SciGirls

pbskidsgo.org/scigirls

PBS KIDS GO!

SciGirls Engineer It
Activity Guide

Izzie

Watch companion videos on Season 1 DVD or online.

tpt NATIONAL PRODUCTIONS

NSF

ExxonMobil

Engineering Success for Girls

The activities in this booklet offer a hands-on, minds-on introduction to the design-build process. They are based on the national PBS Kids television series, **SciGirls**, featuring groups of middle school girls designing, prototyping, and building their own engineering projects.

You'll notice these activities:

- follow the Engineering Design Process (found on page 2)
- incorporate the **SciGirls Seven** strategies for engaging girls in STEM (outlined on page 3),
- connect to **SciGirls** videos and mentors from the show, and
- align to national standards.

All activities can be used alone, but we encourage you to enhance your girls' experience by using video to excite, inspire, and fuel discussion. Then, take your activities to the next level by logging on to the **SciGirls** website at pbskidsgo.org/scigirls. Your girls can create their own profiles and upload their projects to share with SciGirls everywhere!

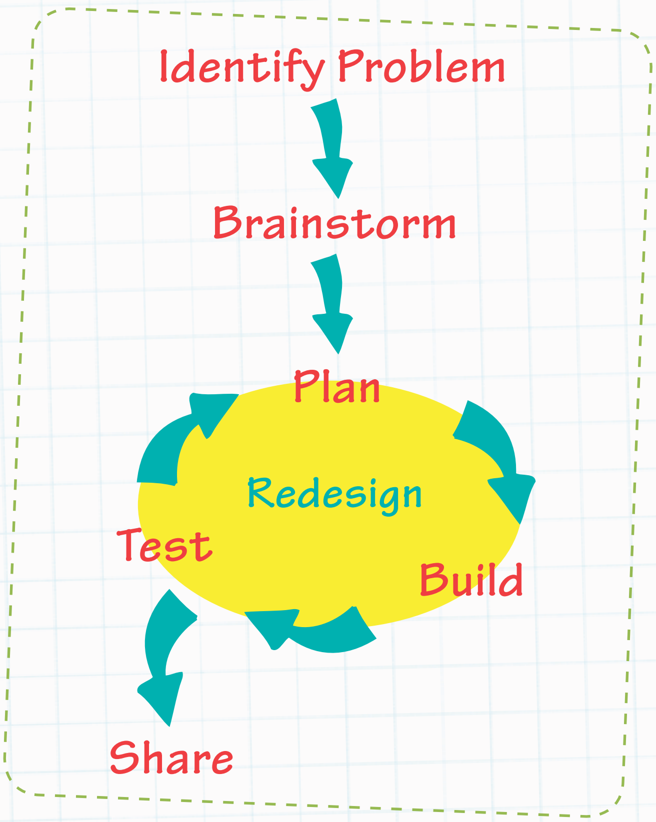
Engaging girls in engineering is really about changing perceptions—theirs and ours! As a leader, you don't need to be an engineering expert, just a capable facilitator who offers a supportive environment. Keep in mind that with many open-ended activities, we recommend a little prep time. Practicing the activities helps you to understand the struggles your girls may face and gain confidence as a guide. In the end, you're bound to be delighted as your girls "engineer" the way!

Table of Contents

Think, Plan, Build!

Engineering Design Process

Here is the **SciGirls**' engineering design process, the same steps that every engineer goes through when tackling a new problem. Encourage your girls to follow these steps as they approach each **SciGirls Challenge** in this activity booklet.



Identify Problem In our activities, the **SciGirls Challenge** lays out the goal, but girls should also discuss constraints they may have (e.g., supplies, time, and tools).

Brainstorm Girls can generate ideas by looking at other comparable designs or models, consulting experts, researching in books or on the Internet, or talking with one another.

Plan Each group must reach a consensus and choose *one* idea. Then they can use their math and science know-how to make a plan of attack, sketch a design, and identify the appropriate materials.

Build Girls should always start small by making a model or prototype and building one piece of the design before tackling the whole project.

Test After each test, girls need to evaluate their results. A failed test can still be a great test! There is something to learn from every experiment.

Redesign The design process is circular. After one cycle, girls may need to modify their original idea, revise their plan, and build and test again until they are ready to share their work.

Share Girls can learn from others by sharing their observations and results with each other, their parents, or on the **SciGirls** website. Learning is not a competition; it's a collaboration.

Throughout this guide, the projector points you to videos on the companion DVD. Or you can watch online at pbs.org/teachers/scigirls.

tpt NATIONAL PRODUCTIONS
NSF
ExxonMobil

The SciGirls Seven

Strategies for Engaging Girls in STEM

The **SciGirls** approach is rooted in research on how to engage girls in STEM. A quarter of a century of studies have converged on a set of common strategies that work, and these have become **SciGirls**' foundation—aka the **SciGirls Seven.** All the activities in this booklet were created with the **SciGirls Seven** in mind and incorporate as many strategies as possible. We even mark the use of select strategies within each activity. (Look for superscript numbers and refer back to this page.) For additional information, please see our introductory booklet, *SciGirls Seven: How to Engage Girls in STEM,* which includes tips for implementing these strategies. You can download it for free at pbs.org/teachers/scigirls/.

