

ASTRONOMY-TO-GO

The John J. McCarthy Observatory

LESSON: The Reasons for the Seasons (4)

CURRICULUM: Grade 5, (CT Std. 5.3) Most objects in the Solar System are in a regular and predictable motion.

Earth and the Solar System: How does the position of Earth in the solar system affect the conditions on our planet?

GUEST INSTRUCTOR: Parker Moreland

TIME: About 40 minutes

LOCATION: Classroom with demonstration bench, projection screen

TEACHING AIDS: World globe with embedded temperature and light sensors; Small spot bulb in goose-neck desk lamp; computer with Logger Lite software; digital projector (for large classes). Large scale model of Earth orbit around Sun system, model Earth with axis. Large cardboard star with double-stick tape to affix to classroom wall (Polaris). SkyGazer program on laptop.

DESCRIPTION: Lecture/Demonstration

After guided discussion about causes for the seasons, common misconceptions are mentioned, and then we use the models to explore the mechanics of the Earth's motion in orbit around the Sun, noticing that the orbit is very nearly circular (Earth is almost equi-distant from Sun during the year) and that the North Pole always points toward Polaris, the North Star. We examine the orientation of the Sun with respect to New Milford at Noon during the year, higher and lower above the horizon. And we recall that when the Sun is higher in the sky, during the Summer, the days are also longer. Hopefully common misconceptions are demolished at this point.

We then align the spot lamp with the center of the Earth, about 40 inches from the globe, and orient the globe with the sensors on New Milford's latitude aimed at the lamp, and the axis tilted away from the lamp (simulating Dec. 21). The lamp is turned on and the Logger Lite software plots light intensity for one minute, and the plot is saved. The lamp is turned off, and the globe platform and axis is rotated 180° so that the sensors still face the lamp, but the axis is tilted toward the lamp (June 21). The lamp is turned on, and data plotting on the same graph begun. We then discuss the reasons for the much higher light intensity in summer vs. winter. Then the higher sun and longer days of summer are connected to the tilt of the earth's axis with respect to the orbital plane. The SkyGazer Seasons script visualizes these motions.

ASSESSMENT: Mini-quiz of one or two questions, graded by classroom teacher.
PEM 7/5/2005 Revised 2/2014