



1ST GRADE SCIENCE

FOR UTAH SEED STANDARDS

1st Grade

for Utah SEEd Standards

Revised 2025

Utah State Board of Education OER

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-source, collaborative, and web-based compilation model, CK-12 pioneers and promotes the creation and distribution of high-quality, adaptive online textbooks that can be mixed, modified and printed (i.e., the FlexBook® textbooks).

Copyright © 2025 CK-12 Foundation, www.ck12.org

The names “CK-12” and “CK12” and associated logos and the terms “FlexBook®” and “FlexBook Platform®” (collectively “CK-12 Marks”) are trademarks and service marks of CK-12 Foundation and are protected by federal, state, and international laws.

Any form of reproduction of this book in any format or medium, in whole or in sections must include the referral attribution link <http://www.ck12.org/saythanks>

(placed in a visible location) in addition to the following terms.

Except as otherwise noted, all CK-12 Content (including CK-12 Curriculum Material) is made available to Users in accordance with the Creative Commons Attribution-Noncommercial 3.0 Unported (CC BY-NC 3.0) License (<http://creativecommons.org/licenses/by-nc/3.0/>), as amended and updated by Creative Commons from time to time (the “CC License”), which is incorporated herein by this reference.

Complete terms can be found at <http://www.ck12.org/about/terms-of-use>.

Printed: May, 2025



Credits and Copyright

Credits Copyright, Utah State Board of Education, 2025.

Unless otherwise noted, the contents of this book are licensed under the Creative Commons Attribution NonCommercial ShareAlike license. Detailed information about the license is available online at <http://creativecommons.org/licenses/by-nc-sa/3.0/legalcode>

Unless otherwise attributed, photos were taken from the ck-12 website and Pixabay.

Prior to making this book publicly available, we have reviewed its contents extensively to determine the correct ownership of the material and obtain the appropriate licenses to make the material available. We will promptly remove any material that is determined to be infringing on the rights of others. If you believe that a portion of this book infringes another's copyright, contact Ricky Scott at the Utah State Board of Education: richard.scott@schools.utah.gov .

If you do not include an electronic signature with your claim, you may be asked to send or fax a follow-up copy with a signature. To file the notification, you must be either the copyright owner of the work or an individual authorized to act on behalf of the copyright owner. Your notification must include:

- Identification of the copyrighted work, or, in the case of multiple works at the same location, a representative list of such works at that site.
- Identification of the material that is claimed to be infringing or to be the subject of infringing activity. You must include sufficient information, such as a specific page number or other specific identification, for us to locate the material.
- Information for us to be able to contact the claimant (e.g., email address, phone number).
- A statement that the claimant believes that the use of the material has not been authorized by the copyright owner or an authorized agent.
- A statement that the information in the notification is accurate and that the claimant is, or is authorized to act on behalf of, the copyright owner.

This book is adapted primarily from the excellent materials created by the CK-12 Foundation - <http://ck12.org/> - which are licensed under the Creative Commons Attribution Non Commercial Share Alike license. We express our gratitude to the CK-12 Foundation for their pioneering work on secondary science textbooks, without which the current book would not be possible.

We especially wish to thank the amazing Utah science teachers whose collaborative efforts made the book possible. Thank you for your commitment to science education and Utah students!

Students as Scientists

What does science look and feel like?

If you're reading this book, either as a student or a teacher, you're going to be digging into the "practice" of science. Probably, someone, somewhere, has made you think about this before, and so you've probably already had a chance to imagine the possibilities. Who do you picture doing science? What do they look like? What are they doing?

Often when we ask people to imagine this, they draw or describe people with lab coats, people with crazy hair, beakers and flasks of weird looking liquids that are bubbling and frothing. Maybe there's even an explosion. Let's be honest: Some scientists do look like this, or they look like other stereotypes: people readied with their pocket protectors and calculators, figuring out how to launch a rocket into orbit. Or maybe what comes to mind is a list of steps that you might have to check off for your science fair project to be judged; or, maybe a graph or data table with lots of numbers comes to mind.

So let's start over. When you imagine graphs and tables, lab coats and calculators, is that what you love? If this describes you, that's great. But if it doesn't, and that's probably true for many of us, then go ahead and dump that image of science. It's useless because it isn't you. Instead, picture yourself as a maker and doer of science. The fact is, we need scientists and citizens like you, whoever you are, because we need all of the ideas, perspectives, and creative thinkers. This includes you.

Scientists wander in the woods. They dig in the dirt and chip at rocks. They peer through microscopes. They read. They play with tubes and pipes in the aisles of a hardware store to see what kinds of sounds they can make with them. They daydream and imagine. They count and measure and predict. They stare at the rock faces in the mountains and imagine how those came to be. They dance. They draw and write and write and write some more.

Scientists — and this includes all of us who do, use, apply, or think about science — don't fit a certain stereotype. What really sets us apart as humans is not just that we know and do things, but that we wonder and make sense of our world. We do this in many ways, through painting, religion, music, culture, poetry, and, most especially, science. Science isn't just a method or a collection of things we know. It's a uniquely human practice of wondering about and creating explanations for the natural world around us. This ranges from the most fundamental building blocks of all matter to the widest expanse of space that contains it all. If you've ever wondered "When did time start?", or "What is the

smallest thing?”, or even just “What is color?”, or so many other endless questions then you’re already thinking with a scientific mind. Of course you are; you’re human, after all.

But here is where we really have to be clear. Science isn’t just questions and explanations. Science is about a sense of wondering and the sense-making itself. We have to wonder and then really dig into the details of our surroundings. We have to get our hands dirty. Here’s a good example: two young scientists under the presence of the Courthouse Towers in Arches National Park. We can be sure that they spent some amount of time in awe of the giant sandstone walls, but here in this photo they’re enthralled with the sand that’s just been re-washed by recent rain. There’s this giant formation of sandstone looming above these kids in the desert, and they’re happily playing in the sand. This is ridiculous. Or is it?



How did that sand get there? Where did it come from? Did the sand come from the rock or does the rock come from sand? And how would you know? How do you tell this story?

Look. There's a puddle. How often is there a puddle in the desert? The sand is wet and fine; and it makes swirling, layered patterns on the solid stone. There are pits and pockets in the rock, like the one that these two scientists are sitting in, and the gritty sand and the cold water accumulate there. And then you might start to wonder: Does the sand fill in the hole to form more rock, or is the hole worn away because it became sand? And then you might wonder more about the giant formation in the background: It has the same colors as the sand, so has this been built up or is it being worn down? And if it's being built up by sand, how does it all get put together; and if it's being worn away then why does it make the patterns that we see in the rock? Why? How long? What next?

Just as there is science to be found in a puddle or a pit or a simple rock formation, there's science in a soap bubble, in a worm, in the spin of a dancer and in the structure of a bridge. But this thing we call "science" is only there if you're paying attention, asking questions, and imagining possibilities. You have to make the science by being the person who gathers information and evidence, who organizes and reasons with this, and who communicates it to others. Most of all, you get to wonder. Throughout all of the rest of this book and all of the rest of the science that you will ever do, wonder should be at the heart of it all. Whether you're a student or a teacher, this wonder is what will bring the sense-making of science to life and make it your own.

