Eggshell Inertia and Pickles Too

Description: Gain a better understanding of how friction and mass affect objects.

Keywords: Inertia, Newton’s Laws of Motion

Concepts: The tendency of a body to resist acceleration; the tendency of a body at rest to remain at rest or of a body in straight line motion to stay in motion in a straight line unless acted on by an outside force is known as inertia.

Materials:
- Hard-Boiled Eggs (Labeled “H.B.” for Hard-Boiled)
- Raw Eggs (Labeled “R.E.” for Raw Eggs)
- Jar of Pickles
- Newspaper (For Easy Clean-Up)
Instructions:
1. Place a hard-boiled egg and a raw egg on a table close to each other.
2. Spin the eggs at exactly the same time with similar forces.
3. Make observations about the eggs.

Possible Interactive Questions:
- Make a hypothesis…which egg will stop first?
- What forces are acting on the egg?
- How do friction, mass, and inertia affect such amusement park rides as roller coasters or bumper cars?

What’s Going On?
The shell on each egg was spun by the participant’s hand. Because the egg white and egg yolk of the hard-boiled egg are solid just as the shell is, they both spin together. The inertia of motion keeps the hard-boiled egg spinning longer until the friction, or resistance, of the table and air against the egg stops it.

The raw egg spins for less time because liquids have more inertial drag than solids. Inside the raw egg, it is liquid and moves very little compared to the outside solid shell. The shell was forced to stop spinning first because the lack of motion of the liquid interior (egg white and egg yolk).

The concept of inertia is today most commonly defined using Isaac Newton’s First Law of Motion, which states that every body at a state of rest or motion will stay in that state until acted upon by another force.
In amusement parks, inertia is utilized to propel rides as well as safely execute a maneuver such as a loop or incline. Can you think of other instances where inertia is utilized? Are there examples of when too little inertia affected the outcome of a ride?

Further Exploration:
1. Instruct students to consistently spin the eggs in the same direction and speed for an extended period of time. After a few minutes, have the students release the eggs and make observations. Was it the hard-boiled or raw egg that continued to spin for a longer period of time, in this instance?
2. Place a large, sealed jar full of pickles (with pickle juice) at the center of a rotating table. Rotate the table back and forth with your hands. Observe what happens, or doesn't happen, to the pickles inside the jar. Pickles at rest tend to stay at rest. Now rotate the table steadily in one direction until the pickles start to rotate along with the jar and the table. Once the pickles are in motion, reach out and grab the pickle jar with both hands and pick it off the table. Observe the motion of the pickles. Pickles in motion tend to stay in motion.