THE LAWRENCE HALL OF SCIENCE | Berkeley UNIVERSITY OF CALIFORNIA

YOUNG engineers AT PLAY

Activities for 2–5 year olds at the Hall and at home

Sponsored by SCHOLARSHARE CALIFORNIA'S 529 COLLEGE SAVINGS PLAN℠

Young children are natural engineers. Whether playing with blocks, digging in the sand, or building a fort, they identify and solve problems much like engineers do. When you nurture an engineering mindset in their early years, you help your child to develop dispositions for learning such as:

- **Resourcefulness**
- **Curiosity**
- **Creativity**
- **Persistence**
- **Problem Solving**
- **Collaboration**

Tips for Supporting Young Engineers

Nurture your child's natural sense of curiosity.

Provide materials and space for creativity and free exploration.

Follow your child's lead by observing their explorations, listening to what they say, and asking questions.

Choose activities with hands-on experiences that require minimal explanation.

Encourage your child to be a persistent problem solver.

Give your child time to think before you provide answers.

Play alongside your child.

Talk with your child about their ideas, process, and discoveries.

Asking Questions

Good questions encourage children to think more deeply about their investigations. Ask questions that prompt them to describe their ideas and observations, and ones that have multiple answers.

Examples of questions that promote scientific thinking:

"What do you notice about...?"
"How would you describe it?"
"What would happen if...?"
"How can we find out?"
"What did you try?"
"What is another way to do it?"
"What other parts are needed?"
"What makes you think so?"
"What did you find out?"

AT THE HALL
Bernoulli Blower

Even though air is invisible, young children begin to understand its properties by feeling it on their bodies and by observing how it can move objects. As they delight in playing with the air jets and balls, they experience the energy of moving air and its ability to hold up objects against the pull of gravity. This phenomenon, demonstrated by the Bernoulli Blower, is the same principle that allows heavier-than-air objects, like airplanes, to fly.

Things to try:

- Toss a ball into the air stream to see what happens.
- Spin the ball different ways while it is suspended and see what happens.
- What happens when you put more than one ball in the air stream?
- Try slowly pulling the ball out of the air stream. What happens? Can you feel a force pulling it back in?
- What happens if you block the air from the air stream?

Explore air pressure by balancing balls in a stream of moving air.

HOME ACTIVITY
Make a Ball Float in the Air

What you need:

- a hair dryer
- lightweight balls (such as ping pong balls, an inflatable beach ball, plastic eggs, or an inflated balloon)

Investigate:

1. Toss the ball into the air and let your child try to catch it. Notice how the ball in the air always comes back down. You might mention that an invisible force called gravity pulls things back to Earth.

2. Plug in the hair dryer and let your child feel the air stream's force. Use the cool setting if possible.

3. Point the hair dryer straight up and hold it steady. Have your child place the ball over the air stream and then let go. What happens?

4. Experiment:

- Count how many seconds you can keep the ball up in the air while tilting the hair dryer.
- See what happens with the hair dryer on different settings.
- Try different balls in the air stream. (If using a balloon, you might want to place a penny in it before blowing it up, to add weight.)
- Try two balls at the same time.

AT THE HALL

Keva Planks

KEVA planks engage children in problem solving, mathematics, physics, and design. They develop coordination, fine motor skills, and hand-eye coordination when they pick up, stack, assemble, or fit blocks together. The beauty of Keva planks is that everyone can build at their own skill level. There's no limit to what you can build—towers, buildings, fences, bridges, roads, animals, sculptures: almost anything is possible.

Things to try:

- If your child is reluctant to start building, get him or her interested by participating yourself.
- Incorporate a story. For example, suggest building a house. Whose house is it? Make another house for a friend, a road so friends can visit, or a fence. Ask "What else should we make?"
- Take turns adding blocks to build a structure together.
- Try to create a tower as tall as your child.

Tip: *There are three ways to stack KEVA planks—flat, on long edge, or on the short edge.*

Bring out your inner builder while exploring principles of balance, shape, and stability.

HOME ACTIVITY
Build a Tower Made of Cups

What you need:

lots of paper or plastic cups (any size works, but it's easier if they're all the same size)

Investigate:

