



Another Perplexing Pair... **Rotation and Revolution**



We've focused our first emails on some important topics in life science; now we're going to spend a few minutes looking at earth science.

What Are this Week's Concepts? According to CRSEP scientists:

- **Revolve:** to turn around a point or line. For example, a train that moves in a circular path around a Christmas tree revolves around the central stem of the tree.

- **Rotate:** to turn around an axis (an imaginary line through the turning object). A basketball spinning on a player's finger is rotating. The axis is the imaginary line from the finger straight through to the top of the ball.

When studying astronomy, students do not always distinguish between **rotate** and **revolve**. The similarities in both the sounds of the words and the concepts can cause confusion. Even scientists sometimes use revolve and rotate interchangeably. Rotation is a special case of revolution where the motion is around an axis through an object. This is comparable to the mathematical concept of rectangles and squares. A rectangle is a four-side figure with right angles and opposite sides equal. A square is a special type of rectangle that has all four sides equal.

Astronomers avoid the problem by using the word **orbit** in place of **revolution**; for example, the Earth makes one complete orbit of the Sun (or, more precisely, the solar system's center of mass) in a period of time called a year.

To help students tell the difference, have them imagine a pin going into their heads, through their bodies, and to the floor. (This is the axis.) Ask them to rotate (spin in place). They do not have to take any steps; they are just moving in place. It is the same motion each time. Then ask them to revolve around or orbit an object. Their feet must take steps traveling in a path around the object. This path can vary; it may be a small orbit around the object, or it may be very large.

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What do the New York State Standards say?

Rotation and **revolution** are found in both the elementary and the intermediate core curricula:

Elementary Science Core Curriculum, Grade K – 4, Standard 4, Physical Setting

Major Understanding:

- 1.1a Natural cycles include:
 - Earth spinning around once every 24 hours (rotation), resulting in day and night
 - Earth moving in a path around the Sun (revolution), resulting in one Earth year...
 - ...the appearance of the Moon changing as it moves in a path around Earth to complete a single cycle"

Intermediate Level Science Core Curriculum, Grades 5 – 8, Standard 4, Physical Setting

Major Understandings :

- 1.1c “The Sun and the planets that revolve around it are the major bodies in the solar system. Other members include comets, moons, and asteroids. Earth's orbit is nearly circular.”
- 1.1g "Moons are seen by reflected light. Our Moon orbits Earth, while Earth orbits the sun
- 1.1h The apparent motions of the Sun, Moon, planets, and stars across the sky can be explained by Earth's rotation and revolution. Earth's rotation causes the length of one day to be approximately 24 hours. This rotation also causes the Sun and Moon to appear to rise along the eastern horizon and to set along the western horizon. Earth's revolution around the Sun defines the length of the year as 365 1/4 days.
- 1.1i The tilt of earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth. The length of daylight varies depending on latitude and season."

Although **rotation** and **revolution** are used exclusively in the Elementary Curriculum, **orbit** is introduced at the Intermediate level. Since elementary students often have trouble differentiating between the words, we suggest using **rotation** and **revolution or orbit**. Equating revolution with a word that is easier to aurally discriminate and that they might already know can make learning easier. Plus, they will be using the same terms as the professionals in the field, the astronomers.

How Can We Assess This?

Here are some suggestions to use with your students. You may have to alter these depending upon your class.

Ask the students to identify if each of the following is an example of **rotation** or **revolution or orbit**.

- Children walk in a circle around the farmer while playing "The Farmer in the Dell" (revolution or orbit)
- A basketball player spins a basketball on a finger (rotation)
- The planet Mars makes one complete turn around the sun (revolution or orbit)
- The moon makes one complete turn around the earth (revolution or orbit)
- A wheel spins on a car (rotation)
- A chicken turns on a rotisserie (rotation)
- A CD playing music (rotation)
- A train runs around the base of a Christmas tree (revolution or orbit)
- A child riding on a Ferris wheel or Merry-Go-Round
- The movement of the Ferris wheel or Merry-Go-Round itself

The last two could be **rotation** or **revolution or orbit**, depending upon how you think about the motion. In order to determine students' understanding, they must both name and describe the motion they picture.

For example:

- The whole Merry-Go-Round is turning on a center point (axis) and is rotating.
- The child on the Merry-Go-Round horse is revolving or orbiting the center of the ride.

Any questions?

Do you have any comments or questions about this week's topic? Any ideas for future email topics? Contact us!