

THINKING AND ACTING
LIKE A
SCIENTIST

TEACHER'S GUIDE

**Daylight Throughout
the Year**

How does the amount of daylight change
throughout the year?

GRADE 1

Earth & Space





Daylight Throughout the Year

Grade Level/Content	1/Earth and Space Science
Lesson Summary	In this lesson, students will make observations and collect data to understand how the amount of daylight is different at different times of the year.
Estimated Time	1, 45-minute class period to set up; 10 minutes biweekly to record and analyze data (Fall through Spring)
Materials	Flashlight, globe, chart paper, yellow and black markers or crayons, access to local sunrise/sunset times, Investigation Plan , Observation Form , journal
Secondary Resources	<ul style="list-style-type: none">• What Makes Day and Night, by Franklyn M. Branley• Sunrise and Sunset Times: Timeanddate.com• Sunrise and Sunset Times: Gaisma.com
NGSS Connection	1-ESS1-2 Make observations at different times of the year to relate the amount of daylight to the time of year.
Learning Objectives	<ul style="list-style-type: none">• Students will collaboratively make and record observations about the relative length of daylight at different times of the year.• Students will make relative comparisons between the amount of day at different times of the year.
Cross-Curricular Project Connections	My Planet!; Night Person, Day Person

How does the amount of daylight change throughout the year?

The presence of daytime dramatically affects children’s lives. When there is daylight, they can play outside, go for a picnic, or fly a kite. When it is night time, they can gaze at stars, see fireworks, or catch lightning bugs. Children understand the concept of night and day from a very early age, but they don’t intrinsically know what causes day and night, and they seldom stop to think about how night and day change throughout the year.

The amount of daylight is constantly getting shorter from June 21-December 20. It is constantly getting longer from December 21 to June 20. The amount of daylight varies from place to place, but the summer and winter solstices occur at the same time worldwide (though in the southern hemisphere they are opposite). In this investigation, children learn how the sun creates day and night, and they observe how days get longer in the summer and shorter in the winter.

Investigation is based on the Van Andel Education Institute (VAEI) Instructional Model for Inquiry-Based Science. In all investigations:



Students don’t know the “answer” they are supposed to get.



Students play a driving role in determining the process for learning.



Teachers and students construct meaning together by journaling.



Students are working as hard as the teacher.

Part 1

INVESTIGATION SETUP

Using chart paper, create a class chart that you can use to record the hours of daylight throughout the year. Create rows for each time of day (12 am-11 pm). Create 2 columns for each month, September through May.

- Flashlight
- Globe
- Chart paper
- Yellow and black markers or crayons
- Access to local sunrise/sunset times
- [Investigation Plan](#)
- [Observation Form](#)
- Journal



Sample Class Chart

Part 2

INVESTIGATION FACILITATION



Question

Introduce the investigation question.

How does the amount of daylight change throughout the year?

STUDENT ENGAGEMENT

Introduce the concept of day and night with a demonstration using a globe and a flashlight. Ask for 2 volunteers, one to play the sun (flashlight) and the other to play Earth (globe). Turn down the lights and have the students simulate the sun shining on Earth. Place a sticker on the globe to mark your location, then as the "Earth" student spins the globe, explain that when the sun hits the sticker, it is day; when the sun does not hit the sticker, it is night.



Personal Knowledge

Students capture what they already know about seasons and daylight at different times of year.

Discuss the following questions as a class:

- How many seasons are there?
- What are the names of the seasons?
- Are there times of the year when it gets dark early?
- Are there times of the year when it stays light for a longer time?

SELF-DIRECTION

Capture each student's personal knowledge with a *Carousel Brainstorm*. Post 4 pieces of chart paper around the room, one for each season. Ask students to write or draw on each paper what they already know about each season.



Secondary Knowledge

Students learn how to determine the amount of daylight in a day.

- Tell students that in order to see if the amount of daylight changes throughout the year, they will need to collect data about how many hours of sunlight there are in a day.
- Model capturing this data by looking up sunrise and sunset times for the current day as a class. You may use weather.com, a weather app, or whatever weather function your phone uses. (For example, ask: *Siri, what time was the sunrise this morning? What time will the sunset be this evening?*)
- Write down the sunrise and sunset times. Then, model counting forward to determine the number of hours of daylight. Write down the number of hours of daylight. To make this more concrete, mark the sunrise and sunset hours on the chart, then color yellow the boxes between sunrise and sunset. Then, you can have students count the yellow boxes to determine the number of daylight hours.