Adam Johnston
Weber State University

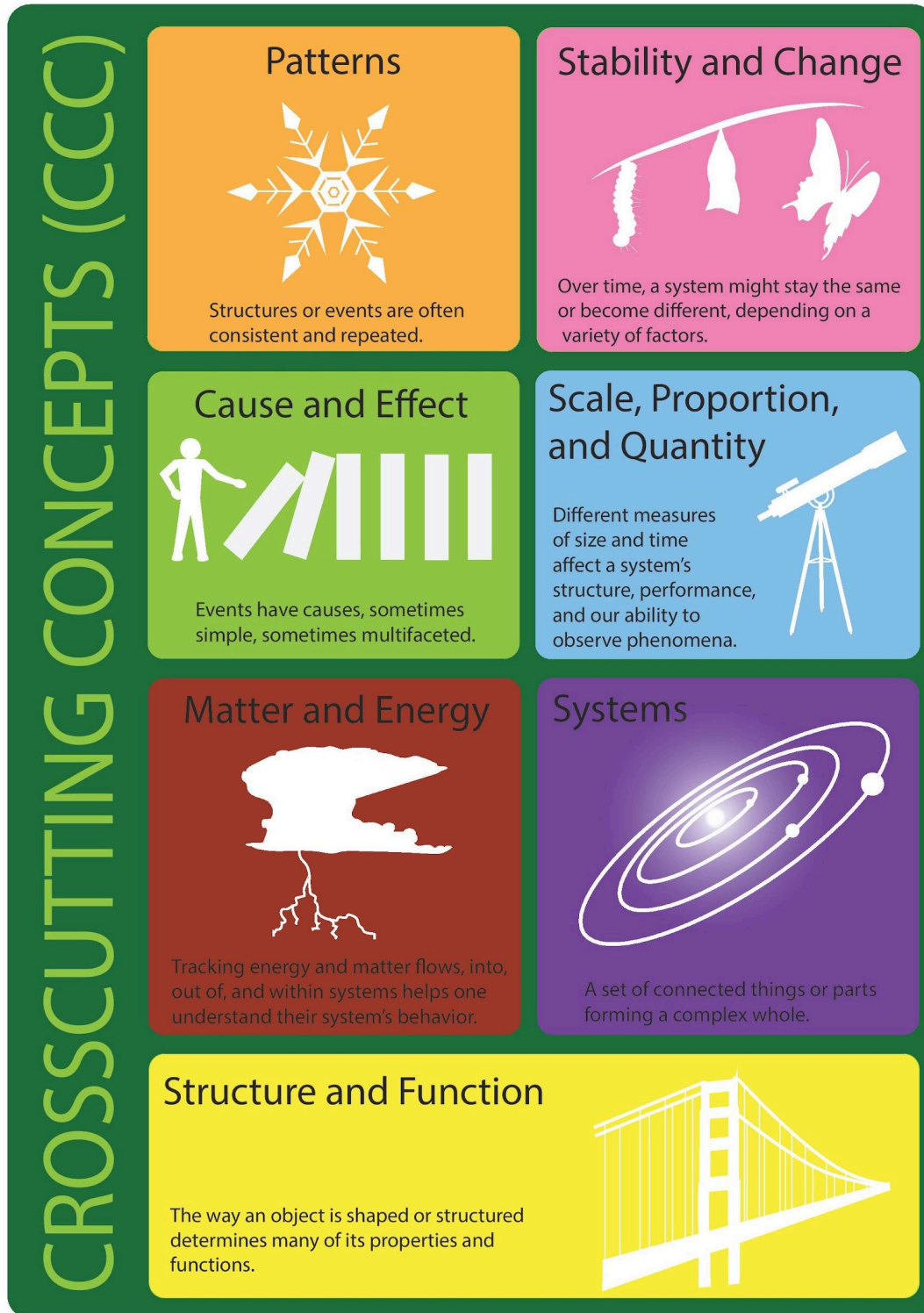
Science and Engineering Practices

Science and Engineering Practices are what scientists do to investigate and explore natural phenomena



Crosscutting Concepts

Crosscutting Concepts are the tools that scientists use to make sense of natural phenomena.



Created by Susan Larson

What is involved in Engineering Design?

Engineering is a creative process where each new version of a design is tested and then modified, based on what has been learned up to that point. This process includes a number of components:

1. Identifying the problem and defining criteria and constraints.
2. Generating ideas for how to solve the problem. Engineers use research, brainstorming, and collaboration with others to come up with ideas for solutions and designs.
3. Use criteria and constraints to evaluate possible design solutions to identify the one(s) that best address these parameters for the problem in context
4. Build and test the prototypes. Using data collected, the engineer analyzes how well prototypes meet the given criteria and constraints.
5. Suggest or make improvements to prototypes to optimize the design.

In the Science with Engineering Education (SEEd) Standards, specific engineering standards generally involve two types of tasks:

1. If the standard includes the idea of designing, then the design process will contain components of defining the problem (along with identifying the criteria and constraints), developing many possible solutions, and optimizing a solution (e.g., determining a best solution for the situation based on the criteria and constraints, testing the solution, refining the solution).
2. If the standard includes the idea of evaluating, then the design process will contain components of defining the problem (along with identifying the criteria and constraints) and optimizing a solution. The idea of developing many possible solutions is not included because various solutions will be provided. The idea of evaluating then means determining a best solution from the provided solutions for the situation based on meeting the criteria and constraints requirements.

Table of Contents

Strand 1: Seasons and Space Patterns	12
1.1.1 Movement	13
1.1.2 Time of Year	30
1.1.3 Daylight Patterns	41
Strand 2: The Needs of Living Things and Their Offspring	56
1.2.1 Sun and Water	57
1.2.2 Surviving Locations	68
1.2.3 Traits of Parents	91
1.2.4 Survival Behaviors	94
Strand 3: Light and Sound	105
1.3.1 Sound Vibrations	106
1.3.2 Effects of Light	116
1.3.3 Light Pathways	128
1.3.4 Communication	136

Strand 1: Seasons and Space Patterns

Chapter Outline

- 1.1 Movement (1.1.1)
- 1.2 Time of Year (1.1.2)
- 1.3 Daylight Patterns (1.1.3)



Four seasons in Japan by Masakazu Matsumoto,
<https://flic.kr/p/avmYzR>, CC-BY

There are patterns in how the Sun, Moon, and Stars appear to move across the sky. These patterns look different depending on where you are on the earth and what time of year it is. The patterns we observe in winter look a little different than the patterns we observe in summer.

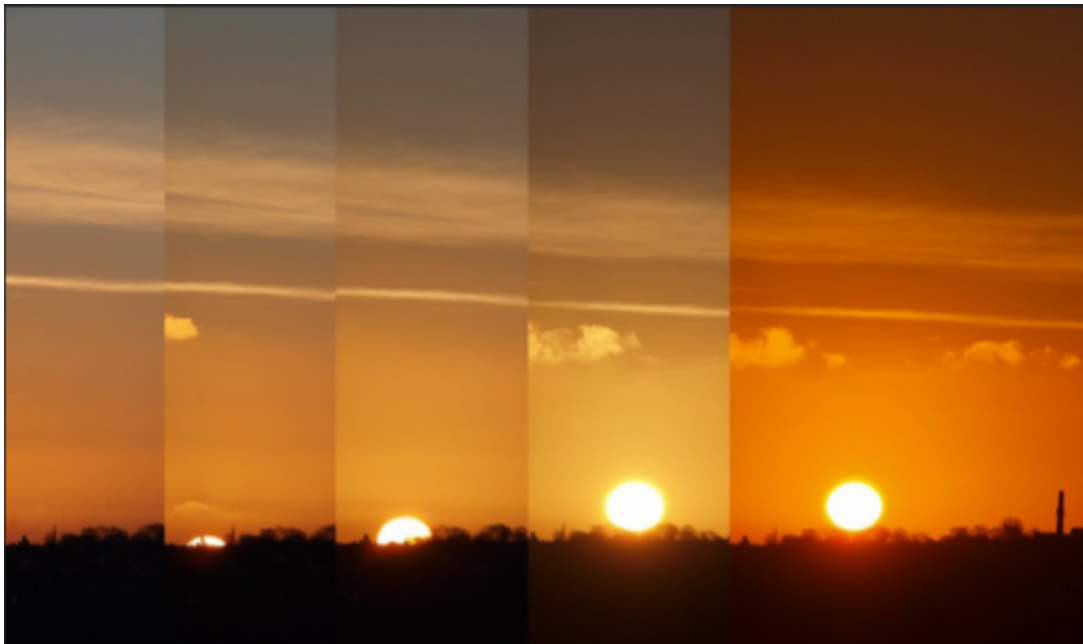
1.1.1 Movement

Phenomenon

Chloe took pictures of the sun from her front porch as she was getting ready in the morning. The first one was at 6:05 a.m. The second at 6:10 a.m. The third at 6:15 a.m. The fourth at 6:20 a.m. and the last at 6:25 a.m.



She put all the pictures together and thinks that the sun appears to be moving in the sky.



Movement of the Sun by Chloe Blanchfield, <https://flic.kr/p/9jhLrr>, CC-BY-NC-ND

Observations & Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.1.1 Movement

Obtain, evaluate, and communicate information about the movement of the Sun, Moon, and stars to describe predictable patterns. Examples of patterns could include how the Sun and Moon appear to rise in one part of the sky, move across the sky, and set; or how stars, other than the Sun, are visible at night but not during the day. **(ESS1.A)**



In this section, identify patterns in the movements of the Sun, Moon, and stars during the day and night.

Movement in the Sun, Moon, and Stars

Every morning the sky goes from dark to light. Or from night to day.



Image by susnpics, pixabay.com, CC0

The sun slowly appears to move higher into the sky providing the earth with more light. This is called sunrise.



Sunrise by jespahjoy, <https://flic.kr/p/7VkwK1>, CC-BY

Even if there are clouds or it is a stormy day the sun still rises and provides the light for the day.



Snowing in March by Ashton Emanuel, <https://flic.kr/p/m3VXiR>, CC-BY-NC-ND

The movement of the sun has a pattern. The sun rises in the east in the morning.

