



Mystery of the Missing Seasons

Grades 3 & 4

Objectives

As a result of the visit to the Planetarium, the student will be able to:

1. State that most things that emit light also emit heat. SC.B.1.2.3
2. State that some source of energy is needed for organisms to stay alive and grow. SC.B.2.2.1
3. State that the motion of an object can be described and measured. SC.C.1.2.1
4. State that the tilt of the Earth on its own axis as it rotates and revolves around the Sun causes changes in season, length of day and energy available. SC.E.1.2.1
5. State that the Sun is a star and that its energy can be captured or concentrated to generate heat and light for work on Earth. SC.E.1.2.3
6. State that in addition to the Sun, there are many other stars that are far away. SC.E.2.2.1
7. Know that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results. SC.H.1.2.2
8. Know that to compare and contrast observations and results is an essential skill in science. SC.H.1.2.4

Concepts Covered During the Planetarium Visit

1. Constellations
 - a. Star maps
 - b. Big Dipper and North Star
 - c. Some constellations are visible only part of the year
2. Earth
 - a. Earth has four seasons
 - b. Earth rotates or spins once a day
 - c. Earth revolves or orbits around the Sun once a year
3. Seasons
 - a. Spring- Daytime gets longer and weather gets warmer
 - b. Summer- Very long daytime and weather is very hot
 - c. Fall- Daytime gets shorter and weather gets cooler
 - d. Winter- Very short daytime and weather is coldest(someplaces it even snows)
4. Reasons for Season
 - a. Distance from the Sun? (Not the reason!)
 - b. The Sun's Path
 - i. Sun is high in Summer (long days)
 - ii. Sun is low in Winter (short days)
 - iii. Sun in between high and low in Spring & Fall (medium days)
 - c. Earth's axis is tilted
 - i. During Summer, axis is tilted toward the Sun
 - ii. During Winter, axis is tilted away from the Sun
 - iii. Seasons are opposite in northern & southern hemispheres
5. Seasonal Constellations
 - a. Earth revolves around the Sun
 - b. Over the course of a year, some constellations are blocked by the Sun's light
 - c. These constellations can be seen six months later when Earth is on the other side of the Sun

Pre-Visit Activities

1. Working in groups, have the students brainstorm to come up with as many things that are different about and during each season. In addition to weather and temperature differences, they may come up with animal behaviors, sports played etc. Have the class compare their ideas.
2. Put the Students into groups. Assign each group to research the climate of one of several distant places on Earth, like Ohio, Alaska, Egypt, Brazil or Argentina. Have each group give a report on their location. Ask the students how the seasons are the same or different around the world.
3. Your school library may have copies of Astronomy, Sky and Telescope or Odyssey magazines. Have the students look at the star charts in the magazine from several different months. Ask them if there are any constellations that can be seen every month and if there are any that can be seen sometimes. Have them brainstorm on possible reasons for this.

Post-Visit Activities

1. Students can chart the changes in the path of the Sun over time. A good way to do this is to observe shadows. Twice a week for 3-6 weeks, have the students place a yardstick on the ground at the same time place at noon (or as close to noon as you can get). Keep a chart in the classroom for the length of the shadow. Depending on the time of year this is done, the shadow will grow longer, meaning the Sun is getting lower, or shorter, meaning the Sun is getting higher.
2. Another way to chart the changes in the path of the Sun can be done at Sunrise or Sunset. Ask the students to choose a spot where they can view either the Sunrise or Sunset and draw a picture of the horizon, including any buildings, trees, etc. For 3-6 weeks, have the student's mark where the Sun rose or set on the picture as seen from their spot. It is very important that the students always stand at the same spot every time they make their observation. Depending on the time of year this is done, the Sunset or Sunrise position will either be moving north or south, or even reverse direction over the course of the observation. **At no time should the student look directly at the Sun, as this will cause eye damage. Always look after the Sun sets, or before it rises.**
3. Make a chart on the wall with four columns, one each for Sunrise time, Sunset time, length of daytime, and length of nighttime. Every day for 2-3 weeks, fill in the chart using the times in the daily paper. You may have to calculate the length of day and night. At the end of 2-3 weeks, have the students make predictions about what the next few days worth of data might be.

