials found around your home to dress-up a mini Ruff. This activity is for two or more players, and you should have about one grown-up for every two children who are participating. If you are a big group, try having all the children work on the same one or two scenes. You can play this activity indoors or outdoors.

**Materials:**
Gather up a bunch of household items that kids can use to make costumes. The kids will be dressing up an orange or ball that will represent Ruff in their show.

**Here are some suggestions:**
- Plastic bags
- Sponge
- Paper (toilet paper, paper towels)
- Balloons
- Tin foil
- Mop or string
- Cardboard
- Cloth (like old t-shirts)
- Tape
- Marker

**You’ll also need:**
- Orange or tennis ball (to be Ruff) for each player
- Scissors
- Flashlight (if you’re doing the “Party Time” scene)
- Plastic basin, sink, or plastic sheet (for any scenes with water)

**Wonder**

- Lay out all the materials on the floor or a table.
- Pass around the materials one at a time, and ask kids to use their senses to explore each one.
  - **Ask:** How does this material look?
  - **Ask:** How does this material feel?
  - **Ask:** How does this material sound?

**Define a Problem**

- Ask kids to choose one of the Ruff scenes provided below, a story from the videos, or make up their own new Ruff adventure!
- You could also assign one scene to each kid.
- For each scene, ask the kids what problem Ruff needs their help to solve.
Imagine and Plan

★ Once they’ve chosen a scene, ask the kids what kinds of materials they predict will be best for their costume:

**Scene 1 – Rainy Day**
- **Ask:** Which material might be good to keep him dry?

**Scene 2 – Big Spill**
- **Ask:** Which material will soak up liquid?

**Scene 3 – Party Time**
- **Ask:** Which material will let light bounce off of it?

**Scene 4 – Nap Time**
- **Ask:** Which material feels the softest?

**Scene 5 – Create your own!**
- **Ask:** Let’s make up a story for Ruff that uses these materials. Think about what kind of clothes he’d need to wear in the story.

★ Write down the kids’ predictions on their printouts.
- **Ask:** Based on your exploration of the materials, which ones do you predict will be the best ones for Ruff’s costume?

★ Next, ask kids to plan out their costume designs on the printout.
- **Ask:** On the printout, draw what you want your costume to look like. Document all the materials you’re going to use.

Create

★ It’s time to create the costume!

★ Ask kids to pick out their building materials, using the list on their printout.

★ Have kids dress up their mini Ruff, and ask them questions about whether the costume does what it needs.
- **Ask:** Do you predict Ruff’s costume will do what it needs to do? Why or why not?

★ Encourage kids to draw a face on their mini Ruff, if they want to!

★ You may need to help kids with the tape or scissors as they create their costumes.

Test

★ It’s time to find out if the kids picked the best materials for Ruff’s costume!

★ If you have a smartphone or tablet, try using it to record the tests.
- **Explain:** It’s time to test your costumes, to see if you picked out the best material for Ruff.
Kids should run their own tests while you offer them support.

The kids can act out the scene as part of their testing, OR just run the test by itself.

Scene 1 – Rainy Day: Pour water on the costume. Observe if the water soaks through or slides off.

- **Ask:** If the costume is waterproof, the water will slide off. What happened to the costume? Did the water slide off or soak in?

Scene 2 – Big Spill: Pour water on the costume. Observe if the water soaks up or slides off.

- **Ask:** If the water soaks in to the costume, that means it will be able to soak up Ruff’s mess. What happened to the costume? Did the water slide off or soak in?

Scene 3 – Party Time: Shine a flashlight on the costume. Observe if the light absorbs or reflects.

- **Ask:** If the light reflects off the costume, that means it is shiny enough for the disco dance party. What happened to the costume? Did the light reflect off it?

Scene 4 – Nap Time: Feel Ruff’s outfit. Observe if it’s soft.

- **Ask:** If the costume is soft, that means Ruff will be able to take his nap. How does his costume feel? Does it feel soft? Can you think of other things that are soft (example: blanket, pillow); is this similar to how those things feel?

Scene 5 – Create your own!: Create and run a test based on your original story. When you’re creating your test, think about how can you test whether the material in Ruff’s costume did its job.

- **Ask:** What happened to the costume? Did it work or not?

Reflect

- After each test, ask kids what happened and write down their answers on the printout.
  - **Ask:** What happened when you tested?
  - **Ask:** Was your prediction right? Why do you think those materials worked?
  - **Ask:** Was your prediction wrong? Why do you think those materials didn’t work?

