

Playtime is SCIENCE™

An Equity-Based Parent/Child
Science Program

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SAMPLE

MAKING AND TOSSING BEAN BAGS

Children gain practice in spatial relations, eye-hand coordination, measurement, and estimation as they express themselves creatively.

Playtime is
SCIENCE™

TIME: ABOUT 40 MINUTES — 15 MINUTES TO CREATE THE BAGS, 15 MINUTES TO CREATE THE TARGETS, 10 MINUTES TO TRY THEM OUT

Skills Developed

Classifying
Estimating
Eye-hand coordination
Model-making
Measuring
Motor coordination
(fine and gross)
Sorting
Spatial-relations

Equity Idea

Girls need tossing activities and experiences that will develop their spatial-relations skills, which are especially important for success in science. In general, boys have more opportunities to develop these skills through games and toys.

S/M/T Framework

Children should know that it is possible (and often useful) to estimate quantities without knowing them exactly.

Materials

- Dried beans of different types and sizes that are familiar to a variety of cultures – navy beans, pink beans, kidney beans, lentils, blackeyed peas, garbanzo beans, mung beans, whole peas, split peas – 1 cup (250ml) per child, plus some extra.
- Foil lasagna or roasting pans to hold the beans.
- Various sized measuring scoops.
- An assortment of clean discarded socks, any size, but without holes.
- Sturdy rubber bands.
- Sharp scissors, to cut off the tops of the socks. (You'll want to keep these out of younger children's reach.)
- A variety of nontoxic markers and crayons.
- Large pieces of paper to make the targets – oak tag, or any fairly stiff paper about 20"x30".
- Large shapes that children can trace to make the targets: round pot covers, square or rectangular boxes.

Getting Ready

Have all your materials assembled before you begin. Put a generous supply of each type of bean in a separate pan, and the socks and rubber bands in containers. Place the bean bag materials on one table and the target materials on another. Children can work on the floor to make their targets. You may want to prepare a sample target and demonstrate how to use it in the tossing game.

Note: If you do not wish to use food, you can make the "bean bags" with synthetic packaging materials or assorted buttons, available from recycling materials catalogs.

Activity

Making Bean Bags

1. Gather children around the bean bag table. Explore the sizes, shapes, and sounds of the beans. Ask if children have seen any of the beans before. This is a good opportunity to make cultural connections. Some children will be able to name the beans in English and/or other languages.

2. Explain to children that they're each going to make their own bean bag. Ask them

to watch, while you demonstrate the procedure:

- Select a sock.
- Fill the foot section with beans, using one of the scoops. You might say, “I’m going to use this scoop to measure out my beans. You decide what you’d like to use. You can use your hands if you want.”
- Secure the beans in the sock, with a rubber band. Children will need help and supervision using scissors sharp enough to cut off the top of the sock. An alternative is to tie the end instead of using a rubber band.

Making a Tossing Game

1. As children finish their bean bags, ask them to move over to the target making area. Explain that they’ll be trying to toss their bag so it lands inside the shapes they’ve drawn on the large sheets of paper. If you have made a sample target, show it to the children and toss a bean bag onto it.

To make a target:

- Take a large piece of oaktag or paper.
- Select shape(s) to trace around, or draw a design freehand.

Encourage children to be creative using lots of colors, names, numbers,

words, pictures, all sorts of things on their targets.

2. As children work, pose a few open-ended questions to extend their thinking:

- What do you think will happen if you make the targets very big? What if you make them very small?
- Do you think the size of the bean bag makes a difference? Why?
- Do you think the weight of the bean bag makes a difference? Why?

3. Be sure to label bean bags and targets so children can take their games home to share with family members.

Expanding the Activity

Estimating with Beans

- 1.** Gather a variety of different sized measuring objects (cups, scoops, spoons), three varieties of beans (small, medium, and large), small pieces of paper, and pencils.
- 2.** Ask children to choose one type of measure from the selection and estimate (guess) how many scoops (cups, spoonful) it will take to fill the foot of their socks. Older children can jot down their estimates on a piece of paper. Facilitators can write for younger children.
- 3.** Help children actually count scoops as they fill the foot of their sock. Was it more than they estimated? Was it less?

4. Ask children to pick a different sized bean and repeat the activity. Compare the results. Involve children in devising ways they can record their estimations, such as making graphs or drawing picture illustrations of the process.