Sunshine State Standards Benchmarks

SC.3.N.1.6	Infer based on observation.
SC.3.E.5.1	Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.
SC.3.E.5.2	Identify the Sun as a star that emits energy; some of it in the form of light.
SC.3.E.5.3	Recognize that the Sun appears large and bright because it is the closest star to Earth.
SC.3.E.5.4	Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.
SC.3.E.5.5	Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye.
SC.3.E.6.1	Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost.
SC.4.E.5.1	Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons.
SC.4.E.5.2	Describe the changes in the observable shape of the moon over the course of about a month.
SC.4.E.5.3	Recognize that Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day.
SC.4.E.5.4	Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected.

Vocabulary

Your class should be familiar with the following vocabulary words before their visit to the Planetarium:

Axis: A straight line about which a body or geometric object rotates or may be conceived to rotate.

Big Dipper: A cluster of seven stars in the constellation Ursa Major, four forming the bowl and three the handle of a dipper-shaped configuration.

Campfire: An outdoor fire in a camp, used for cooking or warmth.

Computer: A general-purpose machine that processes data according to a set of instructions that are stored internally either temporarily or permanently.

Constellation: A formation of stars perceived as a figure or design, especially one of 88 recognized groups named after characters from classical mythology and various common animals and objects.

Earth: Third planet from the Sun and made out of rocks. It's our home planet.

Fall: The season of the year between summer and winter, lasting from the autumnal equinox to the winter solstice and from September to December in the Northern Hemisphere.

Leo: A constellation in the Northern Hemisphere near Cancer and Virgo, that has the shape of a lion.

Little Dipper: a cluster of seven stars in Ursa Minor; at the end of the dipper's handle is Polaris, the North Star.

North: The direction along a meridian 90° counterclockwise from east; the direction to the left of sunrise.

Northeast: halfway between due north and due east.

Northwest: The direction or point on the mariner's compass halfway between due north and due west.

North Pole: The northern end of the earth's axis of rotation.

North Star: True name Polaris. A star located at the end of the handle of the Little Dipper and almost at the north celestial pole. Also called polestar.

Orbit: The path of one object as it moves around another.

Orion: A constellation of a hunter in the celestial equator near Gemini and Taurus, containing the stars Betelgeuse and Rigel.

Pegasus: is a northern constellation, named after the mythological flying horse.

Planet: A body that is in orbit around the Sun, is round in shape, and has cleared its orbit of debris.

Revolution: Orbital motion about a point, especially as distinguished from axial rotation.

Rotation: Turning around a central point.

Scorpius: A constellation in the Southern Hemisphere that looks like a scorpion.

Season: One of the four natural divisions of the year, spring, summer, fall, and winter, in the North and South Temperate zones. Each season, beginning astronomically at an equinox or solstice, is characterized by specific meteorological or climatic conditions.

South: The direction along a meridian 90° clockwise from east; the direction to the right of sunrise.

Southeast: The direction halfway between due south and due east.

Southwest: The direction halfway between due south and due west.

South Pole: The southern end of the earth's axis of rotation.

Spring: The season of the year between winter and summer, lasting from the vernal equinox to the summer solstice and from March to June in the Northern Hemisphere.

Star: A ball of gases the glows and makes heat.

Summer: The usually warmest season of the year, occurring between spring and autumn and constituting June, July, and August in the Northern Hemisphere, or, as calculated astronomically, extending from the summer solstice to the autumnal equinox.

Tilt: To cause to slope, as by raising one end.

Vacation: A period of time devoted to pleasure, rest, or relaxation, especially one with pay granted to an employee.

Weather: The state of the atmosphere at a given time and place, with respect to variables such as temperature, moisture, wind velocity, and barometric pressure.

West: The cardinal point on the mariner's compass 270° clockwise from due north and directly opposite east.

Winter: The usually coldest season of the year, occurring between autumn and spring, extending in the Northern Hemisphere from the winter solstice to the vernal equinox, and popularly considered to be constituted by December, January, and February.

Year: The period of time during which Earth completes a single revolution around the sun, consisting of 365 days, 5 hours, 49 minutes, and 12 seconds of mean solar time. In the Gregorian calendar the year begins on January 1 and ends on December 31 and is divided into 12 months, 52 weeks, and 365 or 366 days. Also called *calendar year*.