1. **Girls benefit from collaboration, especially when they can participate and communicate fairly.**

2. **Girls are motivated by projects they find personally relevant and meaningful.**

3. **Girls enjoy hands-on, open-ended projects and investigations.**

4. **Girls are motivated when they can approach projects in their own way, applying their creativity, unique talents, and preferred learning styles.**

5. **Girls' confidence and performance improves in response to specific, positive feedback on things they can control—such as effort, strategies, and behaviors.**

6. **Girls gain confidence and trust in their own reasoning when encouraged to think critically.**

7. **Girls benefit from relationships with role models and mentors.**

Bouncing Balloons

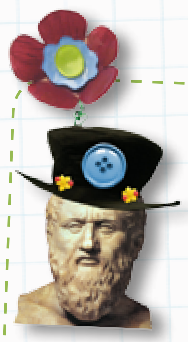
MAKE A SUPER BOUNCY BALL OUT OF A BALLOON.

Sports + Engineering = Great Fun!
Sports engineering focuses on designing, developing, and testing sports equipment, such as balls. When a ball collides with something hard, its shape alters. But if the material used to make the ball is elastic, the ball will return to its original shape, causing it to bounce. Some balls, like basketballs, are very bouncy and some, like baseballs, hardly bounce at all.

You'll Need (per small group):

- 1 uninflated balloon
- 1 rubber band or binder clip
- items to add weight, such as paper clips, coins, or dry rice
- 1 ft. of tape
- a ruler or measuring tape
- paper and pencil
- optional: scale, sports balls, funnel

30-45 min.



SMART START: Here's one way to start this activity and get girls thinking. Put different kinds of sports balls around the room and give the girls a chance to explore their properties. The girls can make a list of each ball's size, weight, shape, etc. What makes one bounce better than another? [3] [6]

Here's how:

1. **Brainstorm and plan.** Ask your girls to get into small groups [1] and deliver the **SciGirls Challenge:** Engineer a super bouncy ball out of a balloon and the materials provided. Give the groups 10 minutes to brainstorm and agree on a design before beginning construction. [3] How can they change the size of their balloon? The weight?

POINTER: Each group gets only one balloon. Tying off balloons with rubber bands or binder clips instead of knots makes redesigning easier!

2. **Try out these tests.** Encourage girls to invent their own, as well. [4]
   - **Bounce height** Drop the balloon on the floor from a set height and use a ruler to measure how high it bounces.
   - **Elasticity** Count the number of times the balloon bounces after being dropped.
   - **Weight** Use a scale to find out how heavy the balloon is.

3. **Share results.** Create a graph or chart with all the groups' data and discuss the results. Which design produced the highest bounce, or the greatest number of bounces? Why? How do these designs differ? [6]

tpt NATIONAL PRODUCTIONS NSF ExxonMobil

[1-7] See **SciGirls Seven** strategies on page 3.

Parachute Parade

DESIGN A PARACHUTE TO GIVE A TOY FIGURE A SAFE LANDING.

Skydivers rely on parachutes to slow them down as they fall from frightening heights. Parachutes catch air and create drag, a force that works against gravity. Parachutes are usually large and made of lightweight materials, so they create the most drag possible without adding a lot of weight.

You'll Need (per small group):

- several items from this list: plastic wrap, tissues, paper towels, plastic bags, tissue paper, coffee filters, handkerchiefs
- 1 toy minifigure (LEGO, for example)
- string or thread
- scissors
- tape
- paper and pencil
- optional: stopwatch

30-45 min.

Here's how:

1. **Introduce parachutes.** Ask your girls to get into small groups [1] and then deliver the **SciGirls Challenge:** Construct a parachute that helps a toy minifigure reach the ground slowly and safely. Briefly discuss parachutes. Has anyone ever seen a parachute before? Can they describe or draw one? [2] (Think of the different shapes, sizes and uses of parachutes.)

2. **Brainstorm and build.** Challenge girls to construct a parachute using only the materials provided to help their toy minifigure reach the ground slowly and safely. Give groups 10 minutes to brainstorm and agree on a design before they construct their parachute. [3]

3. **Plan.** Reconvene all the girls. Ask them to discuss how to test their designs against each other to see which design provides the most drag. How will they set up the tests so the designs can be usefully compared? [4] (Use a stopwatch, compare two at a time, make sure the parachutes are dropped from the same height, etc.)

POINTER: This activity is great for practicing a very important STEM skill—changing only one variable at a time as you redesign. Some variables to consider: material choice, parachute size, and length of string. Encourage girls to think of other variables, but remind them to keep everything the same except the one variable they are testing. [6]

4. **Predict.** Before implementing the tests, ask the girls to make predictions about which parachute will drop to the ground the slowest. Why?

5. **Interpret.** After the tests, ask the girls to consider the results. Were they in line with their predictions? Why did one parachute fall slower than another? Allow your girls to come up with and present possible explanations. [4 6]

Twirling in the Breeze

BUILD A DEVICE TO MEASURE HOW FAST THE WIND IS BLOWING.

You may have heard a weather reporter warn, "Wind gusts are up to 30 mph!" Scientists measure wind speed using a weather instrument called an anemometer, which relies on cups attached to freely rotating arms to catch the wind and make the arms spin. The device then records the number of revolutions in a given time period and translates this into miles per hour (mph).

You'll Need (per small group):

45 min.

