NATIONAL SCIENCE EDUCATION STANDARDS

A. Science as Inquiry

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

B. Physical Science

K–4

Properties of objects and materials

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. These properties can be measured using tools, such as rulers, balances, and thermometers.

Position and motion of objects

- The position of an object can be described by locating it relative to another object or the background.
- The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.

5–8

Motions and forces

- The motion of an object can be described by its position, direction of motion, and speed.
- An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.

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GRAVITY IN SPACE

Gravity is the force that pulls objects toward each other. The sun, the earth, and the International Space Station are all objects. They each pull the other with the force of their gravity. Of course, the sun is much bigger, so the force of its gravity is the strongest.

Sun

The **diameter** of the sun is about a hundred times the diameter of the earth.

Earth

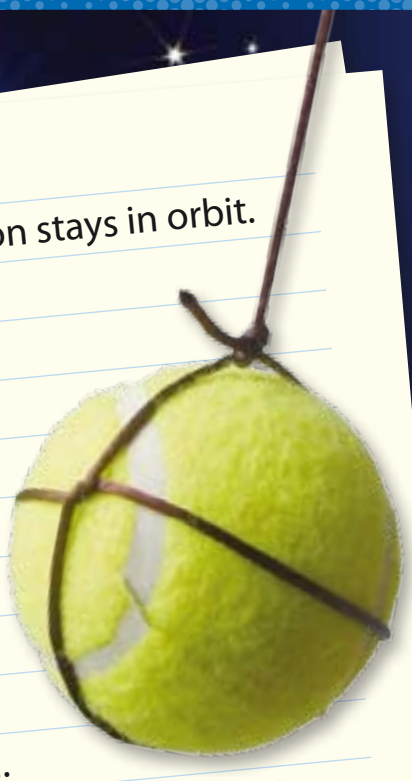
The earth orbits the sun because of the sun's gravity, and the Space Station orbits the earth because of the earth's gravity.

Did you know that the sun's **volume** is 1.3 million times the earth's volume? This means that if the earth equaled one glass of water, the sun would equal 1.3 million glasses of water of the same size.

The earth is not as close to the sun as shown on this page.

Overcome Gravity

You can model how the Space Station stays in orbit.



You will need:

- a piece of string
- a tennis ball

What to do:

1. Go outside—somewhere where there's lots of room.
2. Tie the string to the tennis ball.
3. Whirl the tennis ball in a circle above your head.

Show a friend:

Have a friend watch you do this experiment. Explain that the tennis ball represents an object in orbit and the string represents gravity. Then let the string go. The tennis ball will fly off away from you in a straight line. This is what would happen without gravity.

Safety tip:

Make sure no one is nearby when you let the string go!

Gravity and Smoke

Scientists on the International Space Station also study smoke. Smoke detectors work by detecting **particles** in the air that are the same size as the particles found in smoke. The problem is that some smoke detectors are so sensitive that even burning toast sets them off!

In microgravity, smoke particles have more time to join together, so they get bigger than they do on earth. This makes them easier to study.

Astronauts also study how fluids behave in space. They want to know what could happen if someone in space ever became so ill that they needed **intravenous** fluids.

Getting Taller

If you've ever felt it would be good to be taller, you could try going into space—or spending the night in bed! Gravity forces the spongy part between the disks in your spine to squash together slightly more as a day goes on. You gradually get shorter! If you don't believe this, try measuring an adult's height the minute they get out of bed and then measure it again last thing at night.

In space, an astronaut's spinal disks are not affected by gravity. Astronauts gain as much as two inches (over 5 centimeters) of extra height when they're in space.

Did you know that an adult loses about an inch (2.5 centimeters) in height during a day? Don't worry. They get taller again while they sleep!