Improve

- Ask kids to improve their costume designs based on the results of their tests.
  - **Ask:** How would you improve your costume, so it passes the test? Spend a few minutes changing your design, then let’s run the test and see if you get a different result!
Materials:

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8.

Scene:

Draw your costume for Ruff in the space provided, and list which materials you'll be using to make it.

Activity

Funding for The Ruff Ruffman Show is provided by the Corporation for Public Broadcasting and the Department of Education. The contents of this document were developed under a cooperative agreement #PRU295A150003, from the U.S. Department of Education. However, these contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.
Hello Families:

Today your child worked with others to “Dress For Success.” Using their engineering and critical thinking skills, your child worked with others to imagine and create an appropriate outfit for Ruff Ruffman based on a challenge they were given. With the help of Ruff, from the PBS KIDS program The Ruff Ruffman Show, we discovered that materials have different properties that make them useful in some situations (like waterproof raincoats for when it’s raining).

To find out more about what your child learned, you can ask:

- What challenge did you have to design an outfit for?
- What materials did you use to make your outfit?
- What happened when you tested your outfit?
- If you could have changed or improved anything about your outfit, what would you have improved?

Your child also had the opportunity to listen to Home by Carson Ellis. Have your child tell you about the book.

Here are some related books to look for at the library:

- Beautiful Oops! by Barney Saltzberg
- The Most Magnificent Thing by Ashley Spires
- Soft and Smooth, Rough and Bumpy: A Book About Touch by Dana Meachen Rau
- Rocks: Hard, Soft, Smooth, and Rough by Natalie M. Rosinsky
- Sam Sorts by Marthe Jocelyn

Tune into your local PBS station and visit PBSKIDS.org online for more opportunities to learn, watch, and play together with your family. Watching videos and playing games with your child encourages social interactions, bonding, and learning.

You can also access PBS KIDS content free in PBS KIDS Video app and the PBS KIDS Games app.
Hola Familias:

Hoy su hijo/a trabajó con otros para “vestirse para el éxito”. Usando sus habilidades de ingeniería y pensamiento crítico, su hijo/a trabajó con otros para imaginar y crear un traje adecuado para Ruff Ruffman basado en un desafío que se les dio. Con la ayuda de Ruff, del programa PBS KIDS The Ruff Ruffman Show, descubrimos que los materiales tienen diferentes propiedades que los hacen útiles en algunas situaciones (como impermeables para cuando llueve).

Para saber más acerca de lo que su hijo/a aprendió, puede preguntar:

- ¿Cuál fue el desafío que te dieron para diseñar un traje?
- ¿Qué materiales usaste para hacer tu traje?
- ¿Qué pasó cuando probaste tu traje?
- Si pudieras haber cambiado o mejorado algo de tu traje, ¿qué habrías mejorado?

Su hijo/a también tuvo la oportunidad de escuchar la historia Home by Carson Ellis. Haga que su hijo/a le cuente sobre el libro.

Aquí hay algunos libros relacionados que puede buscar en la biblioteca:

- Beautiful Oops! By Barney Saltzberg
- The Most Magnificent Thing by Ashley Spires
- Soft and Smooth, Rough and Bumpy: A Book About Touch by Dana Meachen Rau
- Rocks: Hard, Soft, Smooth, and Rough by Natalie M. Rosinsky
- Sam Sorts by Marthe Jocelyn

Sintonice su estación local de PBS y visite PBSKIDS.org en línea para obtener más oportunidades de aprender, ver programas y jugar con su familia. Ver videos y jugar con su hijo/a fomenta las interacciones sociales, la unión y el aprendizaje.

También puede acceder al contenido de PBS KIDS gratis en la aplicación de video PBS KIDS y en la aplicación de juegos PBS KIDS.
Resources to Support Material Properties Activities

Get children thinking and exploring like scientists using this collection of resources about material properties from Ready to Learn and PBS KIDS. Providing young children the opportunity to participate in simple investigations, inspired by PBS KIDS characters they know and love, where they ask questions, make predictions, collect data, and draw conclusions is a great way to support developing science inquiry skills and practices.

These resources can be used and adapted to meet the particular needs of your learning environment and the children that you are working with. Whether you are a program director, classroom teacher, after-school and summer provider, or any other adult working with young children, these resources are for you!

