

Ramps and Rollers

TINKERING WITH MOTION



YOUNG CHILDREN ARE FASCINATED BY ROLLING OBJECTS.

They become familiar with the phenomenon of rolling because of their natural curiosity and playful experimentation with things that roll or slide. Tinkering with Ramps and Rollers provides opportunities for children to play with rolling objects. They may modify their rollers with materials to change the way they roll, and develop their own theories about how and why they move the way they do.

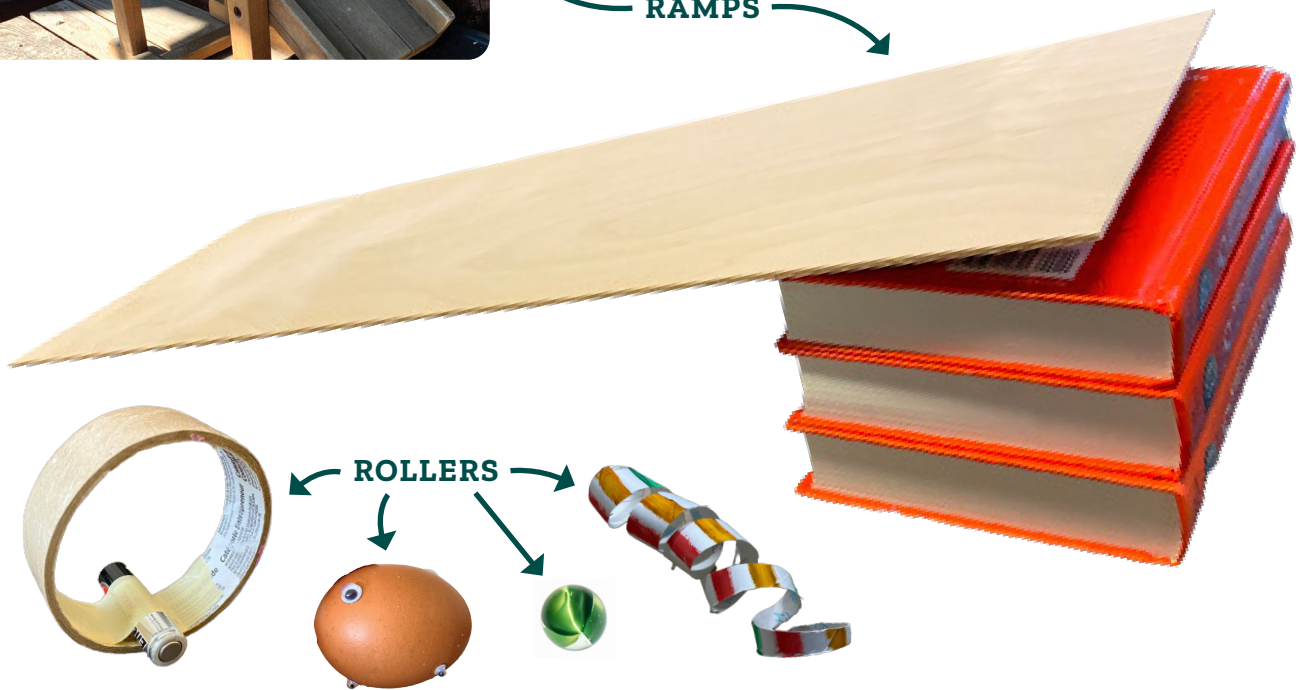
Overview

THE RAMPS AND ROLLERS ACTIVITY is a tinkering experience that supports children to investigate the way things roll or slide down a ramp.

EXPLORING RAMPS AND ROLLERS WITH CHILDREN using everyday materials of various shapes, sizes, and weights, supports their familiarity with STEAM concepts like motion by manipulating rolling objects to move in new, unexpected ways. The children create and test a variety of new rollers as they tinker.