- 1 unsharpened pencil (with eraser)
- 6 straws
- 10 T-pins
- 4 small paper cups
- 1 stapler
- 1 hole puncher
- 2 ft. of masking or transprent tape
- 1 fan (or one for the whole room to share)
- stop watches or clock with second hand
- paper and pencils

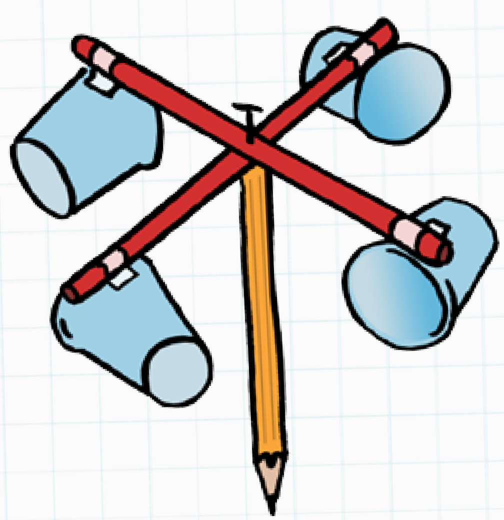
POINTER: If a group is struggling encourage them. Suggest using the pencil as the base or pushing a T-pin through the middle of a straw and into the pencil's eraser as a way to attach arms.[5] (See below.)

Here's how:

1. **Identify problem.** Ask your girls to break into small groups, [1]then deliver the **SciGirls Challenge:** Build a device that can spin in front of a fan, allowing you to count the number of times it rotates in 1 minute. Discuss why it might be important to know wind speeds.[2] (The placement of wind turbines is one example.)

   Watch girls use an anemometer on the *SciGirls Engineer It* DVD. (Select Blowin' in the Wind: Data Collection.) [7]

2. **Brainstorm and build.** Remind groups that the weather instrument they create should use only the materials provided. It must spin when placed in front of the fan. Give groups 10 minutes to brainstorm and agree on a design before building their anemometers. [3]



1-7 See **SciGirls Seven** strategies on page 3.

Twirling in the Breeze continued

3. **Redesign.** Once girls have constructed their anemometers, encourage groups to exchange ideas as they test and redesign their prototypes. [1]

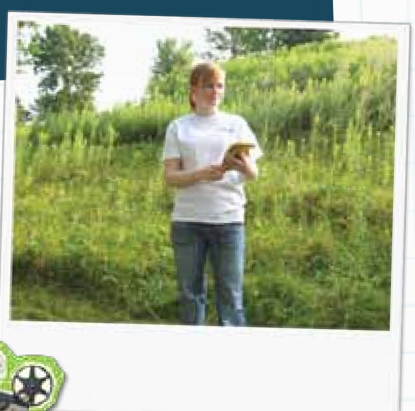
4. **Collect data.** With a successful design accomplished, have each group find the wind speed of the fan by counting the number of times the anemometer revolves in 1 minute. The girls should make sure the anemometer is always the same distance from the fan and that they can tell when there's been a complete rotation. This will give wind speed as revolutions per minute (rpm).

5. **Experiment.** Have girls measure wind speed at different fan settings, distances, or positions (for example, centered on the fan or off to the side). Encourage creativity! [4] How do the wind speeds compare?

6. **Continue exploring.** Consider taking your girls outside to find the place with the best wind speeds.

Mentor Moment

Mallory Peper is a geographic information system (GIS) specialist whose job is to figure out where to put wind farms. She goes to a location, gathers data, and analyzes it for optimum wind power conditions. Mallory became interested in wind energy after interning at the National Weather Service, but her love of STEM started when she was a kid watching sci-fi shows!



Watch Mallory discuss her career path on the *SciGirls Engineer It* DVD. (Select Blowin' in the Wind: Mentor Moment.) [7]

Special thanks to the Franklin Institute for being the inspiration behind this activity. The Franklin Institute in Philadelphia has been a pioneer in science experiences for girls and families since the late 1980s. The Franklin Institute has recently partnered with SciGirls to establish the Museum Affiliates Program, uniting museum educators nationwide in an effort to provide quality, gender sensitive programs supported by training, monthly conference calls, and an online community. If you are interested in learning more about this program, contact scigirls@tpt.org.

THE FRANKLIN INSTITUTE

Puppet Power

DESIGN A SHADOW PUPPET WITH MOVING PARTS AND USE IT TO TELL A STORY.

The tradition of using shadow puppets to tell stories dates back thousands of years, making it one of the oldest forms of motion-picture storytelling. Shadow puppet theater originated in India and China, where the tradition lives on today. Shadow puppets are often used to convey culturally important stories, such as myths, legends, folklore, and religious stories.

You'll Need:

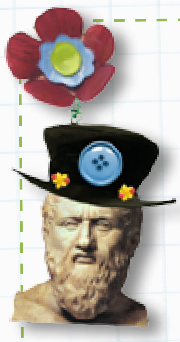
per girl

- 2-3 pieces of thin cardboard (from cereal boxes, poster board, shoe boxes, tissue boxes, chip board, etc.)
- 20 brass fasteners (½ in. or ¾ in.)
- 1 paint stirrer, ruler, or tongue depressor
- paper and pencil

per small group

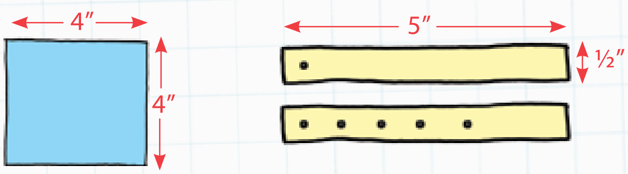
- 1 paper punch
- 1 ruler
- scissors
- 1 roll of tape (masking or clear)
- directional lights (overhead projector, gooseneck lamp, or clamp-on shop light with a 75- or 100-watt bulb). Or, if there's enough light, girls can cast shadows on the tables, walls, or floor.
- optional: decorative elements (e.g., feathers, cloth, lace, straw, doilies, colored cellophane or report covers)

2+ hours

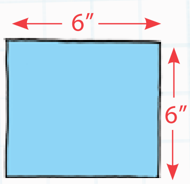


SMART START: Before doing this activity with your girls, build your own shadow puppets. This practice will help you guide your girls. For younger girls, you may want to do Parts 1 and 2 only.