Resources are grouped by activities, videos, and games (online and mobile), and include a list of books related to the topic of properties of materials. Resources can be used as-is, adapted, grouped to make a complete lesson, integrated into preexisting lessons, or used as a jumping off point for your own lesson ideas. If you’re looking for an example of a completely sequenced activity on material properties, using resources from the following list, check out the ‘Dress for Success’ activity featuring content from The Ruff Ruffman Show.

Visit klru.org/guideresources for links to each resource

Videos

**The Ruff Ruffman Show**
**Make Sure it’s a Hamster**
7:31 min
Grade Level: K-2
In this video Ruff has to put together a leash in order to stop an out-of-control rhinoceros from completely ruining Blossom’s apartment. But what material could possibly be strong enough to hold a 5,000-pound rhino?

**The Ruff Ruffman Show**
**Plarn It**
4:47 min
Grade Level: K-2
In this video Ruff must figure out how to fix Blossom’s things, which were ruined by Fluff the Rhino. Luckily, two kid scientists introduce him to plarn (plastic yarn). Will this creative material be the answer to Ruff’s problems?
The Ruff Ruffman Show

Turn Your Rhino into a Dog

4:08 min

Grade Level: K-2

In this video Ruff has to find the right material to transform Fluff the Rhino into Fluff the shaggy Puli Dog before Blossom comes home. Can Ruff and Chet find the right materials and create a convincing costume in time?

The Ruff Ruffman Show

A Dry Pet is a Happy Pet!

5:27 min

Grade Level: K-2

In this video Ruff is on a quest to find the best material for a rhino-sized raincoat for Fluff. Can Ruff figure out how to keep the 5,000-pound rhinoceros dry?

STEM from the START

Sorting by Properties

1:57 min

Grade Level: preK-3

The Quinks have brought back a number of items that all look different. Willow challenges them to identify properties of items that are the same. They identify color as a property. Flux tries to organize the items by colors, but he gets it wrong. He tries again and gets it right this time.

Everyday Learning

Muffin is Missing

1:59 min

Grade Level: preK-1

This animation takes children on a hunt through the backyard to find Muffin, a missing cat. Students will need to use their knowledge about counting by ones and twos, sorting by color, and patterns to reunite Muffin with her owner in time for dinner.

Activities

The Ruff Ruffman Show

Showtime

PG 133

Grade Level: K-2

Explore wearable science and use materials found around your classroom or your house to create costumes and dress-up a mini Ruff for his next show.
**The Ruff Ruffman Show**  
**Grab it and Run**  
Grade Level: K-2  
Explore wearable science and try to make it to the finish line of this special relay race without breaking any materials.

**The Ruff Ruffman Show**  
**Ruff and Smooth Scavenger Hunt**  
Grade Level: K-2  
Encourage children to explore core science concepts in this activity. From a prickly pinecone to a soft sweater, everything we touch has texture. How many textures can you find inside or outside?

**The Ruff Ruffman Show**  
**Teacher’s Guide: Wearable Science**  
Grade Level: K-2  
Learn about wearable science and material properties alongside Ruff in this Teacher’s Guide.

### Games

**The Ruff Ruffman Show**  
**Photo Stuff with Ruff app**  
Grade Level: K-2  
Use the app to inspire children to discover what the ‘stuff’ in their world is made of. As children explore their surroundings they will take pictures of different materials to complete silly scenes based on prompts from Ruff. As children explore and take pictures using the app, ask them about why they are choosing the materials they choose.

Challenge them to find additional materials that also match Ruff’s prompts.

**The Ruff Ruffman Show**  
**Dress that Rhino**  
Grade Level: K-2  
Use science inquiry to explore, test, and document material properties to help dress up Fluff the Rhino for Ruff’s pet-sitting adventures.
The Cat in the Hat Knows a Lot About That!
Sorta-ma-gogo
Grade Level: PreK-K
Sort and categorize items by their properties in this fun game with the Cat in the Hat.

Sesame Street
Dress Up Time
Grade Level: PreK-1
Match and categorize colors and patterns with Elmo and Abby in this fun dress-up game.

Books
Beautiful Oops! By Barney Saltzberg
The Most Magnificent Thing by Ashley Spires
Soft and Smooth, Rough and Bumpy: A Book About Touch by Dana Meachen Rau
Rocks: Hard, Soft, Smooth, and Rough by Natalie M. Rosinsky
Sam Sorts by Marthe Jocelyn
Home by Carson Ellis

Find Extra Resources on the next few pages.
Grab It and Run

Kid Description: Grab a grown-up and some friends for this special relay race! Can you make it to the finish line without breaking any materials?