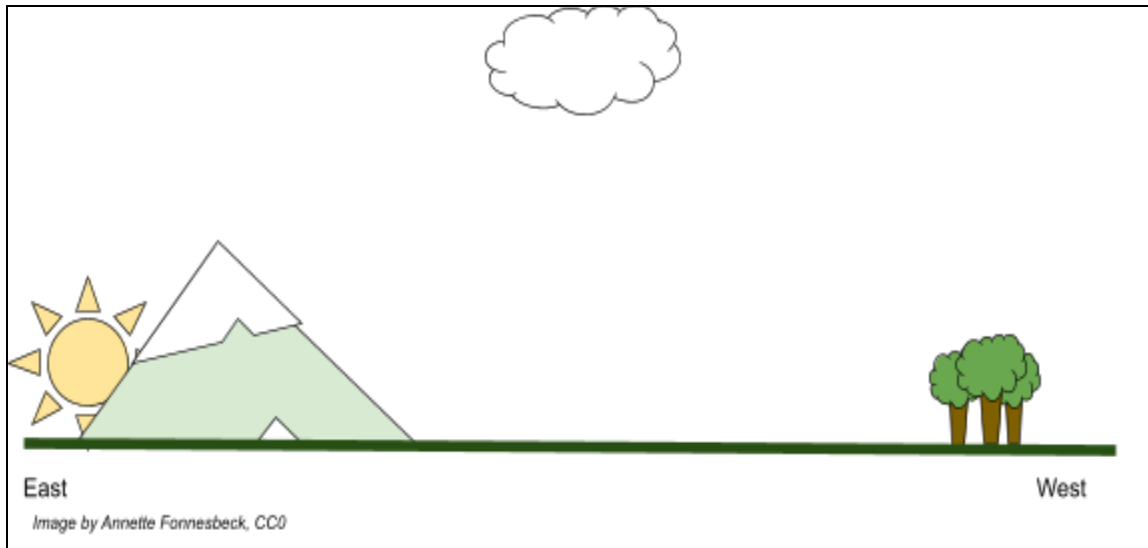
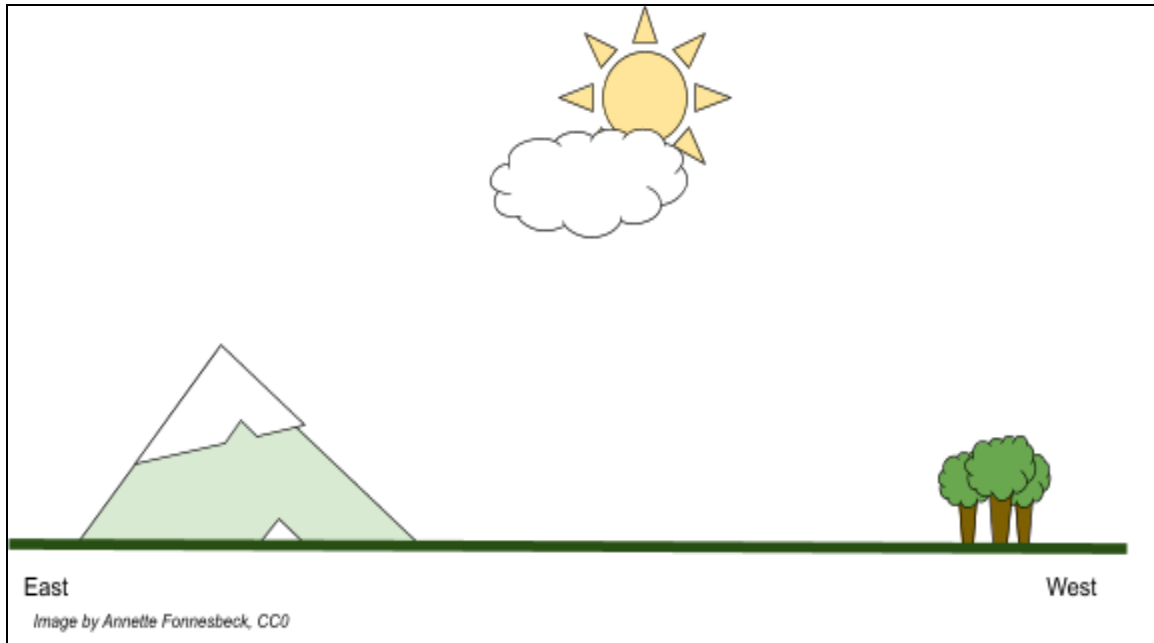


Image by Myriam Zilles (Myriams-Fotos), Pixabay.com, CC0

The sun then moves high in the sky during the middle of the day.



New Year's Day 2015 by Daniel Zimmerman, <https://flic.kr/p/qnAwk2>, CC-BY

Finally, the sun always goes down in the west.

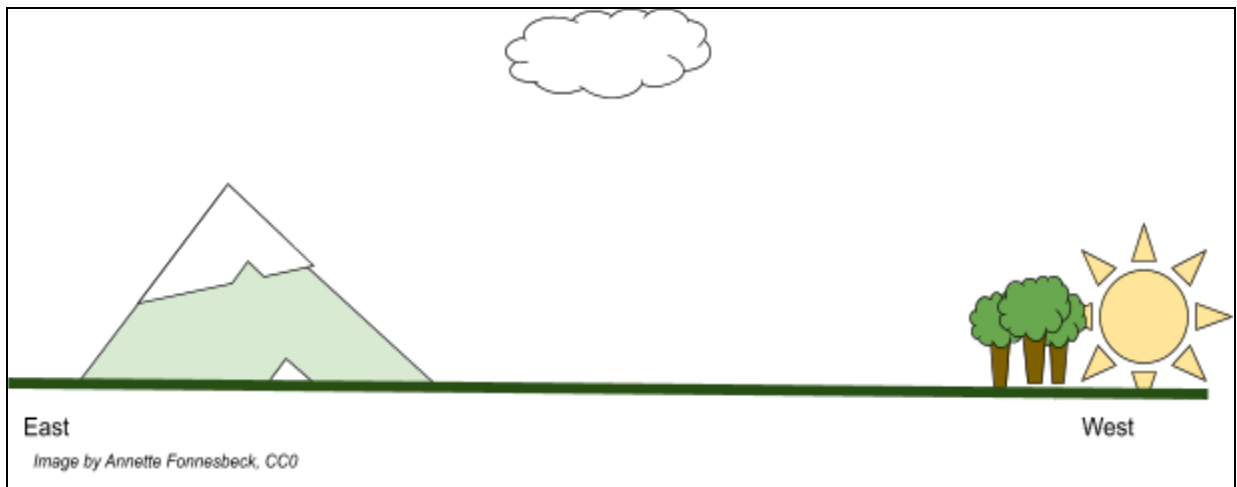


Image by karen1, pixabay.com, CC0

When the sun goes down, the day turns into night. This time between day and night is called sunset.

When the sun has gone down and no longer can be seen in the sky, it is called night. At night, we can see the stars.

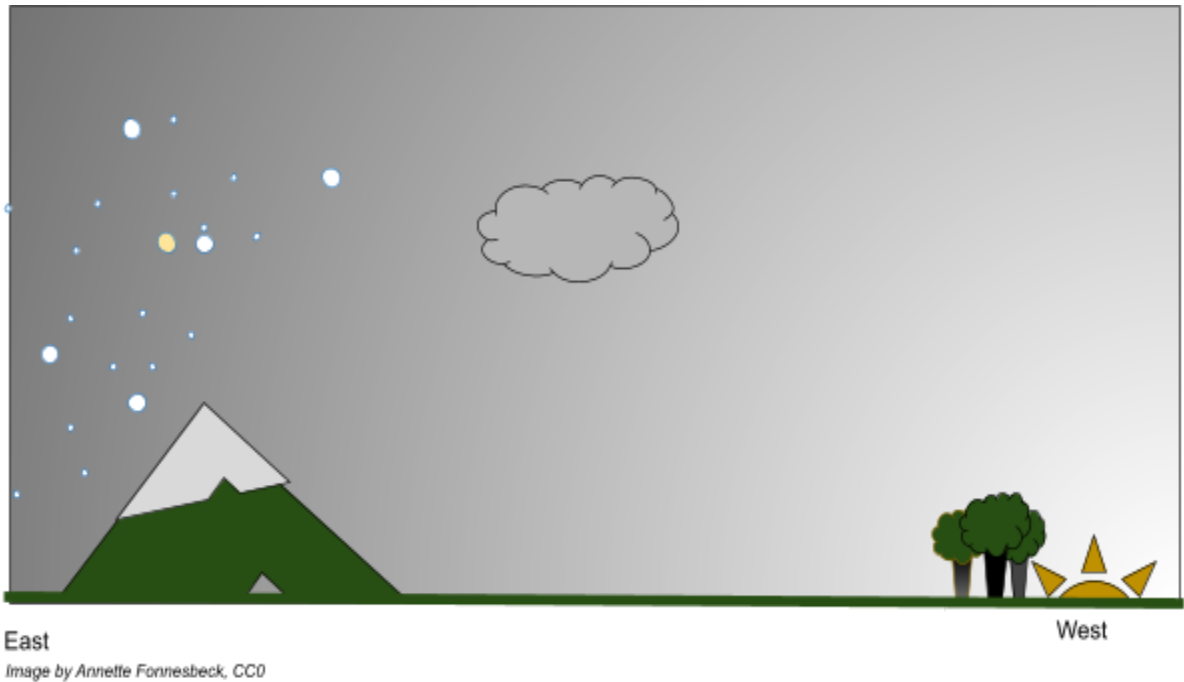


Image by Free-Photos, Pixabay.com, CC0

Stars appear to move across the sky too. They follow the same pattern as the sun.