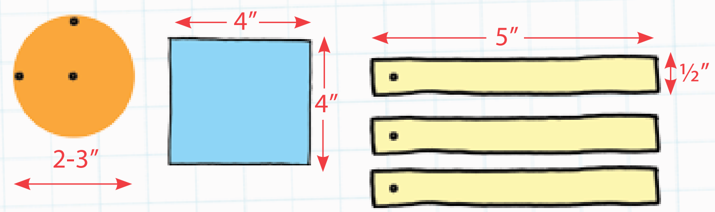
Prepare materials ahead of time. For Part 1, each **small group** will need a 4-in. square of cardboard and two cardboard strips, ½ in. x 5 in. Punch one hole in one strip and five holes in the other.



For Parts 2 and 4, **each girl** will need a cardboard square that is at least 6 in. x 6 in., but cut extras!



For Part 3, each **small group** will need another 4-in. square of cardboard and three more ½ in. x 5 in. cardboard strips with a hole punched in each strip. Groups will also need a cardboard disc with a 2-3 in. diameter and three holes punched in it.



tpt NATIONAL PRODUCTIONS NSF ExxonMobil

1-7 See **SciGirls Seven** strategies on page 3.

Puppet Power continued

Part 1
Prototype a Simple Linkage

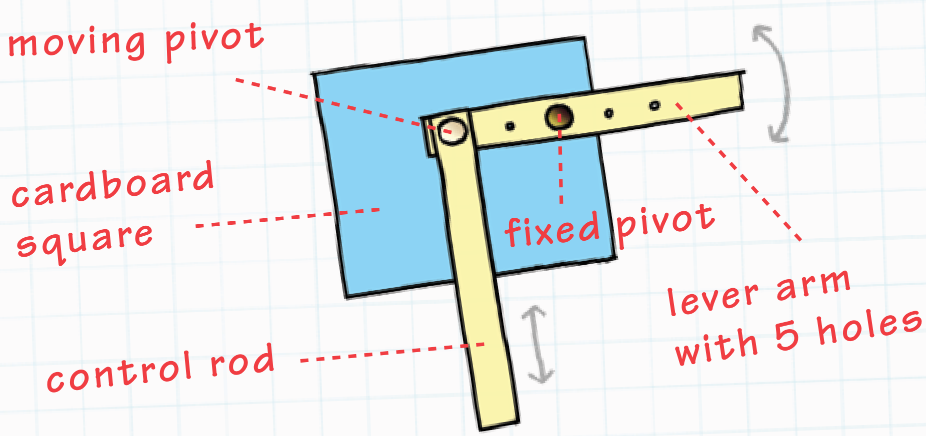
Here's how:

1. **Introduce shadows.** Using your hand, make a shadow figure on a wall, floor, or table. (For example, make a rabbit head by forming a fist and extending two fingers. You can find other ideas by searching "Hand Shadows" on the Internet.) Point out how the outside edges determine a shadow's shape. Can you think of any street signs that feature silhouetted figures? ("Children Playing," "Deer Crossing," or "Crosswalk.") Point out that only the outline matters, rather than a puppet's surface details.

2. **Introduce shadow puppets.** Ask if anyone has ever seen a shadow puppet show. Ask the girls how telling a story using puppets might be different from doing a play. (Easier to perform. Puppets can do things people can't, like fly.) How can working with shadows enhance a story? (You can make a puppet look sharp or blurry or change its size by moving it closer or farther away from the light source.)

3. **Make a prototype.** Ask your girls to break into pairs or small groups and give each group a cardboard square, two brass fasteners, and two lever arms to connect. (See below.) Have your girls:

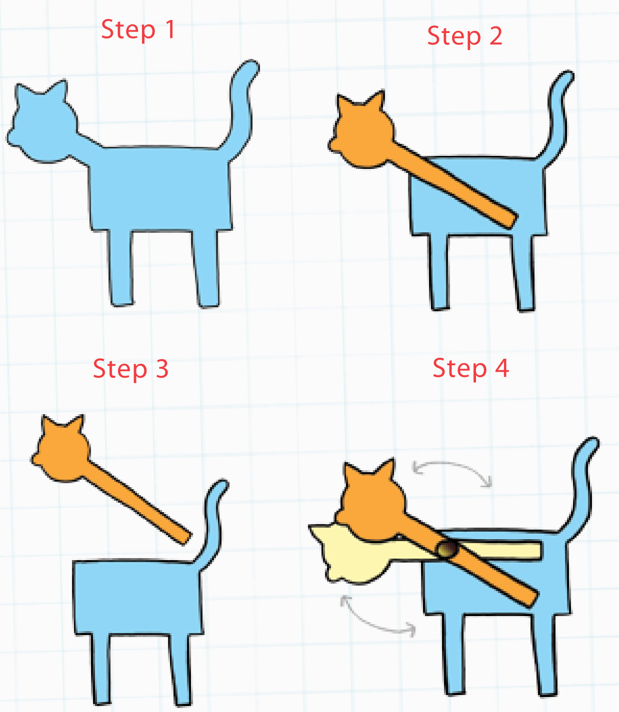
- Explore how one pivot moves while the other is fixed in place.
- Try placing the fixed pivot at different points along the lever to see how it changes how much the end moves.
- Brainstorm actions a puppet could do based on a lever's up-down motion. (nod its head, wag a tail, chop wood, kick a leg, flap wings, open and close its jaw, etc.) [3]



Puppet Power continued

4. Plan each piece. To help girls see that a puppet's body and moving parts are separate, work through a prototype together. (Or, to save time, you can have an example ready.)