This game is for four or more players, and should be played outdoors or indoors in a big open area. If you have kids with motor issues or who otherwise cannot participate, ask them to be a team coach or score keeper.

Explore:
material properties, inquiry practice (predict, document, investigate, reflect)

Materials:
Gather up a bunch of household items with different properties – that’s how they look, feel, smell, sound, or taste. You’ll want a mix of strong and weak materials for the race.

Here are some suggestions, but feel free to add your own! Each material should be about 2 feet long, and you’ll need at least 2 of each (one for each team, plus extras if they break).

- Rope or ribbon (strong, flexible)
- Rubber bands (stretchy)
- Licorice ropes (stretchy, breakable)
- Tin foil sheet (unfolded - breakable; rolled - strong)
- Toilet paper (breakable)
- Wooden dowel (stiff, hard)
- Dry paper towel (somewhat strong)
- Wet paper towel (weak)
- Plastic bag (as bag - weak; knotted - strong)

Predict

★ Sit in a circle and pass around the materials one at a time.

★ Ask kids to use their senses to explore each material. What do they notice about each material?
  - Ask: How does each material look?
  - Ask: How does each material feel?
  - Ask: How does each material sound?

★ Ask kids if they could experiment with the materials to make them stronger.
  - Ask: How could you experiment with the materials, or change them, to make them stronger? (Hint: could you roll them up, knot them, something else?)
Have kids line up the materials on the ground, in order from “strongest” to “weakest.” This will be their order in the relay.

• Ask: Based on our investigation of the materials and any other experience you might have, predict which are the strongest and which are the weakest. Line up the materials in order from strong to weak. I’ll also document your prediction by writing it on the printout.

On the printout, write down each kid’s predictions for the materials.

Explain the relay rules to the kids.

• Explain: Teammates will work together to run each material to the finish line without breaking it. The first team to get each material to the finish line has been declared the winner. Keep playing until one of each material has been declared the winner. If their material breaks before the finish line, players drop the material by their marker, and pick up a different material. If their material breaks again, players can pick up a different material. If their material doesn’t break, hooray! Players drop the material by their marker, then run back to get the next item.

Time to start the race! When one leader says “Ready, set, go!” players run with their material to the finish line. If their material breaks, players have to start over with the same material. If their material breaks again, players can start over with a different material. If their materials breaks, players can pick up a different material. If their materials breaks again, players can pick up a different material.

If their material doesn’t break, hooray! Players drop the material by their marker, then run back to get the next item. Keep playing until one of each material has been delivered to the finish line.

The first team to get each material to the finish line wins. Or, the team that gets the most materials to the finish line wins.

Reflect

Sit in a circle around the two piles of materials.

• Ask kids about their predictions on the printout.

• Ask: Were your predictions right?

• Ask: Why do you think some materials were easier to run with?

• Ask: Why do you think some materials were harder to run with?

• Ask: Were your predictions right?

• Ask: Why do you think some materials were easier to run with?

• Ask: Why do you think some materials were harder to run with?

• Ask: Were your predictions right?

• Ask: Why do you think some materials were easier to run with?

• Ask: Why do you think some materials were harder to run with?

• Ask: Were your predictions right?

Ask kids what other materials could be used in the race.

• Ask: What are some other materials we could use in the race? Do you think those materials could be used in the race?

Funding for The Ruff Ruffman Show is provided by the Corporation for Public Broadcasting and the Department of Education. The contents of this document were developed under a cooperative agreement #P327B150003, from the U.S. Department of Education. However, these contents do not necessarily represent the policy of the Department of Education and you should not assume endorsement by the Federal Government.
Activity

Grab It and Run

Write down the materials you’re using in Column #1, what you predict will happen to them in Column #2, and what happens when you test them Column #3.

<table>
<thead>
<tr>
<th>#1 Material</th>
<th>#2 Prediction</th>
<th>#3 Result</th>
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</table>
Search for TEXTURED treasures!

From a prickly pinecone to a soft sweater, everything we touch has texture.

How many textures can you find inside or outside of your house?

- Race the clock or race a friend with this printable scavenger hunt.
- Instead of drawing or writing, snap photos with a digital camera.
- In the spaces on your sheet, make crayon rubbings of the textures you find.
- Target your scavenger hunt. Look for objects in nature, in your kitchen, or on your walk to school.
- Explore other senses. Find things with different colors, smells, or even tastes.

