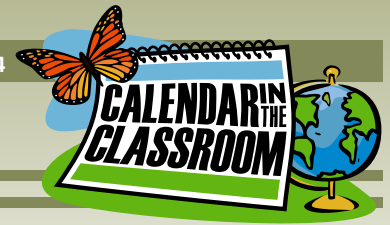




We're Burnin' Daylight



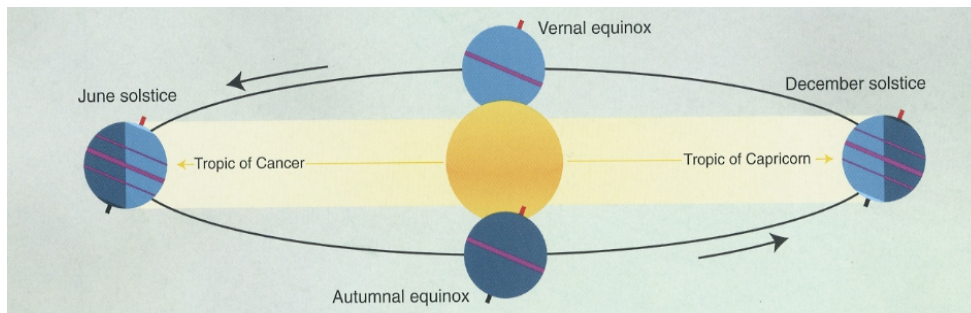
Overview

How does the number of daylight hours we experience change during the year? After determining the percent of daylight hours in a given day according to the data on the *Minnesota Weatherguide Environment™ Calendar* students will graph the percentages on a Length of Day Chart and notice a pattern of lengthening or shortening daylight hours consistent with seasonal change.

Background

The following diagram demonstrates the relationship between the Earth's tilted (23.5°) axis and the sun, so that the sun is higher in the sky for a longer period in the northern hemisphere's summer solstice (June) and lower in the winter solstice (December). During the spring and fall equinox the length of day and night are equal. This is part of the 3rd and 5th grade science standards, so students should be familiar with the concepts. You may also refer to the third grade lesson "Sunrise-Sunset"

The Activity



Day 1

Calculating Percent

1. Ask students, "Is it easier to go to bed in the summer or winter? Why?" This should spark a discussion on the changing amount of daylight hours as it correlates to seasonal change. This discussion will continue at the conclusion of the lesson.
2. Gather students in a circle on the floor and show them the *Minnesota Weatherguide Environment™ Calendar*, pointing out the inclusion of the daily Sunrise and Sunset times. Some students may notice already that it changes by a small amount each day.
3. Tell students that you will be working in partners to find the percent of daylight hours for a designated month and then graphing the results.
4. Ask students how many hours there are in a day (24). Tell them that this number is our denominator because we are finding out how many hours are daylight out of a possible 24 hours.
5. Ask students how we can find out how many hours are daylight for a given day (count hours from sunrise to sunset). Tell them that this is the

Time:

Day 1: 60 minutes
Day 2: 60 minutes

Skills:

Recording
Predicting
Critical thinking
Data collecting
Drawing
Interpreting

Vocabulary:

percent
numerator
denominator
daylight

Materials Needed:

- *Minnesota Weatherguide Environment™ Calendar*
- Whiteboard
- Calculators
- Math notebooks
- Pencils
- Graph paper

numerator: the number of actual daylight hours.

6. Explain that to calculate percent you take the numerator divided by the denominator to get a decimal. Then multiply the decimal by 100 to get the percent. You may choose to round to the nearest percent, tenth of a percent, or hundredth of a percent.

7. Pair students up to share the calculations for one month (12 months, 2 students per month, approximately 15 days per student). This work should be done in students' math notebook. Partners will share calculated percents to have data for a whole month.

Day 2

Graphing the Percents

1. Project a sample, blank piece of graph paper. Show students how to create axis, and labels appropriate for the size graph paper you are using (the X axis should be "Date" and the Y axis should be "Percent of the Day that is Daylight"). Demonstrate how to plot their percents on the graph, and color the bars.

2. Hand out the graph paper one piece per pair of students. Students work with their partners from Day 1 to create a graph the data from their month.

3. Allow time for graphing. Circulate and assist as necessary.

4. When students are done graphing bring them together in a circle along with their graphs. Collect graphs and display them in a central location in phenological (seasonal) order; start with June. These will be helpful to refer to throughout the discussion. Ask students if they see any patterns in the graphs when displayed this way.

Questions for Discussion

· Which month has the greatest percentage of daylight hours? June, it is the month of Summer Solstice when the Earth's axis is pointing towards the sun.

· Which month has the least percentage of daylight hours? December, it is the month of Winter Solstice when the Earth's axis is pointing away from the sun.

· Are there any months that are very similar in the percentages of day length?

March and September have similar percentages because this is the time of spring (Vernal) equinox and fall (Autumnal) equinox.

· Are there any places in the world that experience 100% daylight during certain times of the year? Why? Regions in the far north, or the far south, experience times of the year where it is light 100% of the time. Similarly, at other times of the year it is dark 100% of the time. This is due to the tilt of the earth on its axis and its rotation around the sun. NOTE: This discussion could lead to a more in depth discussion on the tilt and rotation of the earth.

· Are there any regions of the world that always experience the same amount of daylight? Regions along the equator experience the same amount of daylight hours all the time.

Extensions

· Have a thirteenth group graph data for the month of June from the previous year so that the "full circle" of the year of daylight can be seen more clearly.

· Give students a globe with the Earth's tilt built into it, and a light. Challenge them to figure out why daylight changes.

Resources

Minnesota Weatherguide Environment™ Calendar

online: <https://jeffersfoundation.org/programs/calendar-in-the-classroom/>

Reading resource for students:

What Causes the Seasons? From NASA Space Place <https://spaceplace.nasa.gov/seasons/en/>

Minnesota State Academic Standards

Math Standards

Grade	Strand	Anchor Standard	Code	Benchmark
3 4 5	Data Analysis	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.	3.1.1.1 4.1.1.1 5.1.1.1	Notice and describe patterns in data-rich situations or given data sets. (MP7)
4	Data Analysis	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.	4.1.1.4	Critically analyze data visualizations, including tables, double bar graphs, timelines, line plots or spreadsheets to support a claim and solve contextual situations. (MP3, MP7)
5	Data Analysis	Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.	5.1.1.4	Critically analyze data visualizations using measures of center and variability, including but not limited to double-bar graphs, line graphs and line plots to support a claim and solve situations. (MP3, MP7)
5	Patterns and Relationships	Number Relationships: Describe/interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	5.3.5.13	Solve contextual situations using addition and subtraction of positive rational numbers represented as fractions (including mixed numbers) or decimals using visual models, equations and properties of operations. (MP4)

3-D Science Standards

Science Practices:

- 4. Analyzing and Interpreting Data
- 5. Using Mathematics and Computational Thinking
- 8. Obtaining, Evaluating and Communicating Information

Crosscutting Concepts:

- 1. Patterns
- 2. Cause and Effect: mechanism and explanation¹

Disciplinary Core Ideas:

ESS1: Earth's place in the universe

3rd Grade: Record observations of the sun, recognize patterns in data

5th Grade: Use data to describe patterns in daily changes in length of day and night