- Sketch the puppet's outline on a half piece of paper. (See Step 1 below.)
- Tell girls they want the neck and head to move. This part is, in fact, a long lever. The neck and head stick out while the control end remains hidden behind the main body. To show what the entire thing actually looks like, extend the lines of the neck back into the body. (See Step 2 below.)
- Now, figure out what the body and moving part each look like as separate pieces. (See Step 3 below.)
- Use a hole punch and brass fastener to put it all together. (See Step 4 below.)



POINTER: Tell girls that this combination of levers and fixed and moving pivots is called a linkage. Linkages change the direction, motion, and/or force of the input force (i.e., the force on the control rod).

Linkages Are Everywhere!

Mechanical engineers use linkages in all sorts of machines, appliances, and gadgets (for example, locking pliers, bike brakes, bolt cutters, folding baby carriages, folding drying racks, and tire jacks). Bring in some examples to show your girls or have them think of examples from their own lives. [2]

[1-7] See **SciGirls Seven** strategies on page 3.

Puppet Power continued

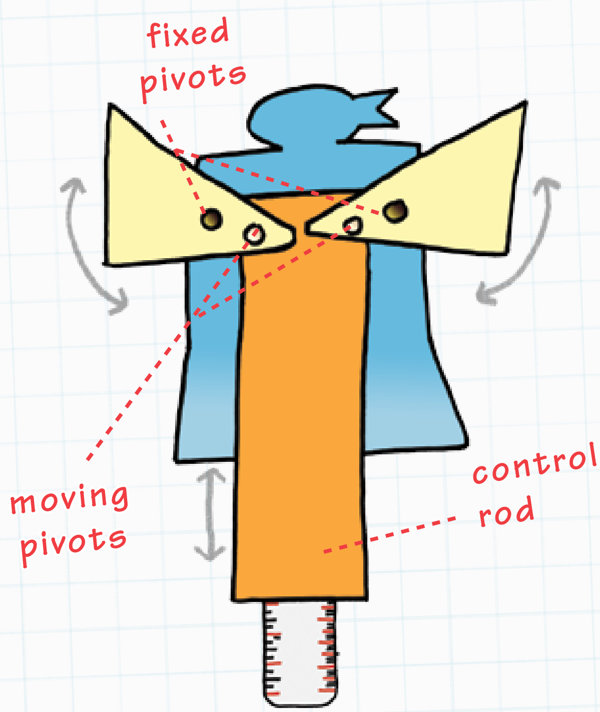
Part 2 Build Puppets with Simple Linkages

POINTER: To add special effects, girls can cut or punch out details, such as eyes, a mouth, and hair, or they can attach decorative elements. Remember, only the silhouette matters with shadow puppets.[4]

5. **Sketch and make puppets.** Give the **SciGirls Challenge:** Design a shadow puppet with one or more moving parts. Each girl chooses a character for her puppet, such as a horse, dancer, or soccer player. Then girls sketch the main body and the moving part on a piece of paper. Referring to the sketch, the girls copy the body onto a piece of cardboard and cut it out. They repeat this process for the moving part.

6. **Assemble the shadow puppets.** By setting the moving part in place on the body and rocking it back and forth, each girl can figure out where the fixed pivot(s) need to go to produce the motion they want. Have them mark the spot(s), punch hole(s), and then use brass fastener(s) to connect the body, moving part, and control rod. Have girls mount the puppet on a handle by taping it to a ruler, tongue depressor, or paint stirrer. (See right.)

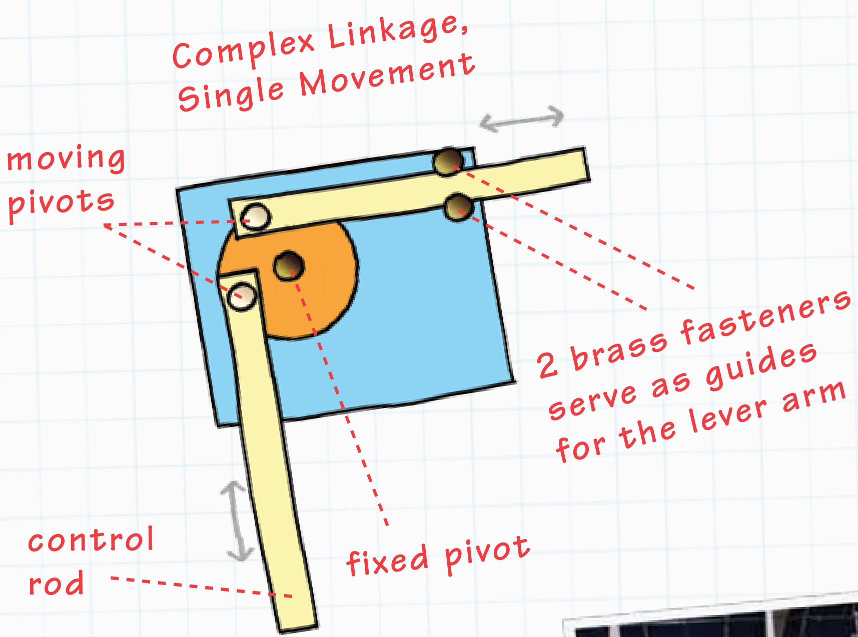
7. **Test the puppets.** If there's sufficient light, girls can cast shadows on the tables, walls, or floor. Otherwise, place lamps around the room and project them at blank spots on the walls. The girls can experiment with how to make the puppets come alive: move them so they walk, run, gesture, etc. Hold them near and far from the wall to change their size and definition.[3]