RAMPS



The guide is divided into three sections that follow the tinkering cycle:

1 PLAN includes everything to prepare yourself and your space for tinkering with Ramps and Rollers.

2 FACILITATE includes ways for you to support children in their tinkering investigations of motion.

3 REFLECT provides ideas for how you can review what the children did during the initial tinkering session and prepare to relaunch the next investigation.

Plan

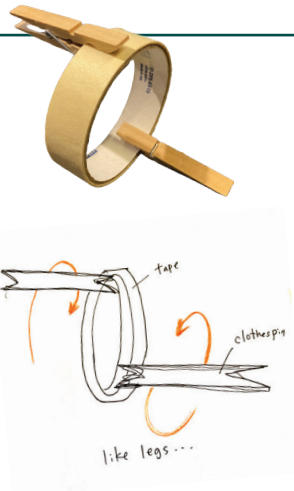
Tinkering for Yourself



TRY THIS EXPLORATION AS A LEARNER, before planning how to facilitate Ramps and Rollers tinkering experiences with children. For this activity, it means you might try out different rollers and see how small changes will affect how things roll. It also helps you to develop an understanding of what slope setup will allow children to observe the rollers and what materials will spark children's interest and support their investigations in rollers. Being engaged in the tinkering exploration yourself may reveal moments of excitement, frustration, and possible pathways for investigation as you begin to plan how you will share this with children.

Test your Rollers

Choose one of the rollers that you collected and try rolling it down a ramp. How did it roll? Pay close attention to how it moves and record what you observe by making a drawing of the movement. You can add arrows or other symbols to your drawing to indicate how the object moves (fast, slow, in a straight line, in a wavy line).



Try this again with other rollers to observe and document how they roll or slide.

Refer to your drawing and make a note about something you might change to rolling objects to make them move in different ways.

Modify your Rollers

Select a roller that you want to modify to change the way it rolls. You might add weight to one side or the other. You could fill an empty container with different shaped objects or change the shape of the object itself (for example, you might turn a smooth round object into an oval or bumpy one). Test it out. Watch it roll and make a note or drawing about the movement and how



it changed when you modified the roller. Tinker with this several more times to get a sense of the different rolling possibilities and to learn more about how materials can be used to modify the rolling objects. Make a list of your favorite explorations and the materials that you used.

When you're finished tinkering, take some time to reflect on the following questions:

→ What was a moment that surprised you about this activity?

→ What was a moment that was challenging?

→ When did you feel like you were tinkering?

Set Goals

IN THIS ACTIVITY, children tend to experiment by exploring materials and observing rolling objects. Through their observations, they notice certain behaviors of rolling objects and then predict what will occur. Then they modify the roller, test out ideas, and interpret the results. Consider these kinds of things when you set your goals for the children's tinkering.

Consider what children may investigate in the tinkering activity, including children with varying abilities.

The goals that you decide on will help when you select materials and starting



point prompts to help focus children's tinkering on key ideas and the phenomena. Some examples of goals include adding weight to the rollers, texture to the ramp, or other modifications that may impact the rolling objects.

Be careful to not include too many goals in your planning

process. Selecting a few developmentally appropriate goals for the first time you tinker with children may lead to a more successful tinkering session. Then you can return to the exploration again and shift your goals as children become familiar with the materials and develop their understanding.

Collect Materials

RAMP

Find a large surface such as a tilted dining table, desk, or coffee table. A large piece of cardboard set at an angle will also work.



THINGS THAT ROLL

Collect objects that can be modified to roll in different ways. These might include rolls of tape, empty containers, cardboard tubes, or unusually shaped objects like pine cones or lemons.