Sorting Beans

1. Gather several different kinds of beans—whole dried peas, split green peas, split yellow peas, lentils, kidney beans, pink beans, black-eyed peas—and small paper plates or empty egg cartons for sorting. For younger children, three varieties are a good beginning. Older children can have a greater sorting challenge with more types of beans and more subtle variations.

2. Mix all the beans together in one pan and let children decide on their own criteria for sorting. They may think about sorting by shape, size, color, or type. If you see a child sorting in a way that seems puzzling, you might ask:

- What are your ideas for sorting the beans?
- How do you think the beans are alike? How do you think they are different?

Help each child devise his or her own logical sorting method.

Note: *If you have not used beans, you can sort buttons or packaging materials instead.*

Home/Community Connections

Take a trip together to a store where children can see a variety of beans. Take time to look at and talk about the various colors, sizes, and shapes. Ask children to bring in a sample of beans that are eaten in their homes. Invite parents and other family members in to cook and/or share a bean dish that is used in their culture.



Make a list together of all the places at school, at home, in the community where items need to be sorted (doing laundry and putting away clothes, sorting recyclables, putting shoes back at the shoe store, stocking the grocery shelves). Keep your list going and encourage children to add to the list over the next few weeks as they become aware of additional examples. Encourage children to ask family members for ideas, and to look around and notice the ways items they use daily, at home and at school, are sorted. Ask children to share sorting games that they play with friends or family members.

Find out about the tossing games that people from various cultures play. Ask children to find out which games their parents and other family members played as children, e.g., boules, bocci, baseball, frisbee, horseshoes.

Equity Strategies

Research shows that children gain skills through practice and that boys get much more practice in tossing than girls beginning in infancy. Therefore, it is especially important for girls to engage in tossing activities, which build spatial-relations skills that are essential for success in science.

Also, keep the bean bag activities geared to fun scientific investigations rather than who can throw the farthest, keeping scores, and discussions of who's best. Stress cooperative play rather than competition.

Encourage children to work in pairs or small groups, and help each other by adjusting target locations to match skills. Without setting up competition or comparisons between individuals, help children see that they are getting better at hitting their targets as they keep practicing.

Using beans that reflect children's diversity and refer-

ring to the names of beans in different languages will affirm that home cultures are valued and contribute to learning.

Resources

Me and My Bean Bag

(Kimbo Educational, P.O. Box 477,
Long Branch, NJ 07740, © 1988).

A record full of musical tossing games
to play with a bean bag.

Here Comes the Recycling Truck by Meyer Seltzer
(Albert Whitman & Company, 1992).

This book demonstrates the role that sorting
and classifying plays in recycling.

What's the Science?

As children select the beans to fill their socks they will estimate the amount of beans needed, they will compare their partially filled socks to the sock created by the facilitator, and they will use scoops and handfuls as a form of measuring (how many beans are needed to fill their sock). Estimating, comparing, and measuring are all mathematics skills needed to carry on scientific exploration. **Mathematics** is the language of science.

When the children toss the bean bags they will notice, perhaps with the facilitator's help, that the bigger bean bags require more strength to throw and that the lighter bean bags are easier to toss. In physics the equation for this relationship is $F=ma$. "F" is the force or effort

required to throw the bean bag, "m" is the mass, and "a" is the acceleration of the bean bag. If "a" is constant, then when the mass increases the force is greater—or more simply, heavier bags are harder to throw. There is also a relation between the target and the bag. More force must be used when the target is moved away. This is because the change in distance affects the acceleration part of the equation.

In tossing the bags onto the targets, children gain experience in spatial relations, learning to judge the distance between themselves and the target. Children are also asked to classify and sort the beans, deciding on logical criteria for sorting—e.g., size shape, and color. Using these criteria children organize the beans into groups.

Acceleration: Causing an object to move faster.

Classify: Arrange or distribute objects, events, or information in classes according to a method or system.

Compare: Discover resemblances or differences.

Criteria: A standard on which a decision may be based.

Equation: A formal statement of the equality or equivalence of mathematical or logical expressions.

Estimate: To guess about the size, extent, or nature of specific objects.

Force: A change in motion or acceleration in the direction of its application, such as a push or a pull.

Mass: A quantity or aggregate of matter, usually of considerable size.

Mathematics: The science of numbers and their operations.

Measuring: Making quantitative observations by comparing to a conventional (an 8 ounce measuring cup) or unconventional (5 handful) standard.

Physics: The science that deals with matter and energy and their interactions.