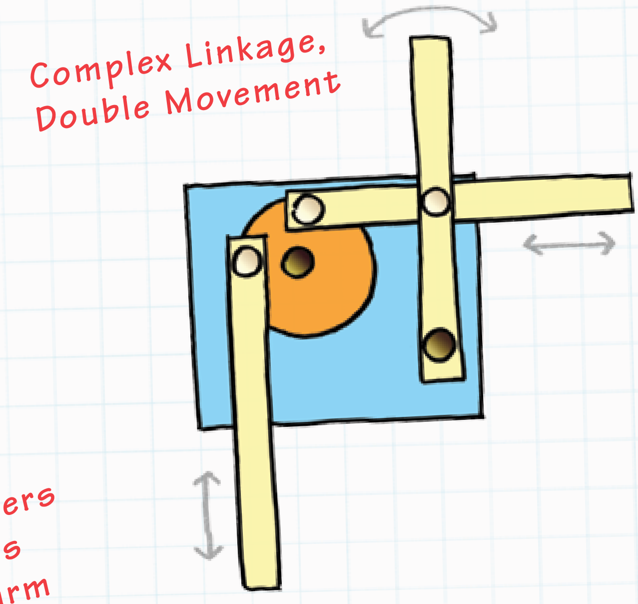
Puppet Power continued

Part 3
Prototype a Complex Linkage

8. **Add a disk.** Ask your girls to break into small groups again. Give each group a cardboard square, two lever arms, a disc, and five brass fasteners. Have girls connect them to create a linkage. (See below, left.) Ask the girls to compare this linkage to the one they made in Part 1. How does this linkage change the speed, force, or direction of the control rod's input force?



9. **Be creative.** The fun really starts when girls combine several elements. Take one of the samples made in Step 8 and connect a lever partway along one of the linkage arms. (See below, right.) What kinds of actions could this be used for? (ears wagging while sticking out a tongue) [6]



Mentor Moment

AnnMarie Thomas is a mechanical engineer who shares her love of the design process as a professor at the University of St. Thomas in Minnesota. When she's not helping kids look at the playful side of engineering (squishy circuits, anyone?), AnnMarie spends time exploring the circus arts with her two children.

Watch AnnMarie help SciGirls prototype on the *SciGirls Engineer It* DVD. (Select Puppet Power: Mentor Moment.) [7]

University of St. Thomas, Mike Ekern

[1-7] See **SciGirls Seven** strategies on page 3.

Puppet Power continued

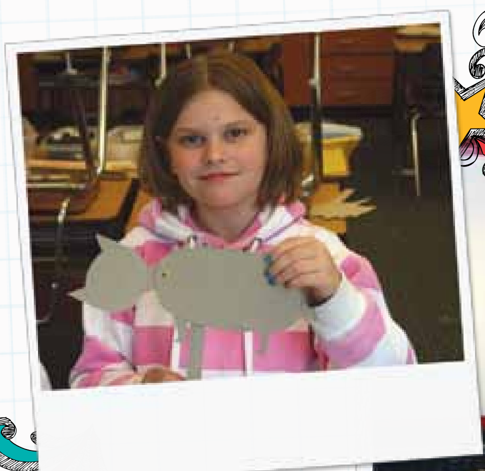
Part 4
Build Puppets with Complex Linkages

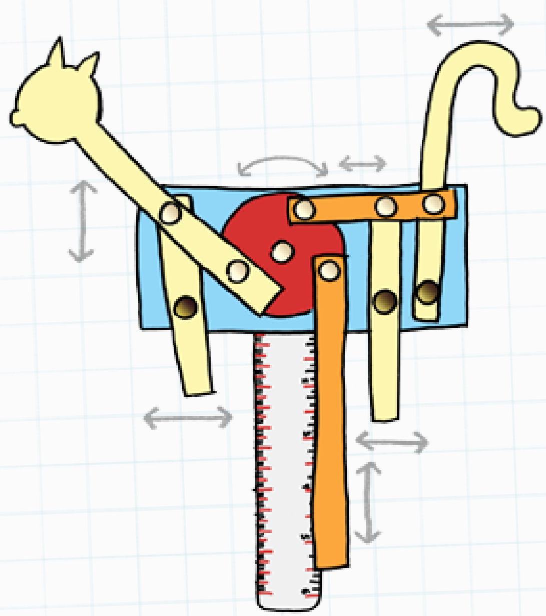
10. Sketch and make puppets. Challenge girls to make a puppet with one or more parts moved by linkages. (See below.) They can decide on a character first and then design the puppet, or they can create a linkage system and then develop a puppet around its movements. [3] [4]

11. Discuss your results. What movements could your second puppet do that your first one couldn't? Why do you think engineers use linkages? (to change the speed, direction, or force of an input force, or to use a single input force to drive multiple outputs)
Watch the *SciGirls Engineer It* DVD. (Select Puppet Power: Share.) Do the SciGirls use linkages in their pig puppet? How? [6]

12. Put on a play. Form groups that create and rehearse a brief skit or story that involves the characters. [4] Then, perform!