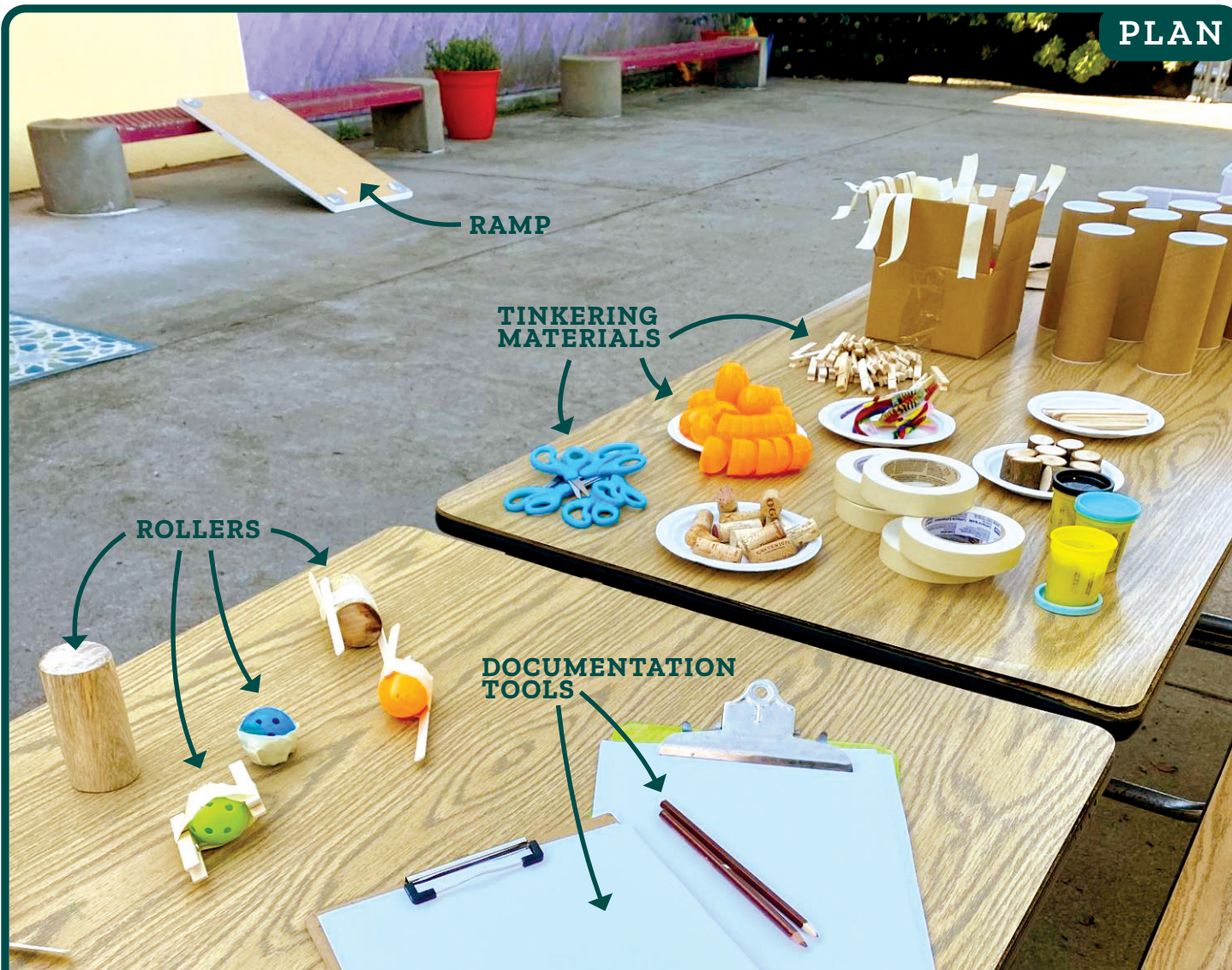
CONSTRUCTION MATERIALS

Gather tools and materials that you can use to modify the rolling objects. This might include binder clips, scissors, rubber bands, or objects that add weight including Play-Doh, washers, sand, and marbles and more.

DOCUMENTATION TOOLS

Have a camera or phone ready to record the things that you make roll, and gather a pen or pencil and a journal or blank sheets of paper to document your notes, thoughts, and observations.