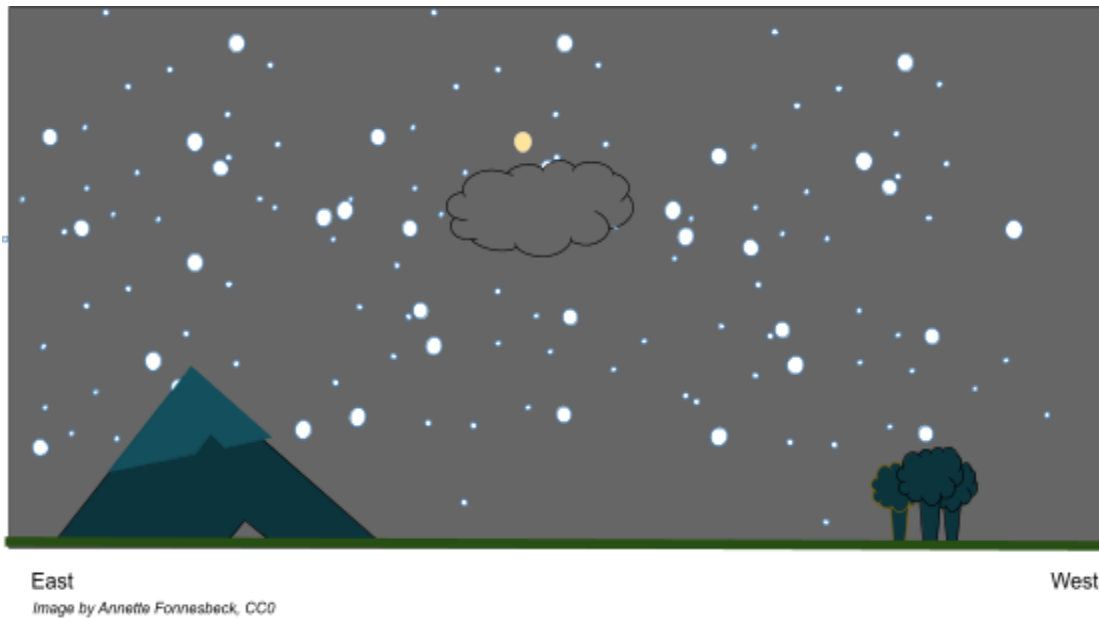
Can you remember what pattern the sun followed as it moved throughout the day?

Stars move from east to west in the same pattern as the sun. There are so many stars in the night sky it is sometimes hard to follow a star and see this pattern, but if you can pick out one star that looks different, or a group of stars that look different, you can watch the movement overnight.

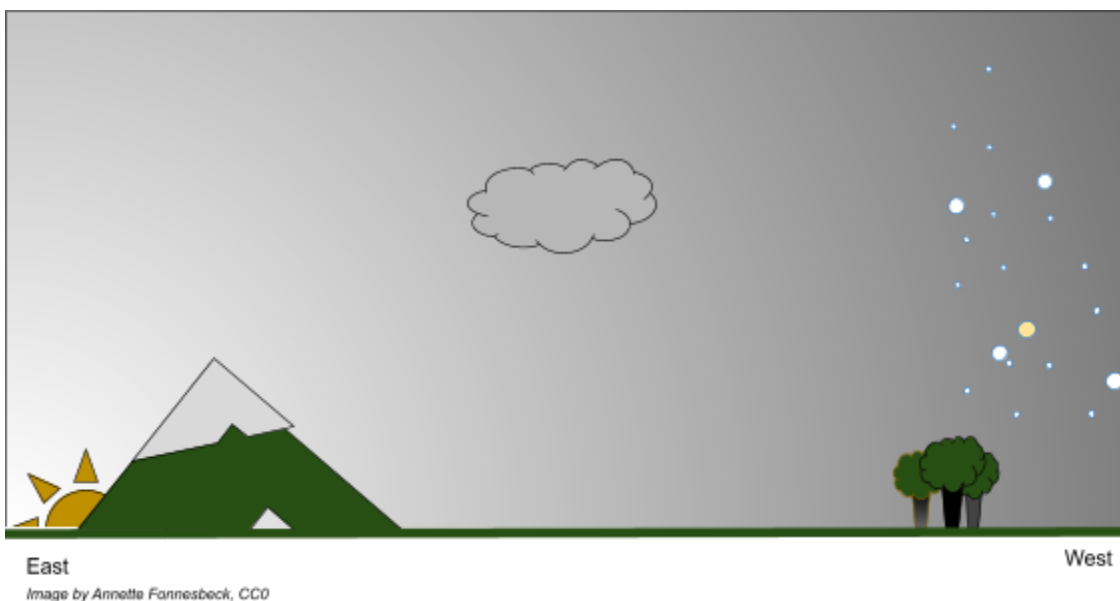


Can you find the yellow (or gray) star in this picture? Describe where it can be found. Now see if you can follow it through the pictures.

As you follow the yellow (or gray) star, you can see that it moved from lower in the east sky to higher in the middle of the sky. This happens slowly throughout the night.



When the night is almost over the yellow (or gray) star goes down in the west. You won't be able to see it during the day because the sun is too bright. Don't worry, you will be able to see it again in the east part of the sky when the sun sets and it is night time again. The stars are always there.



Sometimes at night we can also see the moon.



*Moon rise among the trees 24-01-2013 by PsJeremy,
<https://flic.kr/p/dPayni>, CC-BY*

The moon will also follow the same pattern as the sun and rise in the east and set in the west.

