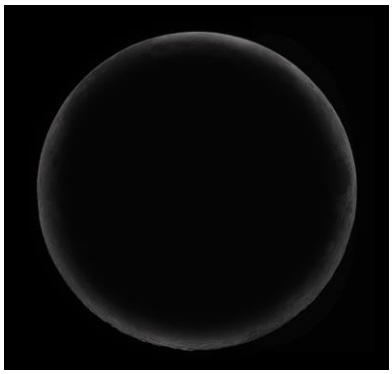
What causes the moon to change in appearance and position in the sky?

Standard 1: Objective 1 6th Grade
Text Structure: Sequence

Doesn't it seem as if the moon's shape changes night after night? As the moon **orbits** -the curved path of a celestial object or spacecraft around a star or planet–Earth, it appears as though the moon is changing its shape in the sky. This is because as the moon changes its position, the amount of sunlight reflected back to Earth also changes. The moon sometimes appears fully lit and sometimes completely dark. Most of the time we see it partially lit.

The North and South Poles mark Earth's axis. Earth **rotates** on its axis every 24 hours. Another major movement of planets and moons is **revolution**-the circling of an object in space around another object in space. It takes a year for earth, or 365.25 days, to revolve around the sun. It takes the moon about 29 days to revolve around Earth. This path is called an **orbit**.

Just as Earth rotates on its axis and revolves around the sun, the moon rotates on its axis and revolves around Earth. The moon's revolution or orbit around Earth is responsible for the changes in its appearance. It takes the moon about one month to orbit Earth. It also takes the same amount of time for the moon to complete one **axis of rotation**-the spinning of objects around an imaginary center line–the two motions take the same amount of time, so this is why the same side of the moon always faces the Earth.



When the moon is between Earth and the sun, we observe a **new moon**– the side of the moon facing Earth is completely dark. On the day of a new moon, the moon rises when the sun rises and sets when the sun sets. The new moon only takes place during daylight hours. As the moon revolves around Earth, we are able to see more of the lit portion of the moon.

We start by seeing a waxing crescent - the lit portion on the right side of the moon. Sometimes you can just barely make out the round outline of the whole moon at crescent phase. This is because some sunlight reflects off the Earth and hits the moon, a phenomena called "Earth shine." The waxing crescent moon phase lasts for about six days.

When it appears that the right half of the moon is lit, we call this the **first-quarter**. This occurs when the moon has completed one quarter of its orbit around Earth with respect to the sun. Even though the moon will be at this place in its orbit for just a moment, the moon appears half lit for about a day.

The lit portion appears to continue to **wax** – grow bigger—into a **waxing gibbous** phase –more than half-lit but less than full.

A **full moon** occurs when the whole side of the moon facing Earth is lit, this happens when Earth is between the moon and the Sun.

After a full moon, the lit portion starts to **wane**–get smaller. The moon will begin to look smaller as we see less and less of the lighted side. This will first show the **waning gibbous** phase followed by the **third-quarter** moon. As it continues to wane, we will see a **waning crescent** moon for about six days until the cycle is completed and we have new moon again. This whole progression of phases takes 29.5 days or about a month. After a complete phase cycle, the cycle begins again

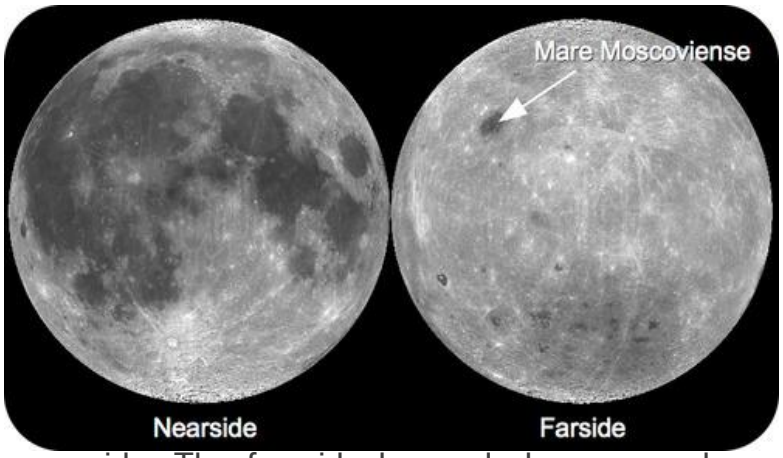
with a new moon.

How does the position of Earth, the moon, and the sun create the appearance of the moon's phases?

Standard 1: Objective 2
Grade 6
Text Structure: Compare and Contrast

The moon is Earth's only **natural satellite**--a body that moves or revolves around a larger body in space. The moon is kept in orbit around Earth by the same gravitational force that keeps Earth orbiting the sun. The moon is 3,476 km in diameter, about one-fourth the diameter of Earth. The mass of the moon is only 1.23 % the mass of Earth. Gravity on the moon is only one-sixth as strong as it is on Earth due to this combination of mass and diameter. If you weigh 120 pounds on Earth, how much would you weigh on the moon? That's right! You would weigh 20 pounds. You can jump six times as high on the Moon as you can on Earth if you weren't wearing a space suit. The moon is also not as dense as Earth.

The moon rotates on its axis in the same amount of time it takes it to make one orbit around Earth. What does this mean? The same side of the Moon always faces Earth, so we always see that side of the Moon in the sky. The side of the Moon that always faces Earth is called the near side. The side of the moon that always faces away from Earth is called the far side. From Earth, people have only seen the moon's near side. The far side has only been seen by spacecraft and Apollo astronauts as they orbited the moon.



http://goo.gl/FY657T

The rotation of Earth gives the sun the appearance of moving across the sky. The sun is actually in the same place in the sky. As Earth rotates, it brings the sun in and out of view giving us daylight and darkness. Remember the sun is not moving, it is the rotation of earth that brings the sun into view. When sunlight is hitting the part of the moon that is facing away from Earth, we see only the dark side of the moon. When we cannot see any part of the moon's lighted reflection, the moon is invisible to us. We call this a New Moon. The New Moon phase only takes place during daylight hours. As Earth rotates to nighttime, the New Moon is no longer in view, having disappeared behind the horizon.