Space Set-Up

CREATE AN INVITING SPACE FOR CHILDREN TO TINKER

with Ramps and Rollers. Make sure there is room around the ramps for children to gather and test with each other, and be ready to make accommodations to allow full participation by children with mobility issues. Make sure the ramps are long enough for the rollers to be observed as they move slowly down the slope. Set out materials and tools at a separate table to encourage children to modify their rollers in one area and bring it to test on the ramp.

Choose a Starting Point

CHOOSE STARTING POINTS THAT WILL ENGAGE CHILDREN in the possible ways they can tinker with ramps and rollers. Here are a few ideas for how you might spark their interest, and engage them in a focused investigation.



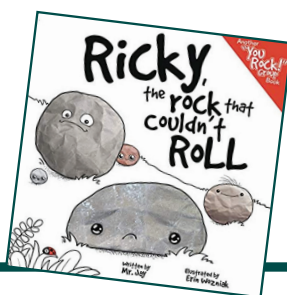
Find ramps and rollers around you

Finding the ramps and rollers that already exist in the learning environment or neighborhood can be a fun way to begin exploring the ideas of rolling objects down a slope. Together with the children, search for ramps that already exist. You may notice the slanted surfaces of chairs, railings, slides or stairs. Have a few rollers ready for children to test these newly observed ramps. Make a list or drawing of the different ramps that they discover, and how each ramp affected the roller.

Depending on how different objects roll when placed on each ramp, children may become aware of the ways in which the shape and texture of an object affects how it rolls, and how the steepness of the ramp affects the speed of the roller.

Read a story

Ricky the Rock That Couldn't Roll is a book about rolling (and not rolling). In the story, all of the rocks gather to roll down the hill but Ricky's flat side doesn't let him roll like the other rocks. We like introducing this story for children to begin looking at the shape of different objects, and to compare how they imagine they might roll or slide down a ramp. Children enjoy the story even more as they build their own rollers to test on the ramp. The book introduces words like roll, slide, and bounce. The words and pictures will come in handy as children begin to describe how their rollers move.



What Rolls Chart

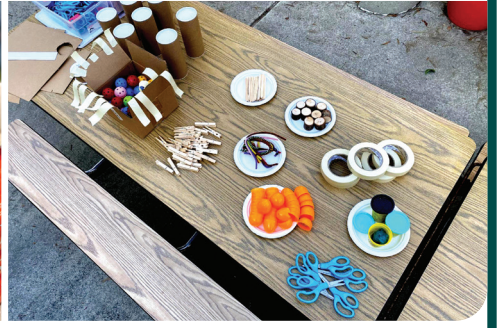
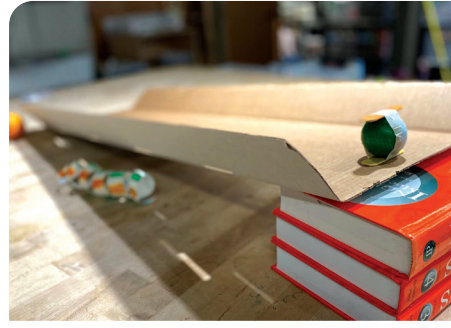
Children made verbal predictions, tested objects, and placed them on a chart. Some children concluded that anything that made it down the ramp is considered "roll."

TEACHER JOANNE

A Ramps and Rollers Exploration

Here's a plan for a Ramps and Rollers activity that will support children in their tinkering exploration.

SET-UP
Prepare for exploration by choosing materials and setting up the ramp.



Rollers

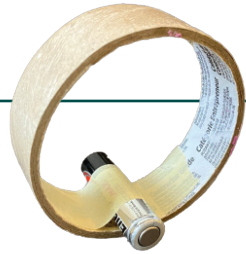
Collect rollers that children can test, manipulate, adjust, and transform. Review your notes from your own tinkering explorations, and choose the rollers that are appropriate for the abilities of the children you are working with. Collect multiples of each kind of roller to encourage more collaborative tinkering.