Sample Data

CONSTRUCTION OF MEANING

Help students relate to the sunrise and sunset times by discussing questions about how their daily activities relate to daylight and darkness. (For example, ask: *Was the sun up when school started? Was the sun up when you woke up? Will the sun be up when you have dinner? Will the sun be up when you go to bed?*)



Prediction

Students predict what the results will be, based on their prior knowledge.

- Ask students to predict the answer to the investigation question using the “I predict _____ because _____” prompt. (An example student response might be: *I predict that daylight will be shorter in the winter, because it seems like it’s always dark in winter.*)

RISK-TAKING

It’s important that students not feel that there is a “correct” prediction. When they return to their prediction in their explanation, they will have the opportunity to see how their prediction is supported or challenged by their evidence.



Investigation Plan

Students plan and conduct an investigation to determine how the amount of daylight is different at different times of the year.

- As a class, review the [Investigation Plan](#). Explain that this investigation will take place over several months.
- Tell students that twice each month, you will ask them to look up the sunset and sunrise times and record them on the [Observation Form](#) or in their journals. (Note: You may decide to collect data as often as once a week or as little as once a month, but strive for consistent intervals of time for more reliable data.)

Continued

- Note that daylight savings time will cause a jump in your chart by one hour, but the pattern of daylight hours will not change.
- After each data collection, you will add the data to the class chart.

CRITICAL THINKING

Use the [Fair Test](#) checklist to help students think critically about the investigation plan. Help them understand that a good investigation plan must include a test that is repeatable, generates quality data, and minimizes error. The more critically students think about their investigation plan, the more confident they will be in their results.

INVESTIGATION PLAN
DAYLIGHT THROUGHOUT THE YEAR

1. Identify what weather website or app you will use to find the sunrise and sunset times:





2. Check sunrise and sunset times 2 times every month from September through May.
3. Record the times on your **Observation Form** or in your journal.
4. Add the data to the class chart: **Daylight Throughout the Year**.
5. In April, analyze the data and answer the question: How does the amount of daylight change throughout the year?

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Investigation Plan

OBSERVATION FORM
DAYLIGHT THROUGHOUT THE YEAR

NAME: _____
DATE: _____

Date	Time of Sunrise	Time of Sunset	Hours of Daylight
			
September			
October			
November			
December			

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Observation Form



Observation

Students record their observations of daylight hours independently and as a whole class.

- On data collection days, have students complete their individual **Observation Forms**. (You may want to tape these at the back of their science journals or keep all of them in a “sun” folder for easy access throughout the year.)
- Once all students have made their individual observations, record the sunrise and sunset times on the class chart. You may want to decide as a class how to represent day and night on the chart (*yellow for day, black stripes for night; blue dots for day, black dots for night; sun stickers for day, moon stickers for night, etc.*).
- If you miss an observation day, go to <https://www.timeanddate.com/sun/usa> and look up the day you missed and record it.

SHARED CONTROL

Support students as needed in looking up the sunrise and sunset times and determining the number of daylight hours. As students show they are capable of performing these tasks independently, encourage them to do so.

PERSEVERANCE

Vary the way you kick off data collection each time to keep students engaged during this long investigation. Perhaps create a paper sunshine and hide it different places each data collection day. When students find the paper sunshine, they know it’s a data collection day. While classroom structure and routines are important to students, so is providing enough variation to develop engagement and adaptability habits.

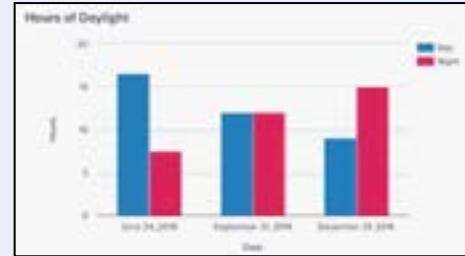


Data Analysis

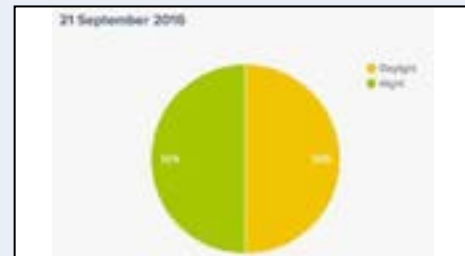
Students make sense of their data by organizing it and representing it visually.

