YOUNG ENGINEERS

Engineers design or improve many of the things in your children's lives, from the warm coats they wear to the airplanes they fly in.

With these activities, you can get your youngsters thinking like engineers. In the process, they'll use math, science, problem-solving, and other skills that will help them succeed in school.

FLY AN AIRPLANE

Making paper airplanes can teach your child about aircraft design and *aerospace* engineering.

Ask her to make a paper airplane and estimate how long it will stay in the air and how far it will go. Then, she can sail it. Have her use a timer to see how many seconds it stays aloft and then a ruler or yardstick to measure the distance it traveled.

Now it's time to build a better airplane. Encourage your youngster to revise her design by adding extra folds to the wings or tail or altering the body, for example. With each change, she can sketch or take a photo of her plane and then record the time and distance it travels. Which one flew the longest and farthest? Why does she think that design worked the best?

Aerospace engineers continually work to improve real airplanes. They experiment with new designs to help planes take off and stay in the air with the least resistance—and in the process improve fuel economy.

EXTEND A CANTILEVER

How long can a diving board be and still support weight? Let your child use CD or DVD cases to make a *cantilever*—a structure, like a diving board, that is anchored at only one end.

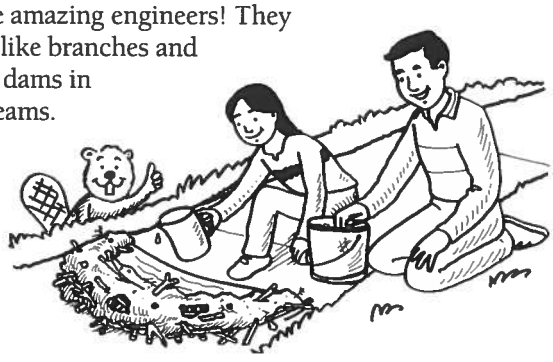
To start, he can place a case on a table with one end barely hanging off the edge. Tell him to continue stacking cases so each one juts out a little farther than the one beneath it. Have him use a ruler to measure the length of his cantilever with each case added. What's the longest one he can build before the cases tumble down? (Once the cantilever becomes too heavy at the unsupported end, it will fall.)

Suggest that your youngster repeat the experiment with lighter or heavier materials, such as playing cards or books. What changes?

The farther you get from the base, the less weight a cantilever can hold. A diving board has to be strong enough to support its own weight and the weight of a diver, which limits how far out over the water it can go.

CONSTRUCT A DAM

Beavers are amazing engineers! They use materials like branches and mud to make dams in rivers and streams. And people build dams to control the flow of water and to generate electricity. Here's how your child can construct her own mini-dam.



First, have her collect twigs from the ground and crisscross them in a pile on a gently sloping sidewalk or grassy hill. Next, she should pour water (from a watering can or bucket) toward her dam—the water will flow easily through the twigs.

continued

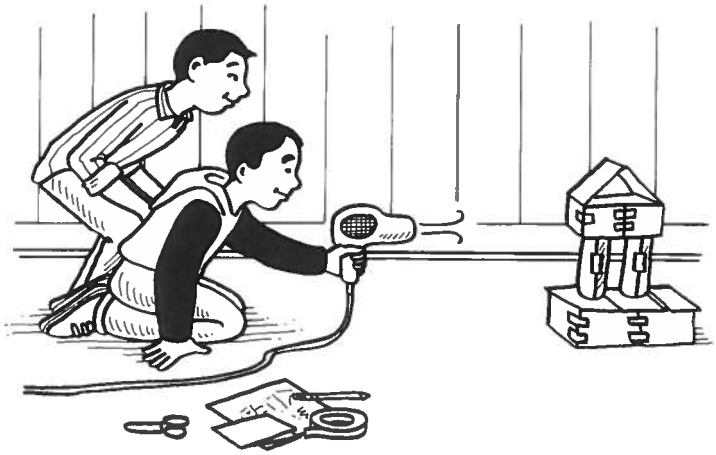
Ask what she could do to keep the water from going into the dam. For instance, she might fill in the gaps between the twigs with mud, leaves, and rocks. When she pours water again, it should pool in front of her dam. If too much water gets inside, she'll need to revise her design and try again.

Idea: Encourage her to look outdoors for beaver dams and other examples of animal engineering like bird nests and spiderwebs.

WINDPROOF A BUILDING

Can your youngster use only index cards and tape to create a building that will withstand strong "winds"?

First, have him make a house of cards that has a roof and walls. (It should be at least 1-ft. tall.) He could tape together several cards in a stack for the roof and then support the stack with columns made by rolling pieces of paper into tubes.



To test his building's strength, he can stand a few feet away and blow on it with a hair dryer set on low (to mimic wind). Does his building topple over, or does it just scoot along the floor? If the "wind" blows it down, suggest that he redesign and retest it. He'll figure out that a wide base and strong vertical supports affect how well a building can withstand wind.

INSULATE AN ICE CUBE

Engineers design insulation to protect against cold or heat. With your child, look around your home for insulators, such as a soft lunch box, a winter coat, or wall insulation in a basement or an attic. Then, challenge her to design insulation that will keep an ice cube frozen longer.

First, have her gather materials to try, such as tinfoil, plastic wrap, a cotton T-shirt, play dough, a mitten, and a towel. Then, she should test each substance by wrapping it around an ice cube. Help her time how long it takes for the cube to melt and record her findings. What does she think causes one material to work better than another?

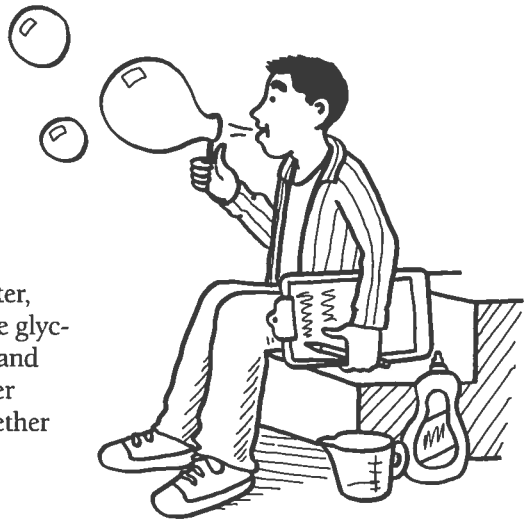
Idea: Have your youngster use the information to build the best possible insulator. She might combine materials or use double or triple layers.

BLOW BETTER BUBBLES

Your child can experiment with chemical engineering by making a longer-lasting bubble.

Ask him to start by trying to create a bubble with just water. He should put 4 cups of water into a pitcher and dip a plastic bubble wand into it. What happens? (The wand won't hold the water.) Next, he can make a bubble solution by adding $\frac{1}{4}$ cup liquid dish soap, $\frac{1}{4}$ cup glycerin or corn syrup, and $\frac{1}{4}$ tsp. sugar to the water. Let him blow a few bubbles, and help him time how long each one lasts before popping. Suggest that he experiment with different quantities of the ingredients and try again. He could record each recipe and the results on a chart to see which formula is the most successful.

You can explain that a bubble is air suspended in liquid. Water by itself won't hold air because it doesn't stretch. But dish soap adds elasticity to the water, and ingredients like glycerin or corn syrup and sugar help the water molecules stay together as a bubble floats.



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