Ramps

Set up one or more ramps for children to test their rollers on. Try to create ramps that are not too steep and allow children to observe their movement as they roll slowly down the slope.

Tinkering Materials

Collect tools and materials for children to modify their rollers. Don't forget to offer blank sheets of paper (or a journal) and something to draw with as they observe and record how things roll when they modify their rollers. Use the material list and your own tinkering experience to guide your tools and materials selections.



Share Inspiring Examples

Construct a few example rollers that have been modified to roll in interesting ways. Children can use these examples to spark their own ideas about how to modify their roller.

TAPE ROLL
Attach a weight inside or outside a roll of tape. You could use Play-Doh, a crayon, or a battery for this.

A clothespin is easy for children to experiment with attaching various objects to the roll of tape.

ROUND/OVAL OBJECTS
Attach bumps on the outside of a round ball or oval object. Googly eyes will add personality to the roller and change the way it rolls.

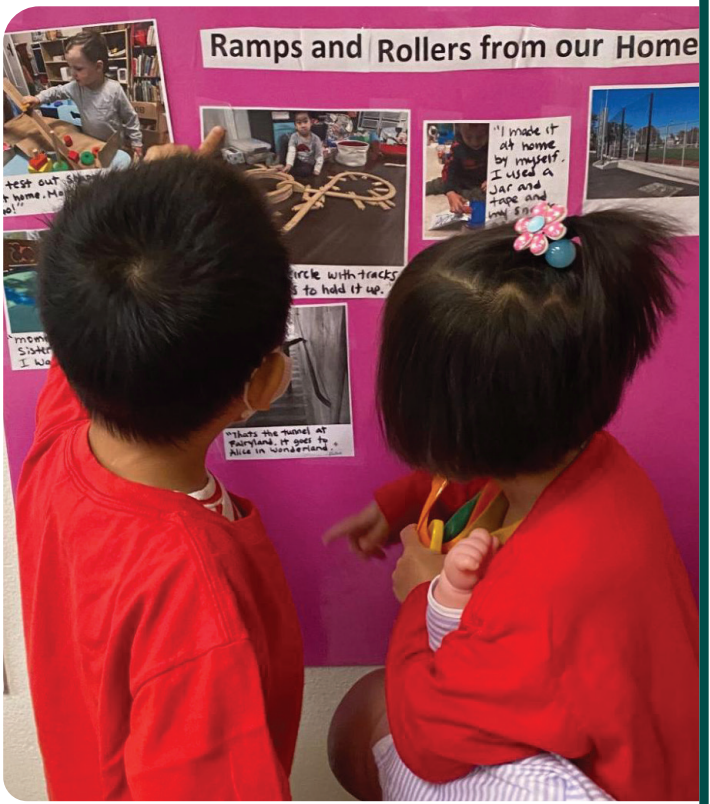
Children can compare the speed and movement of solid rollers to hollow ones.

CYLINDERS
Place various objects inside the container and watch how it affects the movement. Attach pencils, kebab sticks, or rubber bands around the outside of the cylinders to see how it changes the movement.

Plan for Documentation

PREPARE THE TOOLS AND APPROACH THAT YOU WILL USE

to document the children's Ramps and Rollers investigations. Photographs, video clips, recordings, and your own journal notes can help children remember the tinkering experience and spark new ideas for what they might want to try next. You can use the Ramps and Rollers documentation to gain insights about how to relaunch the tinkering exploration next time.



You Might Want to Document

- The children's discoveries while searching for ramps and rollers in their space.
- Images of children's roller modifications to remind everyone what was explored.
- Your observations about what materials worked well with children of differing abilities, what objects you might try next time, or details about how the ramps were set-up that led to positive investigations and learning moments.