Sort: To put a group of objects together on the basis of any characteristic they have in common, e.g., color, shape, size.

Spatial relations: Understanding the space one's body takes up in relationship to the surrounding space. This is important for estimating how much space is needed for a given task, e.g., tossing a bean bag onto a target or a ball into a basket.

Sequential Learning

Pre-K

Encourage cooperative skill-building by asking children to create a large group target. Let children decide how large the target should be, what shapes or designs should be on it, and how far apart they should be. You can use a long sheet of wrapping paper to create the target. To play the tossing game, divide the group in half so children can work as partners, taking turns—half tossing and the other half retrieving, and then switching roles.

Take the bean bags and targets outside to the sidewalk, yard, or playground. As an alternative to their paper targets, children can practice tossing into a box or wastebasket. If the game is played on a sidewalk, children can count pavement blocks to measure the distance they have tossed.

Grades K–1

Help children make their own measuring tool. Use a marker and a long, narrow piece of paper to show 1 foot lengths (30 cm) that run from where they are tossing their bean bags to various targets. Children can practice counting the lengths and changing the targets to find distances that will be successful for them.

Suggest that children design an experiment to see

whether the different size and shape of beans influence their tossing results. To spark thinking, ask open-ended questions such as:

- How can we make the bean bags different from each other?
- Where should we stand for tossing?
- How can we record our results?

Grades 2–3

Help children make measuring “tapes” as mentioned above but more sophisticated, marking off small distances every 6 inches (15 cm) or even every inch (2.5 cm), and measure off distances to toss from.

Create graphs to document results.

Ask children for suggestions on how to make the tossing game more complex. Perhaps they'd like to make bean bags out of other materials and/or see if varying the incline of the targets makes a difference. Using their suggestions, encourage them to plan, try, observe, record, and discuss their experiment, and then revise it using the information they've learned.

Have children compare beans by weight, number, and size. If possible, use estimation and then a balance scale to compare weights. Graph the results of the comparisons.

Integrated Curriculum

Math

- Choose other items to estimate, count, measure, sort (e.g., buttons, screws, sewing decorations).
- Use a balance scale to compare weights of different objects.
- Estimate and then count the number of beans in a scoop.

Language Arts

- Talk about and make a list of the words for beans from many languages, beginning with those languages represented in your group.
- Make a word web of tossing words (e.g., tossing, throwing, lobbing, hurling).

Social Studies

- Discuss the types of beans used in various cultures. Ask children to bring in a bean recipe that is used in their family. Prepare one of the recipes for a snack.
- In the library, try to find a book about sorting games around the world. Play some of the games.
- Do research projects about sports from different cultures that involve tossing.

Art

- Create a variety of targets, three-dimensional, cut-out shapes, decorated cartons.

Related Activity

Children will also practice estimation and spatial-relations skills when they do the activity Ramps, Force, and Motion.

Career Connections

Ball Player
Mathematician
Warehouse Worker / Manager

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FOR STUDENTS WITH DISABILITIES

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MAKING AND TOSSING BEAN BAGS (MODIFICATIONS)

Part 1: Making Bean Bags

FOR STUDENTS WHO ARE BLIND/VISUALLY IMPAIRED

Materials

- Dried beans — Use different sizes, shapes, textures, and color.
- Clean discarded socks — Provide a variety of materials and textures.
- Funnels — Select various sizes or make your own to accommodate different sized beans (see general note below).
- Trays — Cafeteria trays may help students define their own space, keep materials within easy reach, and contain the beans, especially those that roll.

Getting Ready

Have all your materials assembled before you begin. Select the three types of beans with the most distinctive color/shape/size/texture.

Be sure to have a sample bean bag and tactile target available for students to explore.

Activity

- ◆ Explore the sizes, shapes, textures, colors, and sounds of the beans. During the exploration, maximize students' use of their senses. Remember when discussing the color of the beans, students with visual impairments may or may not be able to identify even the most distinctive colors. Since there is no independent way for students who are blind to perceive color, you or another student should name the color(s).
- ◆ Ask if students recognize any of the beans. How do they identify the beans — by size, shape, texture, color, or familiarity from home? If you choose a round type of bean, such as green peas or chick peas, have students pour them out onto a tray in a single layer and run their

open hand over the beans. Ask, “Do other beans feel the same?” “Why?” “Why not?”