Once you have at least two seasons worth of data (ideally, September through May), analyze the data from the class chart together. You may wish to use the [Data Analysis](#) prompt as a guide.

- Have students **evaluate** their data for trustworthiness. Do they feel the data was captured correctly? They may want to compare it to their individual **Observation Forms** to be sure.
- Then, have them analyze their data to find patterns and trends. They may **organize** the data and/or **represent** it visually to construct meaning. Have them use math as appropriate, for example, counting the number of daylight hours in each month, finding the difference between hours of daylight in one month from another.
- Students may choose to represent the data as a bar graph, a series of pie charts, or some other visual representation of daylight throughout the year.
- Have students **interpret** what the identified patterns mean. They should see that there is less daylight in the winter months.
- Ensure students have enough data that it can be used as evidence to support a claim.



Sample Bar Graph



Sample Pie Chart

CREATIVE AND CRITICAL THINKING

Ask students to evaluate and organize their data in a visual way. They must think critically as they evaluate the validity of their data and decide how to organize it. They must think creatively as they communicate their interpretation in the form of a graph, drawing, or infographic.



Secondary Knowledge

Students use secondary sources to help them learn more about how daylight changes throughout the year.

- Use these resources (or your own) to help develop students' understanding that the amount of daylight is different at different times of year .
 - [What Makes Day and Night](#), by Franklyn M. Branley
 - [Sunrise and Sunset Times: Timeanddate.com](#)
 - [Sunrise and Sunset Times: Gaisma.com](#)
- Both of the data sources have yearly sun charts that should be similar to the class chart. Note that the chart jumps one hour for daylight savings time.
- After reviewing the book and websites, students should glean the idea that days get longer in the summer and shorter in the winter.
- Students use this information in the reasoning portion of their explanation.
- Revisit class predictions as needed to clarify any misconceptions (*such as it is dark because it is cold*).

Continued

CURIOSITY

When curious people learn new information, they continue to ask questions and make connections. Develop curiosity by encouraging students to share their learning from secondary resources using a *Fact-Question-Connection* format. They should share one fact they learned, one question they still have, and one connection from what they learned to something they already know, something they are interested in, or something another classmate said.

RISK-TAKING

Revisiting predictions is a good opportunity to promote risk-taking in your classroom, especially if your investigation yields a result that differs from the prediction. Explain that the reason we do investigations is to learn, and remind students that scientists make incorrect predictions and mistakes all the time. That is how they learn and move their science forward.



Explanation

Students write a claim and provide evidence and reasoning to support it.

- Have students use what they've discovered from the analyzed data to write an explanation that answers their investigation question. Students may wish to use the [Explanation](#) prompt as a guide. Have them write their explanation in their journal.
- Have students review the investigation question: **How does the amount of daylight change throughout the year?**
- Have students develop a **claim** to answer the investigation question.
- Then, have them write down the **evidence** that supports their claim.
- Finally, have them add **reasoning** to their claim. Reasoning should include the information obtained from this investigation as well as science principles they have learned.

Claim

The days get longer in the summer and they get shorter in the winter.

Evidence

There were 14 hours of daylight in September, but there were only 10 hours of daylight in December.

Reasoning

Investigation: We conducted a fair test. We looked up the sunrise and sunset times two times every month from September through May. We used the same source for the data every time.

Science: Through our readings and discussions, we learned that the amount of daylight changes based on the seasons. Summer has the most daylight. Winter has the least daylight.

- Once the explanation is written, have students discuss their results using a [Present and Defend](#).

DISCOURSE

Have students conduct a [Present and Defend](#) to develop presentation skills as well as audience participation. Research teams present a summary of their investigation to the class. The class analyzes the information presented and asks clarifying questions, challenges and/or supports the arguments made, and even presents alternative explanations as appropriate. Research teams defend their explanation with evidence and reasoning. If students are doing the same investigation plan, choose 1 or 2 groups to share.