Facilitate

TINKERING WITH RAMPS AND ROLLERS SUPPORTS THE DEVELOPMENT

of important STEAM learning ideas. During the activity, children are encouraged to explore, investigate, and think about the relationships between the various characteristics of rolling objects and the way they roll. The tinkering explorations offer opportunities for children to engage with a variety of STEAM concepts, including size, shape, weight, movement, speed, slope, and properties of materials.

You can watch for these STEAM ideas as they emerge in the children's tinkering, and you gently facilitate ways of supporting their developing theories about these concepts.

Asking Good Questions

Asking children questions about their projects is a familiar strategy in early childhood learning and care. But be careful about how many, and what kinds of questions you ask during the tinkering exploration.

Ask children authentic questions of inquiry that you don't know the answer to. Try to ask open-ended questions about their projects that do not have a right or wrong answer.

You might ask children what they are working on and what they have already noticed about what is working (or not working). Focusing your questions in ways that help you understand their developing theories is an important way to understand their thinking and how the materials and starting points



have impacted their tinkering. Questions that extend their thinking are also helpful when asked at the right time. If you notice a child who seems

confident in what they are building and testing, you might ask them to predict what might happen with a more complex idea.

THESE KINDS OF QUESTIONS MIGHT INCLUDE

→ **What do you think will happen if you add more weight to your roller?**

→ **What do you think will happen if you connect multiple rollers together?**

→ **Compare your roller with someone else's roller. How are they similar, or different?**

→ **Could you modify your roller to move like theirs?**

Questions like these often spark new ideas and thinking for children and extend their tinkering.



Step Back and Observe

Sometimes the best facilitation strategy is to step back and carefully observe how the child is tinkering. By paying close attention to the way they are exploring, modifying their rollers, and engaging in the experience, you can begin to imagine what you might suggest as a next step, offer a new material, or ask a question to deepen their engagement. Closely observing their tinkering is an important part of your learning process as you begin to understand their thinking. Careful observation is also an important part of the documentation process.

Go Deeper

Ask children to create a roller that rolls in new ways. After children test a variety of rollers, you can suggest that they tape multiple rollers together, place a weight inside a cylinder-shaped roller, or attach some objects in or around the rollers. They can also try wrapping rubber bands or tape around the rollers or attaching skewers to the outside of the rollers.

Simplify Their Experiments

When explorations become complex it is often helpful to encourage children to share what they are exploring. You might then help them explore their question of interest by limiting some of the extra materials that are distracting, or help focus their direction of exploration.

For example, instead of changing the angle of the ramp and modifying the roller at the same time, you might suggest to the child that they modify one or the other, to notice what happens when one thing has been changed. This will help develop a pattern of problem solving and focused experimentation that will be helpful in other aspects of their life.



Follow Children’s Lead and Observe Closely

Teacher Joanne created a journal entry about the ways that children pursued their own exploration pathways, and then worked together.



In the block area, Jayson placed a long cardboard ramp into the rooftop of the dollhouse. After repeatedly rolling cars and trains, he noticed the cars landed on the window. The cars did not fall onto the first floor. After a few minutes, Kavan brought another piece of cardboard. He placed it on the first floor. They tried rolling the cars down again. The cars continued to land on the window. I said, “I wonder why the cars aren’t coming down?” Kavan moved closer to examine where the cars went.

He said, “It stuck. Over there.” I asked, “What do you think is preventing it from coming down?” After 20 min, they pulled the doll house out and rearranged the ramps for the cars to roll down from the rooftop to the first floor.

This journal entry highlights the way in which facilitation can support the children’s intentions and curiosity. Joanne observed and occasionally offered helpful advice and questions while the children explored.



Other prompts to spark children’s interest

- Roll the rollers down the slope from top to bottom. What could you do to slow it down as much as possible?

- What do you think will happen if you add some weight to your roller?

- How could you get it rolling as quickly as possible?

- How can you change the rollers to travel in a straight, curved, or zigzag line?

- Observe and draw how your rollers move in different ways.