Instructions:

TEXTURE describes the feel or appearance of an object or the material an object is made of.

More Ways to Play:

I'm RUFF, but I'm smooth...
Search for TEXTURED treasures!

From a prickly pinecone to a soft sweater, everything we touch has texture. How many textures can you find inside or outside of your house? Race the clock or race a friend with this printable scavenger hunt.

Instructions:

1) Print the scavenger hunt table (on the following page). If you are playing with a friend, print two.

2) Begin hunting for textures on your list.

3) When you find something, draw a picture or write the object’s name next to its matching texture.

TEXTURE describes the feel or appearance of an object or the material an object is made of.

More Ways to Play:

• Instead of drawing or writing, snap photos with a digital camera.

• In the spaces on your sheet, make crayon rubbings of the textures you find.

• Target your scavenger hunt. Look for objects in nature, in your kitchen, or on your walk to school.

• Explore other senses. Find things with different colors, smells, or even tastes. (Tastes found in the kitchen, of course.)
<table>
<thead>
<tr>
<th>I’m looking for something...</th>
<th>I found a...</th>
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<tbody>
<tr>
<td>Smooth</td>
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I spy something RUFF!
Overview

Investigating the properties of materials with Ruff Ruffman is a great way for your students to engage in science learning. This series of episodes about material science starts with Ruff pet-sitting what he thinks will be a hamster, but he gets a BIG surprise when a rhino shows up at his door instead! Ruff is excited to discover that he can use what he knows about materials science to create a leash, a raincoat, a dog costume, and other materials for the rhino.

This guide will help you bring the fun of Ruff’s scientific investigation to your students. There are four parts:

1. Background Information
2. Science Talk
3. Let’s Investigate: Material Challenge
4. Extensions

You can find all the resources referenced below on PBS LearningMedia: www.pbslearningmedia.org/collection/ruff-ruffman-show

Background Information

Bringing Ruff Ruffman into the classroom provides an opportunity for students to investigate and develop a deeper understanding of properties of matter and how these properties determine if a material is useful for a particular task.

One science practice to point out is how collecting data helped Ruff Ruffman solve several problems. It was important for him to have an organized way to test and record his observations. Then, he could use what he found out to make the best decision or find the best solution. Here are some key understandings from his data collection and observations:

★ A material is what something is made out of, like wood, plastic, or cotton.
★ Materials have different properties, like color, weight, and texture.
★ You can observe, compare, describe, test, and sort materials by their properties.
You can make different objects (like chairs and bowls) from the same material (like wood). These objects may share some properties (color) and not others (shape).

**Developing Understanding**

Children may have had other experiences with properties of materials and may have ideas about the reasons why some materials are useful in certain situations and not useful in others. Some questions you might encounter as they work to reconcile their thinking might include:

- Can everything be strong?
- What if we just add tape?
- How does fabric hold water?

**Acquiring New Science Words**

Young learners can benefit from having Word Walls to help them communicate their developing ideas. Including pictures of the word in context, whether it is a classroom investigation or a media resource like a Ruff Ruffman video, can help students remember the experience that corresponds with the word.

Some of the vocabulary words related to Wearable Science include:

- **Absorb** – to soak up a liquid
- **Data** – information to help us think about something
- **Material** – what something is made of
- **Observe** – to carefully look at something
- **Predict** – what you think will happen based on what you already know
- **Quality** – a property of matter
- **Record** – write down

**Science Talk**

Talking about science – by making observations, sharing ideas, and participating in group discussion – is an important science practice. Watch the Ruff Ruffman videos with your students, and use the discussion prompts on the next page to engage in science talk.

In *Make Sure It’s a Hamster*, Ruff had several mishaps when things did not turn out as he had planned with Fluff the rhino. Scientists run into this problem frequently. Learning to be resilient can help us be successful in science. A great way to help young students adopt resilient habits of mind is to create “Resiliency Thought Bubbles” filled...
with phrases they can use when they're faced with a challenge. Ruff is illustrating how this might work in the image to the right.

**Discussion Prompt 1**

Ruff Ruffman had a big problem to solve in *Make Sure It’s a Hamster*. He thought he would be taking care of a hamster, and he wound up looking after a rhino instead. As a whole class, discuss what problems Ruff faced when the rhinoceros arrived. How did the situation lead him to find a new solution and a new material? What testing did he have to do to create Fluff’s leash? When have you had to make or use something different than you had planned in order to solve a problem?