- ◆ Encourage students to guess or estimate how many of each different kind of bean fits in a fist or scoop. Allow students who are blind to touch (but not count) a handful of beans placed in your palm or in a scoop to get a sense of the amount.
- ◆ Have students fill the foot section of a sock with beans — funnels work well to help students fill the sock. Place the funnel into the sock and place or pour in the beans. If students have been estimating the numbers of beans in their fists or in the scoops, let them estimate how many hands- or scoops-full of beans will fill the foot of the sock. Charting these estimates should be done in accessible formats, large print, Braille, or other tactile representations.

FOR STUDENTS WHO ARE DEAF/HARD OF HEARING

Materials

- Dried beans — Use different sizes, shapes, textures, and color.
- Funnels — Select various sizes or make your own to accommodate different sized beans (see general note below).

Getting Ready

Have all your materials assembled before you begin. Select the three types of beans with the most distinctive color/shape/size/texture.

Review the pertinent vocabulary and ASL signs to describe the beans such as “round,” “oval,” “smooth,” “rough,” “speckled.”

Activity

- ◆ Ask if students have seen any of the beans before. Ask how they recognize the beans — by size, shape, texture, color, or familiarity from home?
- ◆ Encourage students to guess or estimate how many of each different kind of bean fits in a fist or scoop.
- ◆ Have students fill the foot section of a sock with beans — funnels work well to help students fill the sock. Place the funnel into the sock and place or pour in the beans.

General Notes: Use child-size socks when possible to eliminate creating “giant” over-stuffed bean bags.

For some students, securing the beans in the sock by tying a knot behind the beans will enable them to grasp the “tail” and toss or release the bean bag independently. Be aware, however, that for others, the “tail” may suggest something to swing around and perhaps be used to hit others. If you choose to make a funnel (they work well to help students fill the sock), take a sturdy paper or plastic drinking cup, remove the bottom, and insert the cup into a sock. Or, using a plastic soft drink bottle, cut away the bottom half, put masking tape around the edges for safety, and place the spout end of the bottle into the sock.

FOR STUDENTS WHO ARE PHYSICALLY DISABLED

Materials

- Scoops — Use scoops with longer handles for a full-hand grip, or build up handles with foam rubber or sponge wrapped with masking tape for easier gripping.
- Containers — Choose sturdy plastic or foil containers to hold the beans. The size will depend on whether the students will work individually or in small groups.
- Funnels — Use various sizes or make your own to accommodate different sized beans (see general note below.)

Getting Ready

Depending upon the needs of your students, determine whether they will be working in small groups or individually. Each type of bean should be in a separate container. If students work individually, you will need three containers for each student, one for each type of bean. Use approximately 1/2 to 1 cup of each type of bean per child so there will be a sufficient amount for exploration. Choose containers that will be deep enough for students to run their hands through the beans. Secure the container(s) to the table or lap tray with Velcro or masking tape.

Be sure that all descriptive words and concepts related to making bean bags are included on any communication device being used.

Activity

- ◆ Explore the sizes, shapes, textures, colors, and sounds of the beans. During the exploration, maximize students' use of their senses.
- ◆ Have students fill the foot section of a sock with beans — funnels work well to help students fill the sock. Insert the funnel into the sock and place or pour in the beans.

FOR STUDENTS WHO ARE LEARNING DISABLED/SPEECH & LANGUAGE IMPAIRED/EMOTIONALLY DISABLED

Materials

- Funnels — Use a variety of sizes or make your own to accommodate different size beans (see general note below).

Getting Ready

Determine whether students will be working together in small groups or individually. Each type of bean should be in a separate container. If students work individually, you will need three containers for each student, one for each type of bean. Use approximately 1/2 to 1 cup of each type

of bean per child so there will be a sufficient amount for exploration. Choose containers that will be deep enough for students to run their hands through the beans.

Activity

- ◆ Explore the sizes, shapes, textures, colors, and sounds of the beans. During the exploration, maximize students' use of their senses.
- ◆ For some students with emotional or learning disabilities, too many variables at one time may be over-stimulating, therefore, introducing the beans one type at a time may make it easier for students to focus. Break down the task by examining all aspects of one type of

bean. Then introduce another variety and make comparisons between the two — both round, one oval, one round, bigger, smaller, etc. When you think students are ready, add a third variety and continue to make comparisons.

- ◆ Have students fill the foot section of a sock with beans — funnels work well to help students fill the sock. Insert the funnel inside the sock and place or pour in the beans.
- ◆ Set up sorting or estimation opportunities as separate activities.