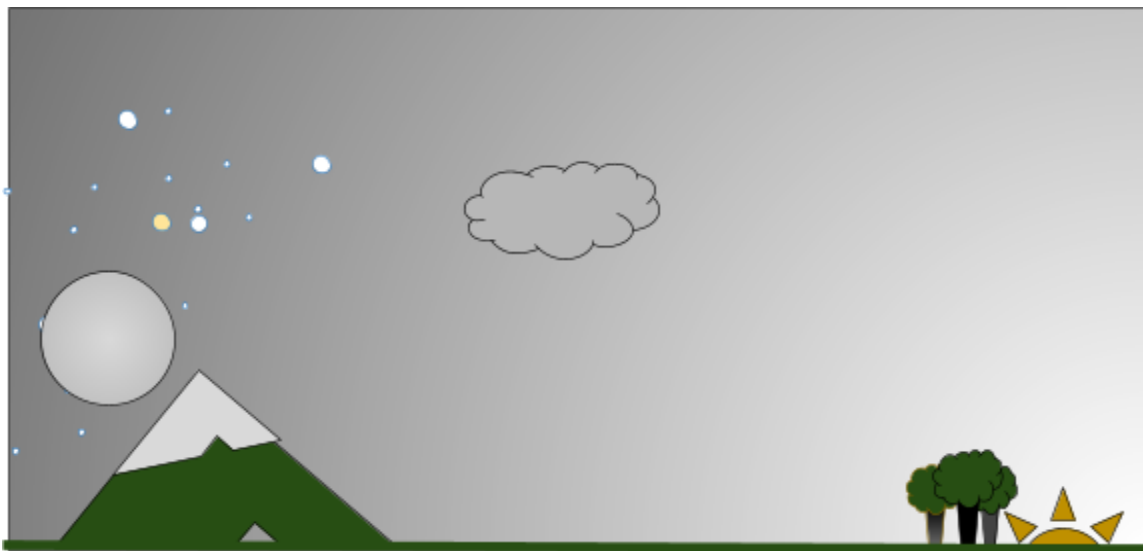


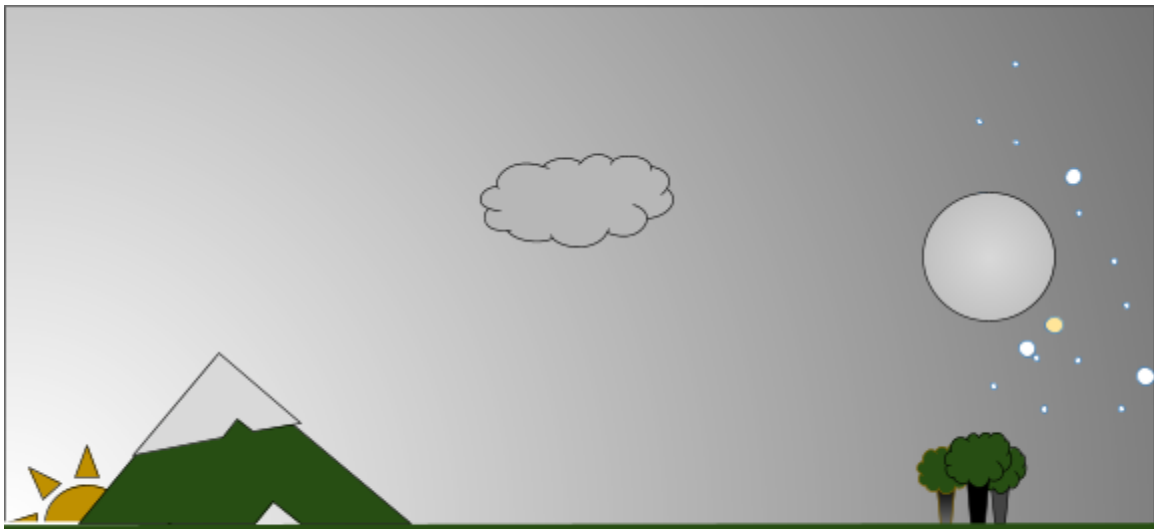
Image by Annette Fannesbeck, CC0



East

Image by Annette Fornesbeck, CC0

West



East

Image by Annette Fornesbeck, CC0

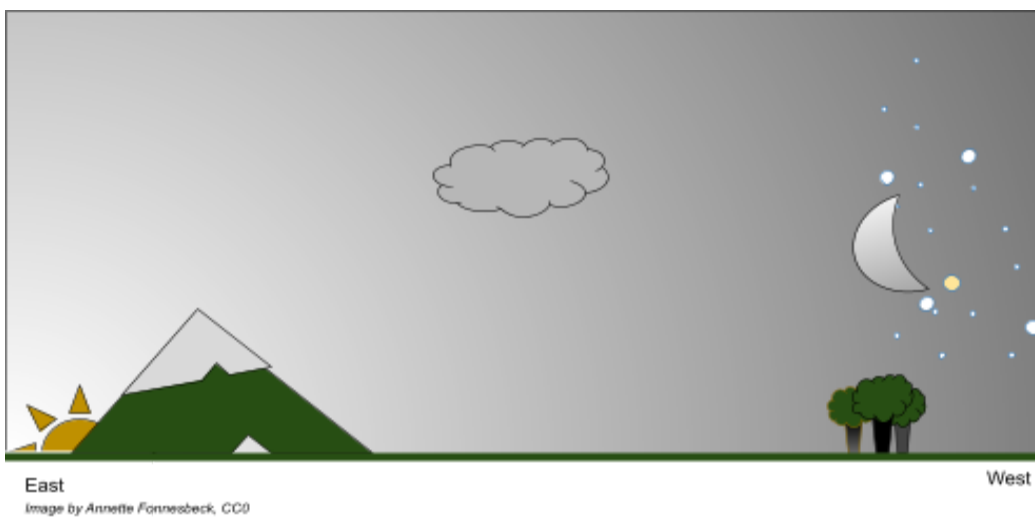
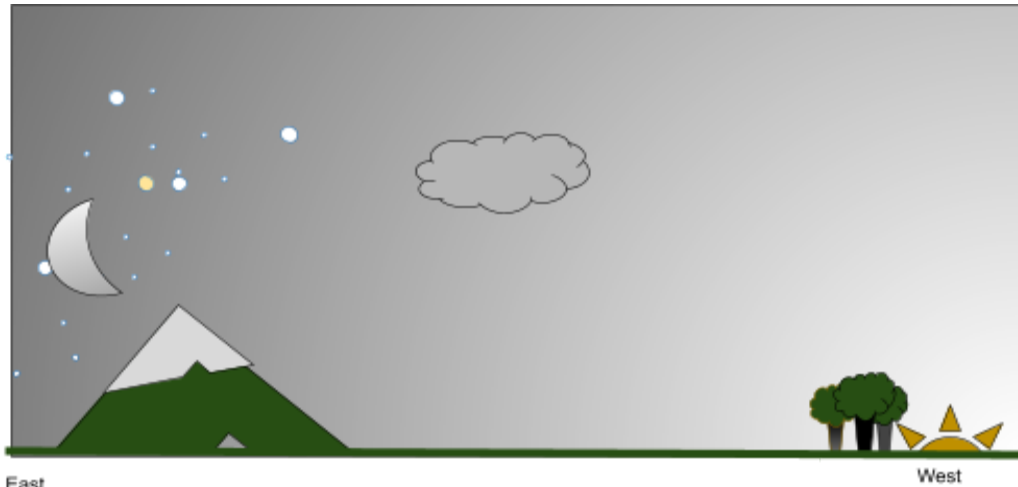
West

The moon sometimes appears to look differently. Sometimes it is a full circle and sometimes it is just a sliver of a circle.



Pixabay.com, CC0

No matter how it looks it will always rise in the east and set in the west.



1.1.1 Movement

Putting It Together



Movement of the Sun by Chloe Blanchfield, <https://flic.kr/p/9jhLrr>, CC-BY-NC-ND

In Chloe's pictures the sun appears to move.

Writing Performance Task:

In the tasks that follow, you will observe and identify patterns about how the sun moves through the sky, to predict the path the sun will follow for the rest of the day and explain why you drew the path like you did.

Gather:



Chloe took pictures of the sun as she was getting ready in the morning.

The first one was at 6:05 a.m.

The second at 6:10 a.m.

The third at 6:15 a.m.

The fourth and 6:20 a.m.

The last at 6:25 a.m.

She put all the pictures together and thinks that the sun appears to be moving in the sky.

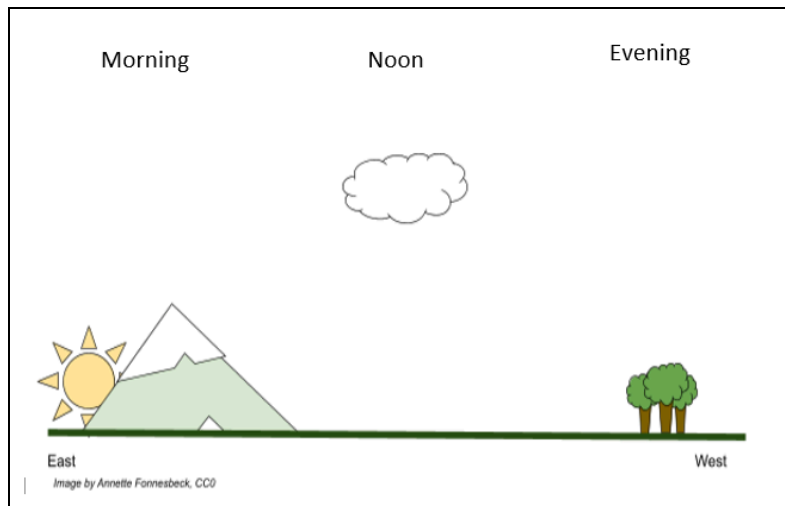
What do you notice about the sun in these pictures that Chloe took in the morning?

Reason:



What patterns do you notice in these pictures of the sun?

Communicate:



This model shows where the sun was in Chloe's last picture. Draw an arrow to show the path you predict the sun will follow throughout the rest of the day. Explain your choice.

straight arrow 

curved arrow 

zig zag arrow 

Sentence Stem:

I drew a _____ arrow

because _____

1.1.2 Time of Year

Phenomenon

Denzel noticed that sometimes during the year it is dark and sometimes it is light when he is waiting for the bus in the morning.

Going to school in August



Image by ebplgrim, Pixabay.com, CC0

Going to school in December



<https://www.deviantart.com/justraven/art/Dark-Bus-112426710>

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.1.2 Time of Year

Obtain, evaluate, and communicate information about the patterns observed at different times of the year to relate the amount of daylight to the time of year. Emphasize the variation in daylight patterns at different times of the day and different times of the year. Examples could include varying locations and regions throughout the state, country, and world.



In this section, identify the patterns of the amount of daylight observed at different times of year and if the patterns are the same everywhere.

Changing Amounts of Daylight

During the year the seasons change. There are different seasons in different parts of the world.

At the poles, there are two seasons - Summer and Winter. The poles are on the opposite sides of the earth and are considered to be the coldest places on earth. At the north pole you will find polar bears and at the south pole you will find penguins.



Image by Annette Fornasbeck, CC0

At the equator, or the middle of the earth, there are also only two seasons - wet and dry.

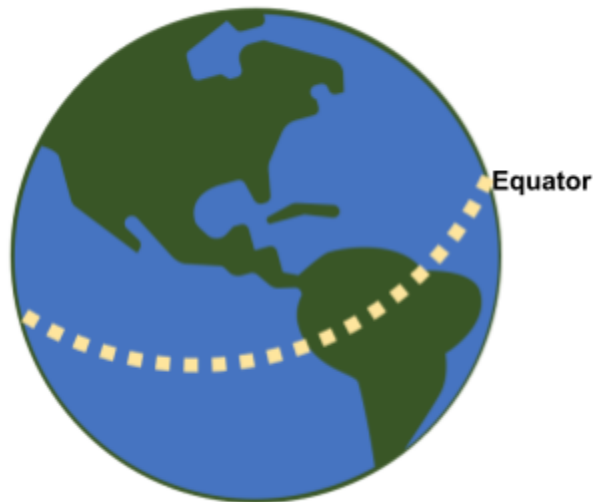


Image by Annette Fennesbeck, CC0

In between the Equator and the poles there are four seasons - winter, spring, summer, and fall.



The Four Seasons by George Hoden, PublicDomainPictures.net, CC0

In Utah, we are between the North Pole and Equator and we experience four seasons.



Image by Annette Fannesbeck, CC0

The seasons change because the amount of sunlight a location receives.

Can you see a pattern between the amount of daylight in the graph and the changes in Utah's seasons?