Share photos of your favorite shadow puppets on our website, at pbskidsgo.org/scigirls.





Blowin' in the Wind

BUILD A WINDMILL THAT LIFTS WEIGHT.

Windmills have been used for thousands of years to grind grain, pump water, and even generate electricity. They lost popularity as new sources of energy, such as fossil fuels, arose. But the idea of using wind for energy has made a comeback in recent decades, and careers in wind energy are growing rapidly as the demand for clean energy increases.

SMART START: It is *highly* recommended that you build your own windmill before running this activity to see what challenges your kids will face!

You'll Need (per small group):

2+ hours

Part 1:

- 12-in. (or larger) electric fan (or set up a couple of fan stations around the room)
- plastic or wooden spool
- 12-in. long wooden dowel (diameter needs to fit through the spool)
- 6-in. piece of PEX tubing (found at a hardware store) or empty cardboard milk carton
- 4-8 index cards (4 in. x 6 in.)
- 4 wooden skewers
- Styrofoam ball (with 2 in. diameter) or squares cut from Styrofoam blocks
- 6 T-pins
- duct tape or sticky tack
- 18 in. piece of clear tape
- scissors
- safety glasses
- paper and pencil
- optional: protractor

Part 2:

- windmill from Part 1
- 4 ft. length of string
- paper or plastic cup
- 15 steel nuts or washers, for weights

1-7 See SciGirls Seven strategies on page 3.

Blowin' in the Wind continued

Part 1
Build a Windmill That Spins

Here's how:

1. **Introduce windmills.** Start with a discussion of how we use energy in our everyday lives.[2] Where does that energy come from? (power plants, coal, gas) What are alternative forms of energy? (solar, wind, hydro) Ask your girls if anyone has ever seen a real windmill or wind turbine. Where? Can they draw an example?

POINTER: If girls have no familiarity with a wind farm, bring in pinwheels or even use the fan itself as a model.

Show video of actual wind turbines on the *SciGirls Engineer It* DVD. (Select Blowin' in the Wind: Research 2.)

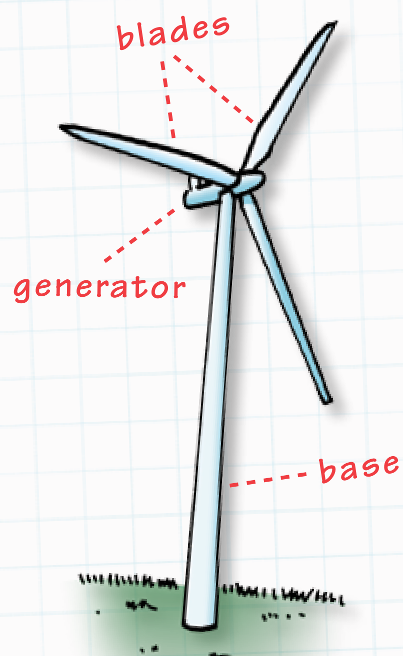
Now, start with what they know.[5] Can they name the parts or features of a windmill or wind turbine? Create a drawing and label the parts. (See right.) Talk about why the blades are shaped and arranged in a particular way.

2. **Understand supply constraints.** Ask your girls to get into small groups[1] and then present the **SciGirls Challenge:** Build a windmill that spins when placed in front of a fan. Then get the windmill to lift a cup filled with weights. Hand out the materials, stressing that they don't have to use all of them.[3] There are not enough materials to build a tower for the windmill, unless you choose to use the milk carton as your base. (See Weight-Lifting Windmill on page 17.) Guide girls to hold their windmills in front of the fan by hand. (See page 16.)

3. **Think and plan.** Ask each group to brainstorm, plan, sketch, and agree on a windmill design before building.[3,6]

Safety First

Wear safety glasses. The skewers are sharp and should not be pointed at anyone's eyes or face. Never stick your fingers into the spinning blades. Either turn off the fan or rotate your windmill 90˚ to stop the blades. Stand behind the windmill, not to the side of it, to avoid being hit if a blade flies off during testing.

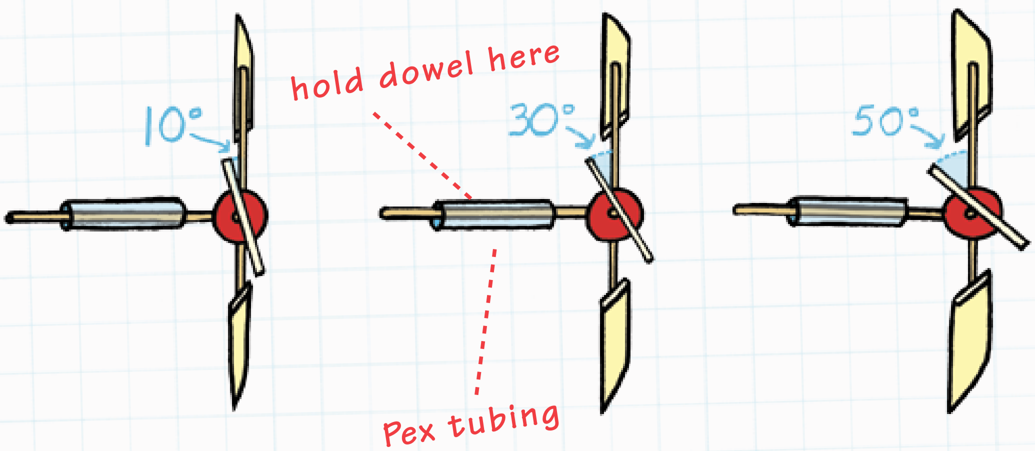


Blowin' in the Wind continued

4. Test prototypes. Remind kids they should first focus on getting the windmill to rotate when placed in front of the fan and not worry about lifting weight yet. Having the fans on a low setting encourages girls to build more efficient designs. They should test their prototypes and redesign before moving on to Part 2.