Evaluation

Students reflect on the investigation.

Ask students to discuss:

- What surprised me?
- How confident am I in my results?

Part 4

INVESTIGATION ASSESSMENT AND EXTENSION



Application

Students demonstrate understanding of how daylight changes throughout the year.

- Using 3 containers, write the following (or others of your choice) on pieces of paper and put them in each container:

Container 1 (activity)	Container 2 (time)	Container 3 (month)
Stargazing	6:00pm	February
Have a picnic	8:00pm	July
Fly a kite	6:00am	October
See fireworks	5:00pm	January
	7:00am	May
	8:00am	December

- Have students randomly choose one slip from each container and then explain if that scenario is possible or not. (*Stargazing at 6:00am in July=Not Possible because the sun is already up at 6:00am in July.*)

Assessment

Evaluate explanations for how well:

- Students collaboratively make and record observations about the relative length of daylight at different times of the year.
- Students make relative comparisons between the amount of day at different times of the year.

Take This Lesson Across the Curriculum

My Planet!

Imagine you could create your own planet. You can decide how long the days and nights are and what the seasons feel like.

Reading/Language Arts	Math	Science	Social Studies
<p>Another World</p> <p>Read <i>Green Eggs and Ham</i> by Dr. Seuss to inspire creative thinking.</p> <p>CCSS.ELA-LITERACY.RL.1.3</p>	<p>What's In a Year?</p> <p>On Earth there are 365 days in a year. How many days would there be in a year on your planet? What is the difference?</p> <p>CCSS.MATH.CONTENT.2.OA.A.1</p>	<p>Daylight Throughout the Year</p> <p>Students observe the amount of daylight at different times of the year.</p> <p>NGSS: 1-ESS1-2</p>	<p>Earthly Shapes</p> <p>What would the continents look like on your planet? How are they alike and different from Earth's continents?</p> <p>NCSS: D2.Geo.10.K-2</p>

Night Person, Day Person

Some people like to go out at night. They like lively restaurants with bright lights. Other people prefer the daytime. They enjoy a sunny day at the beach or a picnic on the grass. Sometimes people refer to themselves as night people or day people based on this preference.

Reading/Language Arts	Math	Science	Social Studies
<p>Gotta Be Me</p> <p>Write an opinion piece as to why being a night person or a day person is better.</p> <p>CCSS.ELA-LITERACY.W.1.1</p>	<p>How Many?</p> <p>Conduct a survey of the class and graph how many people prefer night vs how many prefer day. (Extend the survey into the community if you'd like.)</p> <p>CCSS.MATH.CONTENT.1.MD.A.2</p>	<p>Daylight Throughout the Year</p> <p>Students observe the amount of daylight at different times of year.</p> <p>NGSS: 1-ESS1-2</p>	<p>Looking Back</p> <p>Think about how daytime and nighttime activities are different. How would these activities have been different in the past?</p> <p>NCSS: D2.His.3.K-2</p>

For additional lessons or to customize this lesson, go to www.nexgeninquiry.org.

INVESTIGATION PLAN

DAYLIGHT THROUGHOUT THE YEAR

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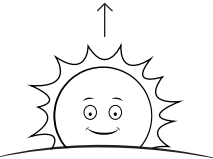
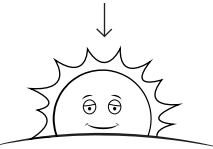
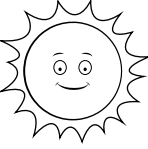
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OBSERVATION FORM

DAYLIGHT THROUGHOUT THE YEAR

NAME: _____

DATE: _____

Date 	Time of Sunrise 	Time of Sunset 	Hours of Daylight 
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September

October

November


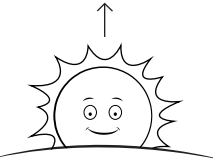
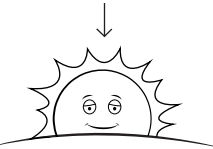
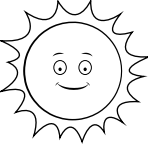
December

OBSERVATION FORM

DAYLIGHT THROUGHOUT THE YEAR

NAME: _____

DATE: _____

Date 	Time of Sunrise 	Time of Sunset 	Hours of Daylight 
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January

February

March

April

May