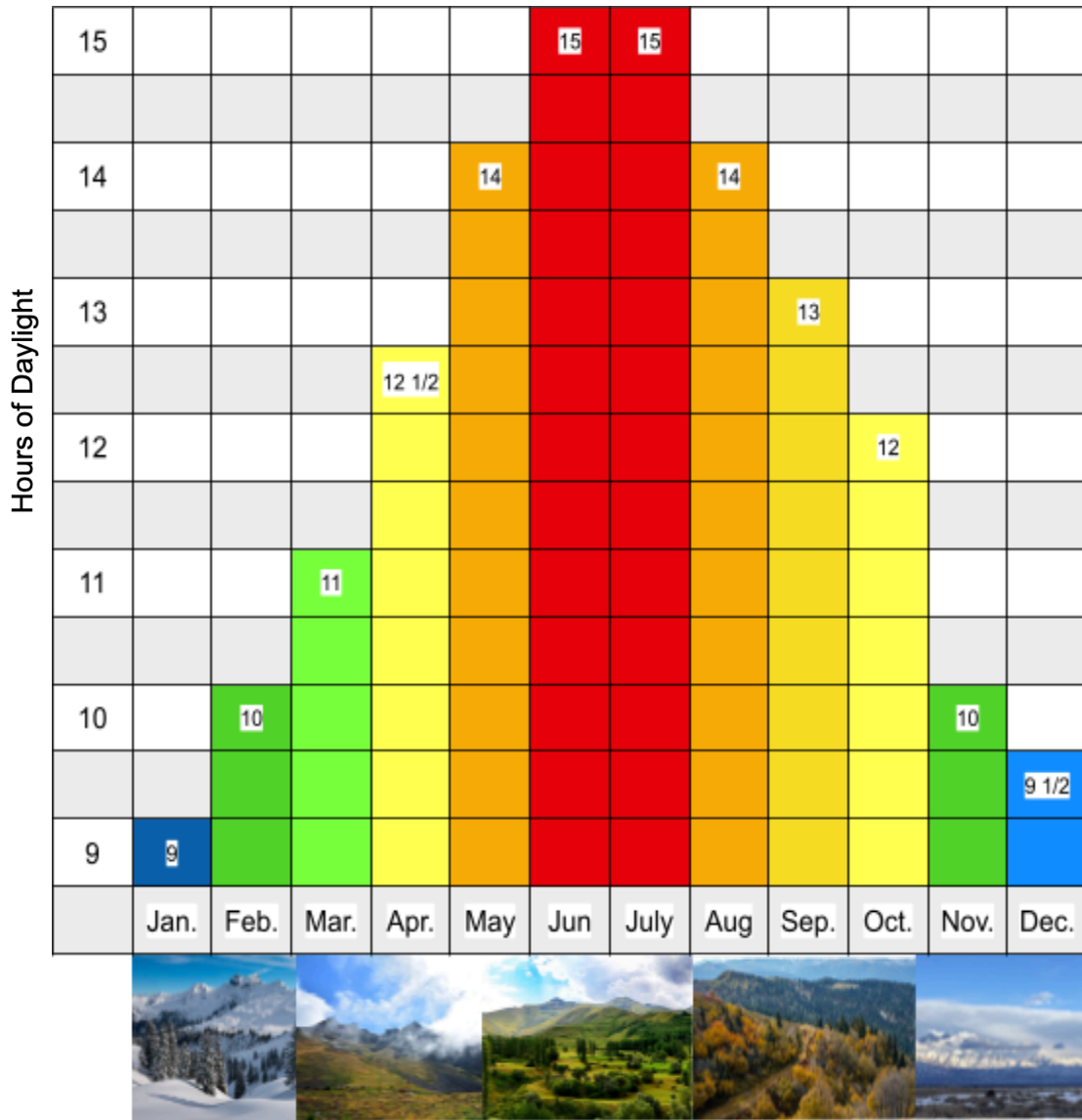


Chart by Natalie Spadafora, CC0; Images from Pixabay.com, CC0

In the summer, the days get longer and the nights get shorter. There is more daylight and the weather is warmer.



Image by StockSnap, Pixabay.com, CC0

In the winter, the days get shorter and the nights get longer. There is less daylight and the weather is colder.



Image by benralexander, Pixabay.com, CC0

Can you see a pattern between the amount of daylight in the graph and the changes in seasons in this graph?

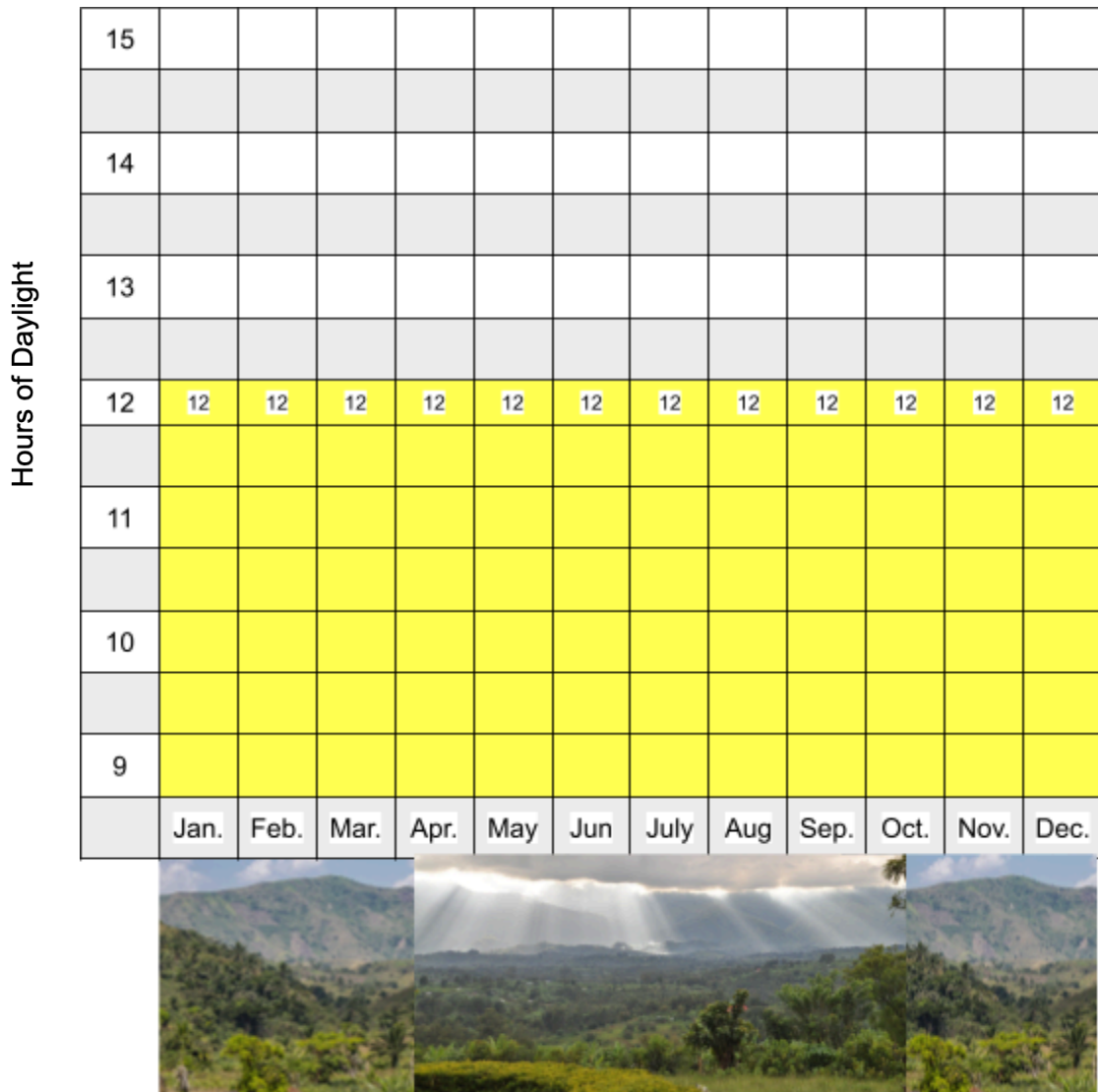


Chart by Natalie Spadafora, CC0; Images from Pixabay.com, CC0

At the equator, the daylight stays the same. The weather has almost equal times of rain and times when it is dry, but the temperature stays about the same.



Image by DEZALB, Pixabay.com, CC0

1.1.2 Time of Year

Putting it Together

Denzel noticed that sometimes during the year it is dark and sometimes it is light when he is waiting for the bus in the morning.