General Notes: Use child-size socks when possible to eliminate creating “giant” over-stuffed bean bags.

For some students, securing the beans in the sock by tying a knot behind the beans will enable them to grasp the “tail” and toss or release the bean bag independently. Be aware, however, that for others, the “tail” may suggest something to swing around and perhaps be used to hit others. If you choose to make a funnel (they work well to help students fill the sock), take a sturdy paper or plastic drinking cup, remove the bottom, and insert the cup into a sock. Or, using a plastic soft drink bottle, cut away the bottom half, put masking tape around the edges for safety, and place the spout end of the bottle into the sock.



MAKING AND TOSSING BEAN BAGS (MODIFICATIONS)

Part 2: Making a Tossing Game

FOR STUDENTS WHO ARE BLIND/VISUALLY IMPAIRED

Materials

- Tactile target-making material — Textured paper, pipe cleaners, straws, string, or yarn.
- Foil pans, cookie sheets, or oven liners for targets — They make a great sound when the bean bag lands on them.
- Cardboard boxes for targets.

Getting Ready

Have all your materials assembled before you begin. Be sure to have a sample tactile target for students to explore.

Activity

- ◆ To make a target, have students attach tactile shapes onto a large piece of oaktag or paper. Foil cookie sheets or oven liners can replace paper and can be decorated with tactile shapes — the foil will make a sound when the bean bag lands.
- ◆ Explain the object of the game is to toss the bean bag and have it land on the shapes attached to the target.
- ◆ A cardboard box also can be used as a target by cutting out shapes traced or drawn on the top. Place a foil pan inside the box so students can hear the bean bag land. Students can identify the entry point because the bean bag will be directly beneath the cut-out it entered.

- ◆ Label each student's bean bag and target with some tactile method of identification — a Braille tag, a specific geometric shape, or by the texture of the sock — terry cloth, nylon, wool, or cotton.
- ◆ Initially, students may need to be very close to the target in order for the bean bag to land on it. As their aim improves, students can move farther and farther away from the target.

FOR STUDENTS WHO ARE DEAF/HARD OF HEARING

Materials

- Target-making materials — Large sheets of oaktag or paper, cardboard boxes.

Getting Ready

Have all your materials assembled before you begin. Review the pertinent vocabulary and ASL signs to describe the tossing game such as “target,” “toss,” “distance,” “near,” “far.”

Activity

- ◆ Explain the object of the game is to throw the bean bag and have it land on the target. Review some possibilities for target design — shapes, numbers, pictures, concentric circles.
- ◆ To make a target, have students draw, cut out, or attach their design on a large piece of oaktag or paper. A cardboard box also can be used as a target by cutting out shapes traced or drawn on the top or side.

FOR STUDENTS WHO ARE PHYSICALLY DISABLED

Materials

- Foil pans, cookie sheets, or oven liners for targets — They make a great sound when the bean bag lands on them.
- Cardboard boxes for targets.

Getting Ready

Be sure that all descriptive words and concepts related to the target-making activity are included on any communication device being used.

Activity

◆ Explain that students will toss their bean bag so it lands inside or on the shape drawn on the large sheets of paper. Foil pans can replace paper and can be decorated with stick-on shapes — the foil will make a sound when the bean bag lands.

◆ A cardboard box also can be used as a target by cutting out shapes traced or drawn on the top. Make some shapes larger than others and designate a different number of points for each shape. Place the foil cookie sheet inside the box so students will hear the bean bag land.

◆ As children play the tossing game, you may want to modify the open-ended questions to allow nonverbal students to respond “yes” or “no”:

- Do you think it will make a difference if the targets are very big? Very small?
- Does the bigger bean bag go farther?

FOR STUDENTS WHO ARE LEARNING DISABLED/SPEECH & LANGUAGE IMPAIRED/EMOTIONALLY DISABLED

Materials

- Target-making materials — Foil cookie sheets make a great sound when the bean bag lands; cardboard boxes with cut-outs on the top or side also make good targets.

Getting Ready

Have all your materials assembled before you begin.

Activity

◆ Find out what students know about targets. Explain that the object of the game is to toss the bean bag onto a target.

◆ Give out target-making materials and discuss some options for target design — tracing shapes, writing large numbers, drawing pictures, or concentric circles.

◆ Foil cookie sheets can replace paper and can be decorated with stick-on shapes. The foil will make a sound when the bean bag lands. Be aware, however, that for some students the addition of sound may be over-stimulating.