- Compare how shapes or texture affect their movement.



Reflect to Relaunch

RAMPS AND ROLLERS IS NOT MEANT TO BE A TINKERING ACTIVITY THAT YOU DO JUST ONCE.

It's an exploration that children can return to again and again as they notice new things, try new ideas, and dream up new experiments.

The practice of carefully observing children and documenting their tinkering process will help you plan possible ways of modifying and relaunching future ramps and rollers investigations.

Documentation of ramps and rollers might include taking photographs of modified rollers, recording video clips of objects rolling down the ramp, and of course your own journal notes about what you are noticing throughout the process.



While tinkering with ramps and rollers, educators have documented children exploring:

→ Changing the angle of ramps

→ Trying out different types of materials to get the desired outcome

→ Creating games and challenges such as knocking over a toy, or landing an object into a container

→ Measuring distance and weight

→ Reviewing their experiments with video



Documentation is a great opportunity for children to reflect on their experience.

Provide drawing materials and ask children to sketch their rollers and how they moved. Have children use their drawing to share what they tinkered with, what they observed, and what they want to try next.

This kind of documentation will guide your plans for new tinkering explorations and help the children remember the tinkering experience, and spark new ideas for what they might want to try next.

Relaunching

FOLLOW THE CHILDREN'S LEAD AS YOU PREPARE TO RELAUNCH

the next Ramps and Rollers investigation. Review your documentation and try something new each time you introduce the experience.

HERE ARE A FEW IDEAS FOR RELAUNCHING RAMPS & ROLLERS



Ramp Modifications

Once children have investigated ways of modifying their rollers, you might relaunch the exploration focused on ways they can begin modifying the ramp. They could change the angle or add materials to the ramp to impact the path of the rollers.

Exploring Sounds

You might explore the sounds that different containers filled with objects make as they roll down the ramp.



Two-wheeled Rollers

If you create these discs with holes, you can explore more possibilities with ramps and rollers! You can connect each other at the center or off-center, and see how they roll. This type of two-wheeled system with an axle will also allow children to attach weights at the bottom or sculptures at the top, and it will rock as it rolls.

There are endless possibilities for what you and the children might explore. The important thing to remember is that most of these ideas will come from the children themselves as they tinker during the ramps and rollers investigation.

Final Thoughts



The tinkering approach can help you reflect on your process and expand your comfort level with STEAM ideas and practices. For many early learning providers, tinkering can be an important opportunity to shift their facilitation in new directions. Yuwen, an early childhood educator from San Francisco, shared one way that her perspective toward STEAM changed after engaging children in ramps and rollers explorations over the course of several weeks.

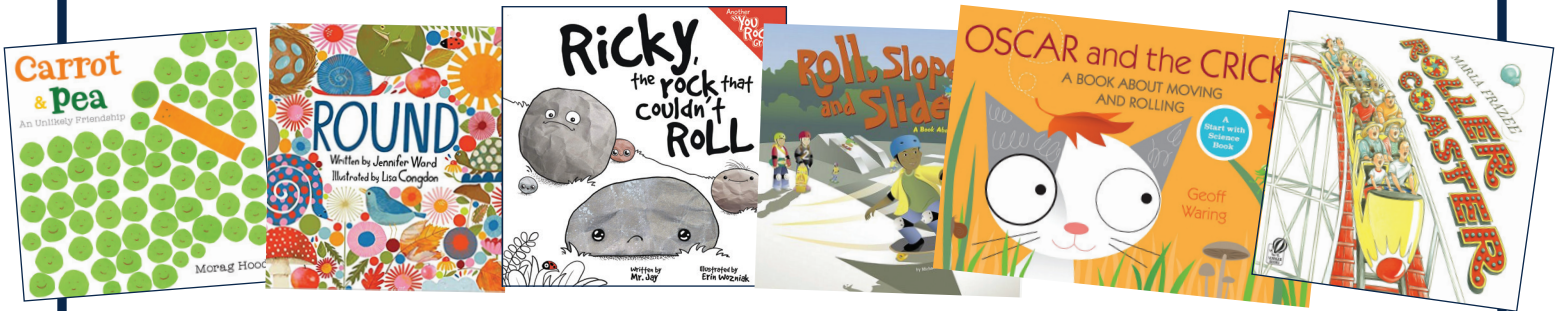
"I first thought science was a demonstration that had a known outcome of what it's supposed to show, and now I see that science is more of a process that I learn from and that I'm engaged with, and it's very open-ended and often surprising."