Going to school in August



Image by ebplgrm, Pixabay.com, CC0

Going to school in December

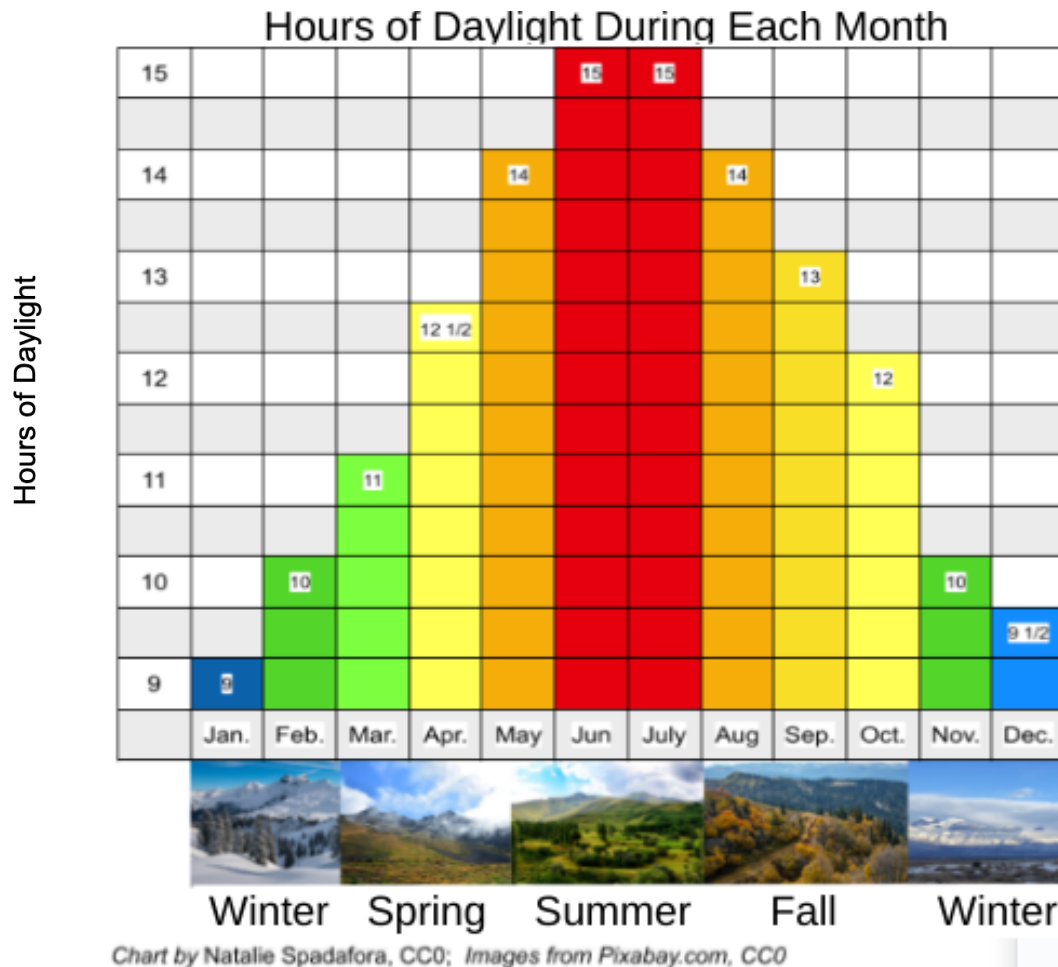


Image by ebplgrm, Pixabay.com, CC0

Writing Performance Task:

In the tasks that follow, you will observe and identify patterns about the amount of daylight observed at different times of the year.

Gather:



A. What do you notice about the patterns in the graph?

B. Are there more hours of daylight in August or December?

Reason:

What is the relationship between the seasons and the amount of daylight during each season?

Communicate:



By cuncon, Pixabay.com, CC0



By dep377, Pixabay.com, CC0

Which kids would have had more daylight to play on the day their picture was taken? Circle the picture. Explain your choice.

Sentence Stems:

They would have more daylight in _____
pictures because _____.

There would be more hours to play in the
_____ picture, because
_____.

1.1.3 Daylight Patterns

Authentic Situation



Image by piviso, Pixabay.com, CC0

I was camping in the mountains and didn't have my watch or electricity to charge my phone. I needed to know about what time of day it was (morning, afternoon, or evening). I needed a way to measure where the sun was in the sky to help me guess the time.

Observations & Wonderings

What is the problem in this situation?

What are possible criteria (positive outcomes) to this situation?

What are constraints (limitations) with this situation?

1.1.3 Daylight Patterns

Design a device that measures the varying patterns of daylight. *Define the problem by asking questions and gathering information, convey designs through sketches, drawings, or physical models, and compare and test designs.* Examples could include sundials for telling the time or tracking the movement of shadows throughout the day.



In this section, design a device that measures the varying patterns of daylight.

Shadows

When there is daylight, the sun is visible in the sky. This is because the sun is a source of light.



Image by Alexas_Fotos, Pixabay.com, CC0

All light travels in straight waves away from its source, we call these rays. When they travel from the sun we can call them sun rays. Sometimes we can see sun rays, but most of the time we don't.



Image by marcelkessler, Pixabay.com, CC0

As light travels to the earth's surface, some of the sun rays will be blocked and create shadows. Our bodies block light and we have a shadow.



<https://www.ck12.org/book/CK-12-First-Grade-Science/section/1.0/>

A tree blocks sunlight and creates a shadow.



By Simy27, pixabay.com, CC0

There are millions of other things that will block light and create a shadow. Can you think of some?



shadow by 613NN, <https://flic.kr/p/6HrAq8>, CC-BY-NC

Where a shadow appears depends on where the light is coming from. That is why shadows change directions during the day.



Happiness is... blue skies #2 by Rachel Kramer, <https://flic.kr/p/7Eajoz>, CC-BY

When the sun is rising, shadows will be long. When the sun is setting, shadows will be long.



Shadow by Kedra Miller, <https://flic.kr/p/apBaNW>, CC-BY-ND

If the Sun is above an object, the shadow will be short.

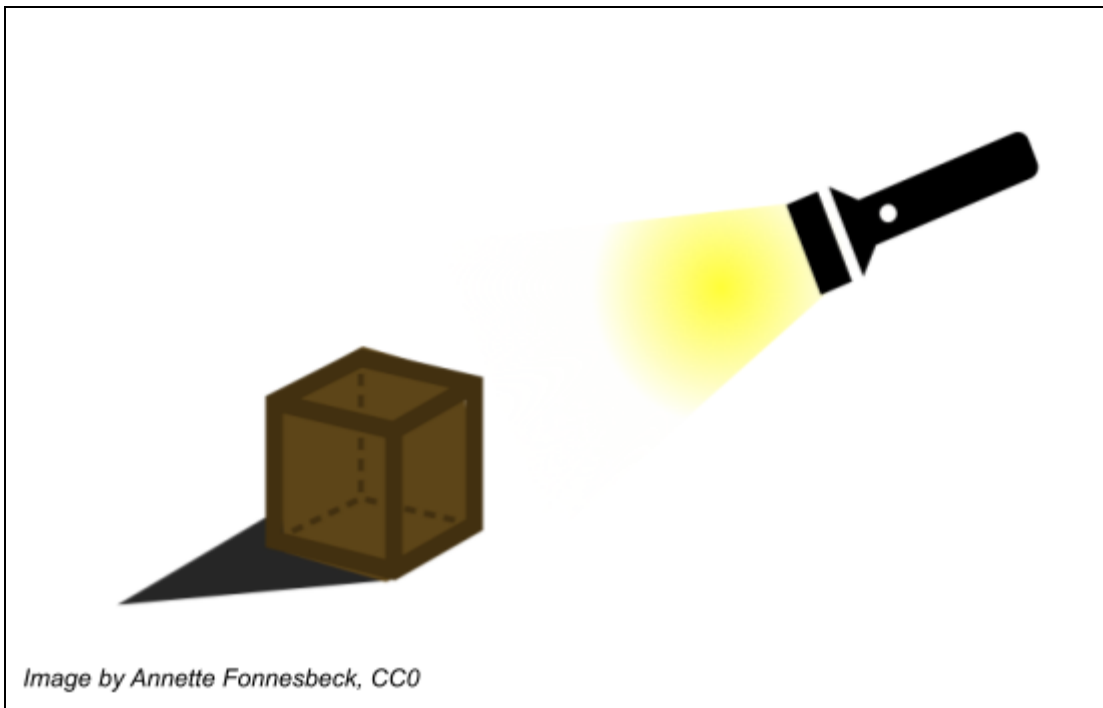
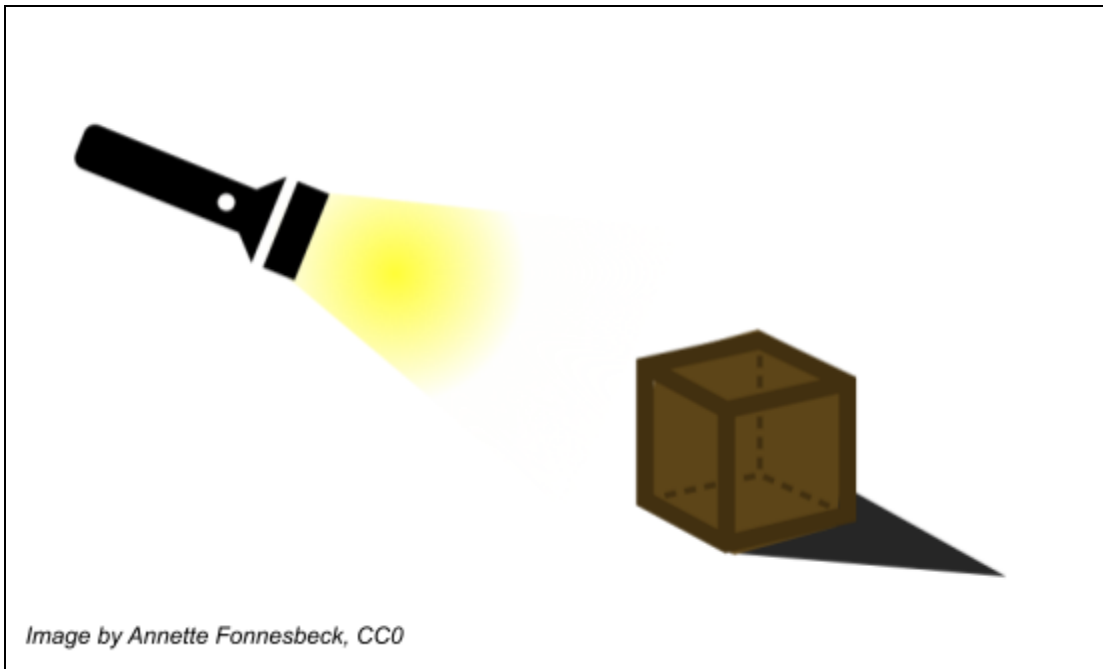