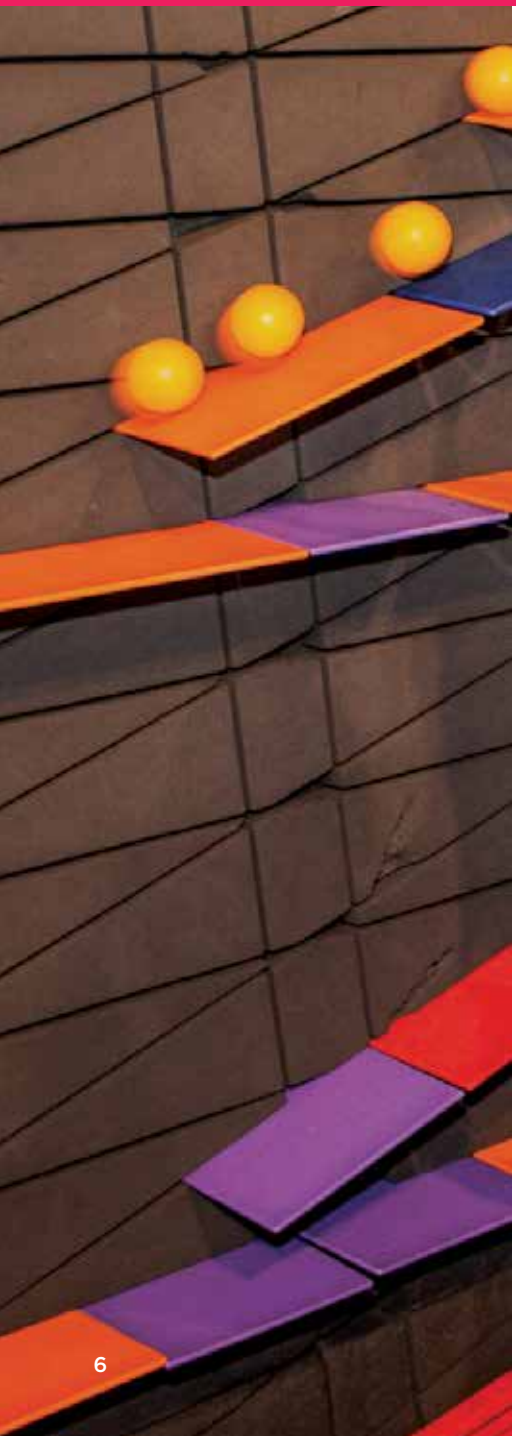
1. Experiment with different ways to stack the cups.

2. Talk about how you can help your structure be more stable.

3. Test out some ideas. Knocking them down is part of the fun.

4. Try making towers, pyramids, and walls. Be creative!

Use new language and descriptive words when talking to your child about what they are doing, like, "balancing" and "gravity." This will help with their language development and conceptual understanding.



AT THE HALL
Gravity Wall

By creating pathways with balls and ramps, your child uses the engineering design process of creating, testing, problem solving, improving, and testing again. They also engage with important physical science concepts, such as gravity, energy, and cause and effect.

Things to try:

- Let your child place the slats wherever she chooses. Let her discover through experience if the ball-run will or won't work. Ask if she can think of better ways to design a pathway.
- Ask questions like, "Why do you think the ball keeps shooting out of there?" "How can you make the ball go where you want it?" "How can you slow the ball down?"

Create pathways and vertical drops using ramps, and then test your design using small balls and the force of gravity.

HOME ACTIVITY
Create a Homemade Marble Run

What you need:

- cardboard tubes from paper towel and toilet paper rolls, some cut in half lengthwise
- marbles or small balls
- container to catch balls
- painters tape
- large empty wall, refrigerator door, or sliding glass door

If your child is under 3 years of age, please remember that marbles are choking hazards, so use larger balls.

Investigate:

1. Find some wall space and tape a tube to the highest spot your child can reach.
2. Have your child drop in a ball or marble and position the container to catch the ball.
3. Help your child add more sections to the marble run. You will need to assist with taping on the tubes.
4. Test each section as you go, to work out the angles and distances.
5. Keep the materials on hand to play with again, and collect more items. You can make chutes out of empty boxes, paper cups with the bottoms cut out, pieces of pool noodles, or foam insulation.

Tip: *Wrap tubes with decorative packing tape to make them colorful and sturdy. If you're using a refrigerator for the marble run, make a magnetic set by attaching craft magnets to the backs of tubes.*

AT THE HALL
River Dams
in *Forces that Shape the Bay*

Children's natural love for playing with sand and water provides a great introduction to learning about dams. Dams are some of the largest structures built by engineers. They can be formed by people, natural causes, or animals such as beavers. By altering the flow of rivers, dams create reservoirs to store water, prevent flooding, irrigate farmland, and generate electricity.

Things to try:

- Place the plastic boards between the river rocks. What happens? Why is the water higher on one side of the dam than the other?
- Move the plastic boards in and out of their slots. Observe the changes to the water level.
- Dig in the sand on the erosion tables.
- Introduce words such as *dam, flow, flood,* and *contain* to help children describe how water moves.

Control the flow of water by building a dam to create a small lake.

HOME ACTIVITY
Build a Dam

What you need:

- water
- toy shovel
- toy bucket or plastic bowl
- large tub, such as Tupperware container (approximately 20” long x 15” wide x 7” deep)
- about 10 lbs. of sand (a sandbox or sand at the beach works too)
- small sticks, popsicle sticks, small rocks, gravel

Investigate:

1. Fill the tub about halfway with water.
2. Use the shovel to add sand to the tub. Notice the change in the level of the water as you add more sand.
3. Pour sand in different locations. What happens? Where does the water go?
4. Can you make a lake or a waterfall?
5. Dig a river in the wet sand and try using sticks, rocks, and other materials to make a dam.
6. Test your dam by slowly pouring water from a bucket down the river’s path. How did your dam work? How can you make it work better?

MORE TO EXPLORE

Be sure to explore these other Hall experiences for 2–5 year olds:

KidsLab

A multisensory area

Birthday Parties

For ages 4½ through 11.

Design Quest Exhibit

Components focus on early engineering

Classes & Camps

Summer and winter camps, plus weekend workshops.

Planetarium

20-minute shows for all ages

Animal Discovery Room*

Meet friendly animals

Early Childhood Workshops

For school groups, playgroups, and co-ops.

Ingenuity Lab*

Explore and play with design challenges

**Open weekends, holidays, and summer afternoons.*

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