

Tops

Materials Needed

A variety of tops (home-made and commercially-made)

Materials for making top spindles (dowels of different lengths and diameters, wooden axles using in making toy vehicles, toothpicks, short pencils, etc.)

Materials for making top bodies (cardboard, circles cut from cottage cheese or yogurt containers, empty thread spools, lids from jars, styrofoamTM, etc.)

Materials for decorating tops (crayons, markers, paints, collage materials, etc.)

[Note: We do not recommend having all of these materials out at once. See below for suggestions on how to introduce and extend top-making activities.]

Purpose of the Study of Tops

While tops come in a variety of shapes, sizes, and styles, they all perform in a similar manner – that is, they spin. The study of tops comes under the general category of physical-knowledge activities. More specifically, it provides lessons in elementary physics. Children have opportunities to experiment with different variables (size of spindle; type of tip on the spindle; size, shape, and weight of top body; placement of top body on the spindle [centered or off-center, higher or lower]; method of propulsion; and surface on which the top is spun) and notice the effects on how the tops spin (speed, duration, stability, etc.). As children try a variety of spindles, top bodies, and methods to make the tops spin, they make hypotheses about what they expect to happen, observe the results, and come up with new ideas. Experimenting with tops thus provides children an informal introduction to rotational motion, inertia, and friction. It also provides children with intriguing experiences to think about, talk about, and write about.

Beginning the Study of Tops

If the children are unfamiliar with tops, you may want to bring a variety of tops to group time. You could show the children the tops and ask if anyone know what they are and what they might do with them. If the children do not know anything about tops, you can demonstrate how they spin. After children have the opportunity to share their ideas about tops, you can conclude by telling the children that the tops will be available during activity time so they can continue their exploration.

Tops can also be introduced during activity time by simply placing some tops on the floor and inviting children to explore them. When the children are engaged in the activity, you can help to stimulate their reasoning by asking questions such as, “How long does it spin?” “Do you have any ideas about why one top spins longer than another?” “Which spindles work best?” “How could you figure that out?” When children identify tops that spin differently, you can ask “What is different about those two tops?” The goal is to get children to notice similarities and differences, and start to make hypotheses about what makes a top spin.

Making Tops

If the children are already familiar with the ways tops behave, you can introduce children to the idea of making their own tops. To help children become more systematic in their observations, set up the materials so that children experiment with only one aspect of the top at a time. You can do this by controlling variables--that is, holding all aspects of the top constant except one, which can be varied in several ways. By allowing children to experiment with only one variable at a time, children will be encouraged to make a connection between that variable and the way in which the top spins. For example, if you want children to reason about the effects of different spindles on how tops spin, provide a variety of material for spindles (different lengths, diameters, shapes, and with different tips) and top

bodies of identical size, shape, and material. You can say, "I wonder which top will spin longest?" On another occasion, you can hold the spindle constant, and vary the top body materials.

Decorating tops provides another opportunity for experimentation. Young children are often surprised by what their decorated tops look like when they are spinning. For example, if they draw a heart on their top body, they expect to see the heart when it's spinning. If they make a star-shaped top, they are surprised that it appears circular when it's spinning. With older children you might discuss the effects they want to create and then invite them to figure out how to create them. (Observation of what happens to their decorations could also lead older children into a study of zoetropes, those hand-held contraptions that allow children to experience the illusion of continuous movement from a succession of still images.)

Extending the Study of Tops

One way to extend the study of tops is to introduce a stopwatch into the top-spinning experimentation. Children can test different tops, time them, and chart the results. If your children are too young to use a stopwatch, you can use an egg timer and ask, "Does that top quit spinning before the sand runs through the timer?" Depending on the ages of the children, this activity can become a project in which children systematically test many variations of tops and determine how each of the variables affects how tops spin.

Another way to extend the activity is to introduce children to other methods of initiating the spin besides simply grasping the spindle between thumb and forefinger and turning it quickly. You can wrap the spindle with a string, hold it steady with a handle (made by drilling a $\frac{1}{4}$ to $\frac{3}{8}$ inch hole in a piece of wood approximately $\frac{1}{2}$ " x 2" x 8"), pull the string and release the top. Or you can purchase a type of top that is propelled by wrapping the top body with a string and then throwing the top in a sort of sideways motion. This type of top, while difficult to master, spins for a very long time. After introducing children to these ways to propel a top, you can encourage them to experiment and chart the results of their experimentation. You can also invite them to invent other ways to propel their tops.

Doodle Tops

Lately, stores have been carrying tops with felt-tipped markers as spindles. These tops, when spun on paper, draw their path. Often children think that tops spin in place, and are surprised to see that they path of a top actually describes a series of small loops. These tops provide an excellent way to help children become more aware of the movements of tops.

Goals

1. For children to notice the differences in the tops.
2. For children to figure out how to create tops that will spin. To do this they must figure out what shapes and size of top bodies work best, what diameter, length, and shape of spindles works best, and that the spindle must be inserted in the center of the top-body so the top will balance.
3. For the children to become aware of the actions they must take to make tops spin.
4. For children to become aware of the effects of different variables on how tops spin.
5. For children to become aware of rotational movement, friction, and inertia.

Principles of Teaching

1. Help children observe tops by calling attention to differences in how they spin.
2. Control variables so children can experiment more systematically.
3. Help children become conscious of contradictions between their expectations of tops and what happens.
4. Suggest effects that children might want to produce.
5. Support children's ideas.