TEACHER YUWEN

Resources

Book List

Combining tinkering activities with books invites playful engagement with STEAM concepts and processes while also reinforcing language development, collaboration, communication, and literacy skills. These books can be paired with experiential Ramps and Rollers activities to support playful learning, inclusion, and creating space for a variety of author, illustrator, and protagonist voices.



CARROT & PEA: AN UNLIKELY FRIENDSHIP

ZANA Y DANTE: LA ZANAHORIA Y EL GUISANTE
Morag Hood

This is a sweet story by Morag Hood about standing out and embracing differences. It features Colin the carrot acting as a tower, slide, and bridge. Use it as a starting point for explorations of different approaches to constructing towers, bridges, seesaws, and slides.

ROUND
Jennifer Ward (author), Lisa Congdon (illustrator)

"Roundness can be found everywhere in nature, but not always as a perfect circle." The author encourages readers to look for round shapes in nature, such as "the curl of a wave and the coil of a shell." This is a book that will get young readers reading, thinking, and, most importantly, exploring!

RICKY, THE ROCK THAT COULDN'T ROLL
Mr. Jay (author) Erin Wozniak (illustrator)

All of the rocks gather to roll down the hill, but Ricky's flat side means he can't roll like the other rocks. This is an inspiring book for children to compare how objects of different shapes roll or slide down slopes, and for building our own rollers to test out. It introduces words like roll, slide, and bounce.

ROLL, SLOPE, AND SLIDE
Michael Dahl (author), Denise Shea (illustrator)

Skateboards, roller coasters, and playground slides, all of these are ramps. This nonfiction picture book provides an introduction to one of the most important machines humans rely on. With fun facts and bright illustrations, find out how people use ramps every day.

OSCAR AND THE CRICKET
Geoff Waring
OSCAR Y EL GRILLO: UN LIBRO SOBRE MOVER Y RODAR
Geoff Waring

This simple story with charming illustrations introduces a base for the concepts of rolling, push, pull, and how objects move by using familiar topics for children. At the end of the story, there are several examples of how to extend the concepts and sample experiments.

ROLLER COASTER
Marla Frazee
LA MONTAÑA RUSA
Marla Frazee

The roller coaster car is going up, up, up to the highest spot. And a little girl in the car with her dad has never ridden on a roller coaster... ever. Zooming, swerving, dipping, and diving, this delightful story with the colorful and lively illustrations featuring a breathtaking ride and will add a hint to creating loops with your ramps an rollers exploration.

STEAM Concepts and Practices

STEAM MINDSETS

→ Observing, exploring, and modifying different kinds of rollers will lead to child-driven inquiry as each child will determine what they want to tinker with.

→ Modifying rollers and watching them roll can be delightful, and lead to positive learning moments for children, even when things don't work as expected.

STEAM PRACTICES

→ When things don't roll as expected, children can engage in problem-solving and experimentation, often leading to the development of new theories.

→ As children become more familiar with how things roll, they may begin to predict the changes that their modification will have on the rolling objects, before they test them out.

STEAM CONCEPTS

→ The speed, direction, and stability of the roller are affected by the slope of the ramp, and the shape and weight of the roller.

→ Patterns of movement can be observed when rollers that do not travel in a straight line.

→ Changing the smoothness of the ramp or roller will affect the speed and movement of the roller.