5. Optimize blade design. Focus kids on the following ideas:

- Pitch is the angle of the blades. For instance, blades that lie completely flat are at 0˚. Have girls experiment with pitch to improve their designs. (See below.)



- Shape helps maximize lift and minimize drag. Lift is a force that pushes up against the blades to make them move; whereas drag (also called wind resistance) is a force that works against the rotation of the blades and slows them down. Encourage girls to think about turbine blades or other devices that move efficiently through the air.[2] To produce lift, airplanes' propellers and wings have curved structures that create a difference in air pressure as wind passes over them. Turbine blades, specifically, have a wider base and narrower tip. The tip of the blade travels faster than the base because there is more distance to cover per turn. Thus, the narrow shape helps reduce drag.

[1-7] See **SciGirls Seven** strategies on page 3.

Blowin' in the Wind continued

Part 2
Test Your Windmill with Weight

6. Introduce the new challenge. For groups ready to do the weight-lift challenge, hand out the string, cups, and weights. Try getting the windmill to lift the cup alone before adding weight. (See below.)

7. Test and redesign. If needed, remind kids to consider the size, shape, pitch, and number of blades. Each one of these factors is a separate variable, so encourage groups to change only one at a time.

To see girls model this process, watch the *SciGirls Engineer It* DVD. (Select Blowin' in the Wind: Test.) [7]

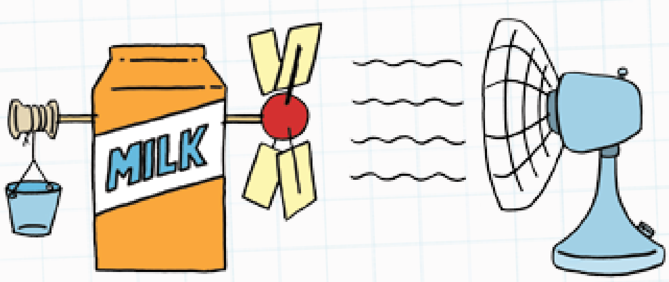
After agreeing on which variable to change, the kids should conduct a trial, then measure and record the results before testing a different variable. The fan speed and distance from the windmill should be kept constant.

8. Problem solve. If groups are struggling, encourage them to look at other groups' designs. Which techniques work well? Remind kids that this activity is not a competition and everyone can learn from and support one another. [5]

9. Share results. After each group has had a chance to get its windmill to lift weight and has tested at least one variable, reconvene as a large group and discuss the designs that lifted the most weight. Which variables improved performance? Brainstorm uses for your device. Would you want a windmill on your tree house to carry cargo up and down? [4,2] Be creative!

Share results of your weight-lifting creations on our website at pbskidsgo.org/scigirls.

Weight-Lifting Windmill



Special thanks to KidWind for their ideas and expertise. The KidWind Project is a team of teachers, engineers, and scientists committed to innovating energy education. They promote the elegance of wind power through affordable tools and training programs that challenge, engage, and inspire students of all ages. For more wind energy activities, visit kidwind.org.

Standards Correlation

The activities in this book align to national education standards including: Standards for Technological Literacy, printed here, and National Science Education Standards. To download the complete and most current alignments, please visit pbs.org/teachers/scigirls.

Standards for Technological Literacy 3rd Edition

Grades 3-5

	The Nature of Technology					Design							Abilities for a Technological Wolrd						The Designed World
	2G	2H	2I	2J	2L	8C	8D	9C	9D	9E	10C	10E	11D	11E	11F	11G	12E	12G	16C
Bouncing Balloons			x	x	x	x	x	x	x		x				x	x	x	x	
Parachute Parade			x	x	x	x	x	x	x	x	x				x	x	x	x	
Twirling in the Breeze	x		x		x	x	x	x	x	x	x	x	x		x	x	x	x	
Puppet Power	x		x		x	x	x	x	x		x			x	x	x	x	x	
Blowin' in the Wind	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Grades 6-8

	The Nature of Technology					Design								Abilities for a Technological World						The Designed World
	2N	2P	2Q	2R	2S	8E	8F	8G	9F	9G	9H	10F	10H	11I	11J	11K	11L	12I	13F	16F
Bouncing Balloons	x			x	x	x	x	x	x	x	x	x	x			x	x	x		
Parachute Parade				x	x	x	x	x	x	x	x	x	x			x	x	x		
Twirling in the Breeze	x			x	x	x	x	x	x	x	x	x	x			x	x	x	x	
Puppet Power	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Blowin' in the Wind	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x

This material is based upon work supported by the National Science Foundation under Grant No. 0813519. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Join the SciGirls Revolution at pbskidsgo.org/scigirls

PBS KIDS GO!

SciGirls®

Create a profile and make new friends!

Be a SciGirl!

Share cool science projects and learn what other girls are doing.

Watch real SciGirls go on STEM-ventures online and on PBS stations!

Puppet Power

Blowin' in the Wind

Turtle Mania

Collect all the SciGirls Educator Resources

SciGirls is produced for PBS by *tpt* National Productions and is made possible by the National Science Foundation. Additional support by ExxonMobil.

tpt NATIONAL PRODUCTIONS
NSF
ExxonMobil