**Discussion Prompt 2**

In *Plarn It!* Ruff realizes that he needs to fix the big hole in Blossom’s wall before she returns. By asking his friends for help, Ruff discovers he can use plastic shopping bags in a new way. As a class, make a T-chart comparing and contrasting the properties of the plastic bag versus the properties of the materials made from plarn.

**Discussion Prompt 3**

Ruff takes on another BIG challenge in *Turn Your Rhino into a Dog*. How did sorting and gathering data help him find the right material to turn Fluff into a dog? Why are comparing things and recording data important skills in science?

**Let’s Investigate: Material Challenge**

An important point to consider is that sometimes a material’s qualities are useful and sometimes they are not, depending on the need or task at hand. As a class, watch *A Dry Pet is a Happy Pet* and see how Ruff finds this out when Fluff’s mop-head costume disguises him as a dog inside the house, but then becomes heavy and leaves puddles behind outside in the rain. Then figure out what the best material is to clean up Fluff’s puddles!

**Ask Questions**

- How were the mop heads useful inside the house?
- What happened to them when Ruff and Fluff went out in the rain?
- What science words could we use to describe this?
Get Set

Materials:

- 3-5 plastic trays or plates
- Various materials to test such as the following:
  - Paper towels
  - Plastic wrap
  - Paper
  - Ribbon
  - Cotton balls
  - Aluminum foil
  - Towel
  - Fabric
  - Sponge
- Clipboard, paper, and pencil (1 per student)

★ While students are at lunch, recess, or another time when all students are out of the classroom, stage several “puddles” left behind from Fluff stopping by in the soggy–wet costume. Pour the puddles into plastic trays or plates and place them on several desks or tables in the classroom.

★ When students have returned, explain that Ruff and Fluff came by and left puddles in the classroom! Now, the class has to think like scientists and figure out the best material to clean up the puddles.

★ Have the students think of a way to solve the problem of the puddles. Show them the materials they can use in this experiment. As a class, discuss the properties of each material and decide on the material you’re going to try at each puddle station.

★ Brainstorm a list of way to test the materials to figure out which one is the best for cleaning up Fluff’s puddles.

Predict

Engage students in thinking about what might happen when they use each material to clean up the puddles. Offering students a chance to decide on the prediction through class vote or other method can increase motivation and connection to the experiment. Students might want to predict:

★ What material will be the best at cleaning up the puddles?
★ What material will be the worst at cleaning up the puddles?

Observe

★ Divide the class into groups, 1 for each puddle station. Place the selected materials at each station.

★ Provide each student with a clipboard, paper, and pencil so they can record their observations of the material’s performance as they conduct the tests you’ve decided on as a class.
Debrief
Gathering students to debrief after an activity is an important part of a science learning experience. Students can use the following sentence starters to help share their learning.

★ To communicate their observations: “I saw…”
★ To reflect on their predictions: “I thought…but then…”
★ To demonstrate science community skills: “I liked…” or “I respected…”
★ To make a conclusion: “If Ruff Ruffman wants to clean up puddles, he should…”

Extensions
★ Students can use their wearable science knowledge in the Dress That Rhino game, where they test different materials to find a solution for Ruff and Fluff.

★ Have students watch A Well-Dressed Rhinoceros, starring Ruff Ruffman, to reinforce all the useful properties of matter in choosing the right thing to wear! Students can help Fluff dress for a trip in the What Should Fluff Wear? activity. Fluff will need different clothing depending on where he goes on his trip. Encourage students to be creative and resourceful as they look around the classroom for materials that will keep Fluff comfortable in different weather. They can either glue the material onto Fluff or draw the clothing on using a pencil or crayons. Then have them describe why they chose that particular material based on Fluff’s destination.
## PBS KIDS Learning Goals

### STEM (Science, Technology, Engineering & Math)

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<tr>
<td>Cat In The Hat 2-5</td>
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<td>Scientific Inquiry, Life Science</td>
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<td>Dinosaur Train 2-5</td>
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<td>Scientific Inquiry, Life Science, Natural History</td>
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<td>Ready Jet Go! 3-8</td>
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<td>Martha Speaks</td>
<td>4-8</td>
<td>Literacy, Vocabulary Acquisition</td>
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<td>WordGirl</td>
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## SOCIAL STUDIES, THE ARTS & MORE

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## SOCIAL & EMOTIONAL DEVELOPMENT

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<td>Arthur</td>
<td>4-8</td>
<td>Social &amp; Emotional Development, Problem Solving</td>
</tr>
</tbody>
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