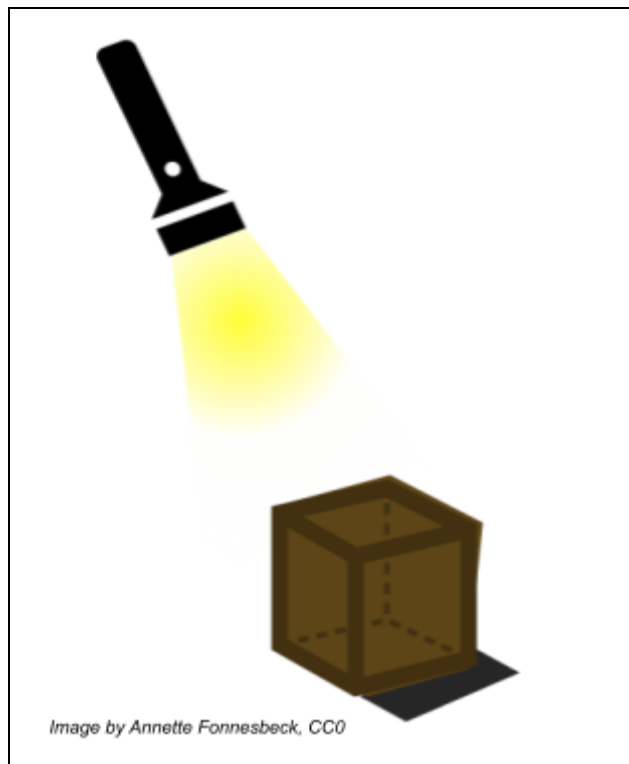
Image by Mylene2401, Pixabay.com, CC0

A shadow is always on the opposite side of the object from the light source.



Image by EvgeniT, Pixabay.com, CC0





The sun moves from east to west throughout the day. This causes shadows to change depending on what time of day it is.

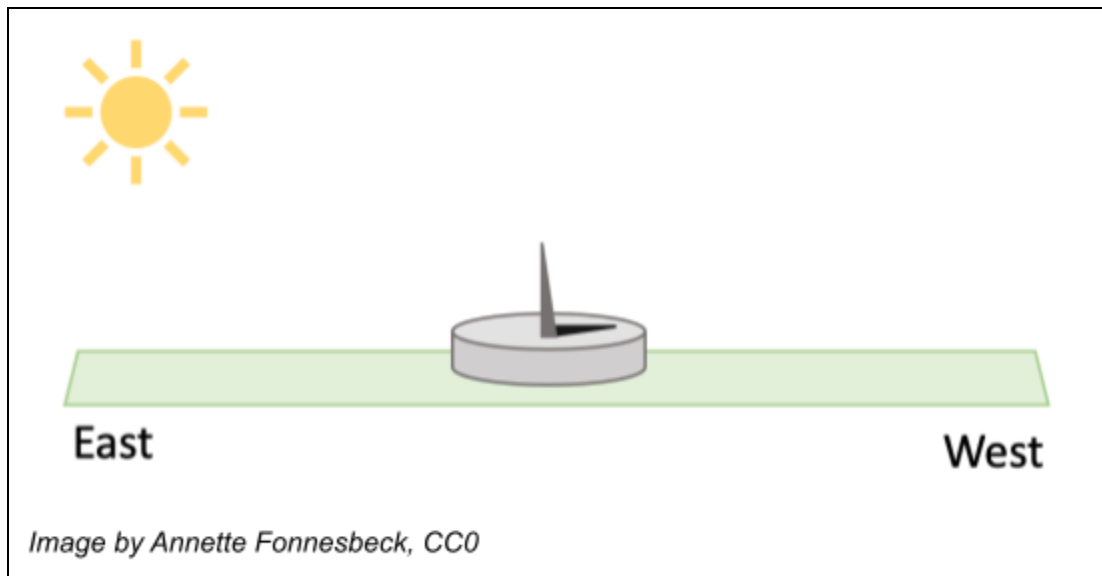
In the past, people used shadows to tell time. They measured the shadows as they moved throughout the day. Using patterns of daylight they were able to tell the time of day.



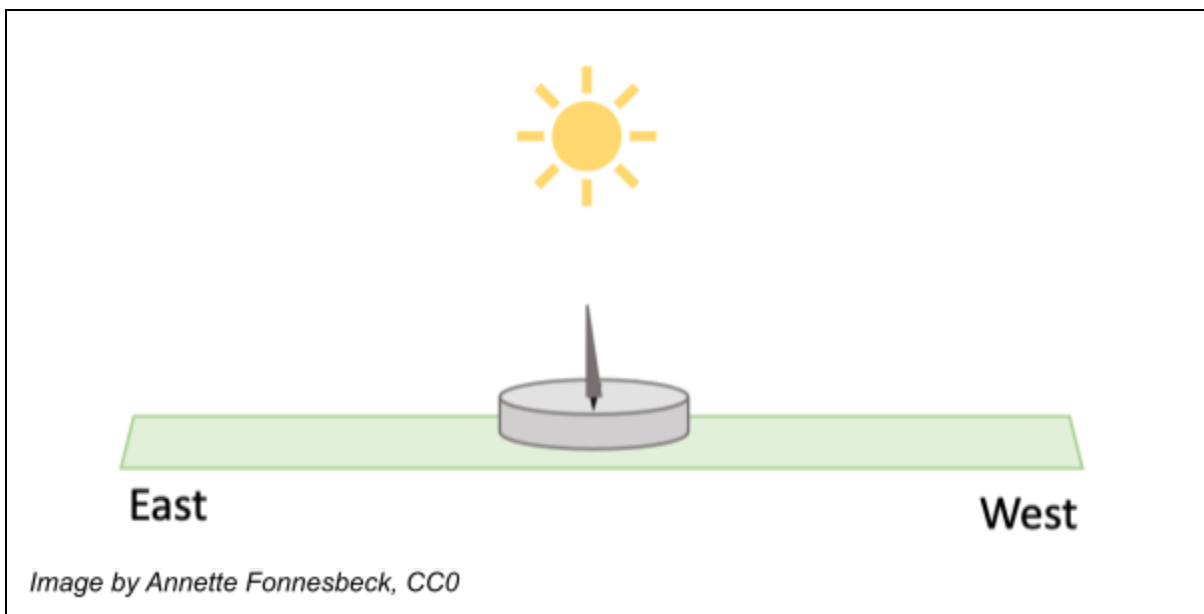
Sundial

Image by Mink Caldicott (mnc1995), Pixabay.com, CC0

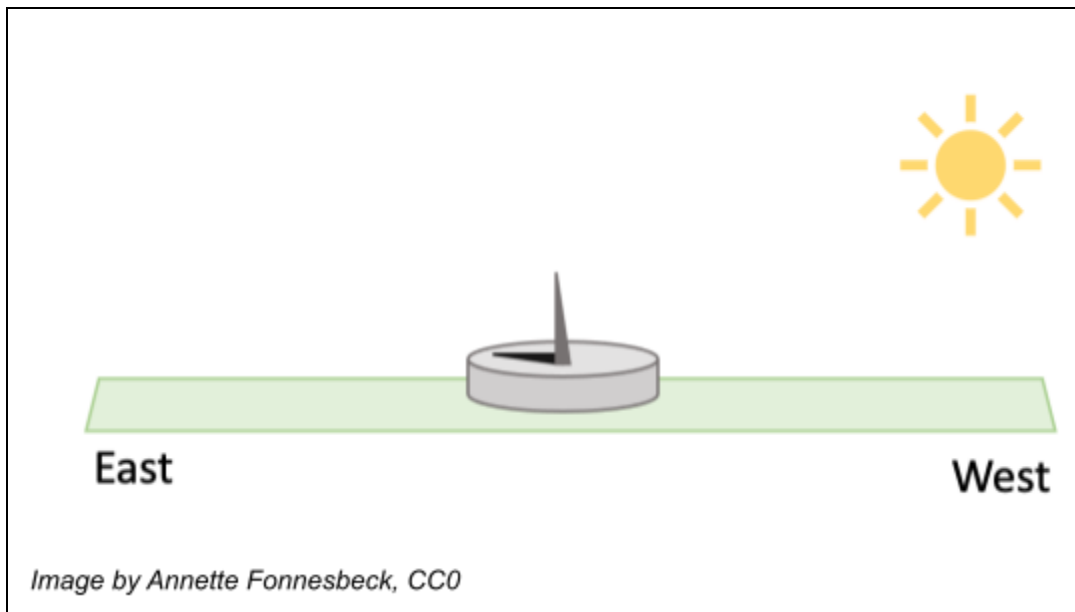
If it was early in the morning, the shadow would be long and point to the west because the sun was in the east.



If it was the middle of the day, the shadow would be short and be in the middle of the east and west side.



If it was the end of the day, the shadow would be long and point to the east because the Sun was on the west.



1.1.3 Daylight Patterns

Putting it Together



Image by piviso, Pixabay.com, CC0

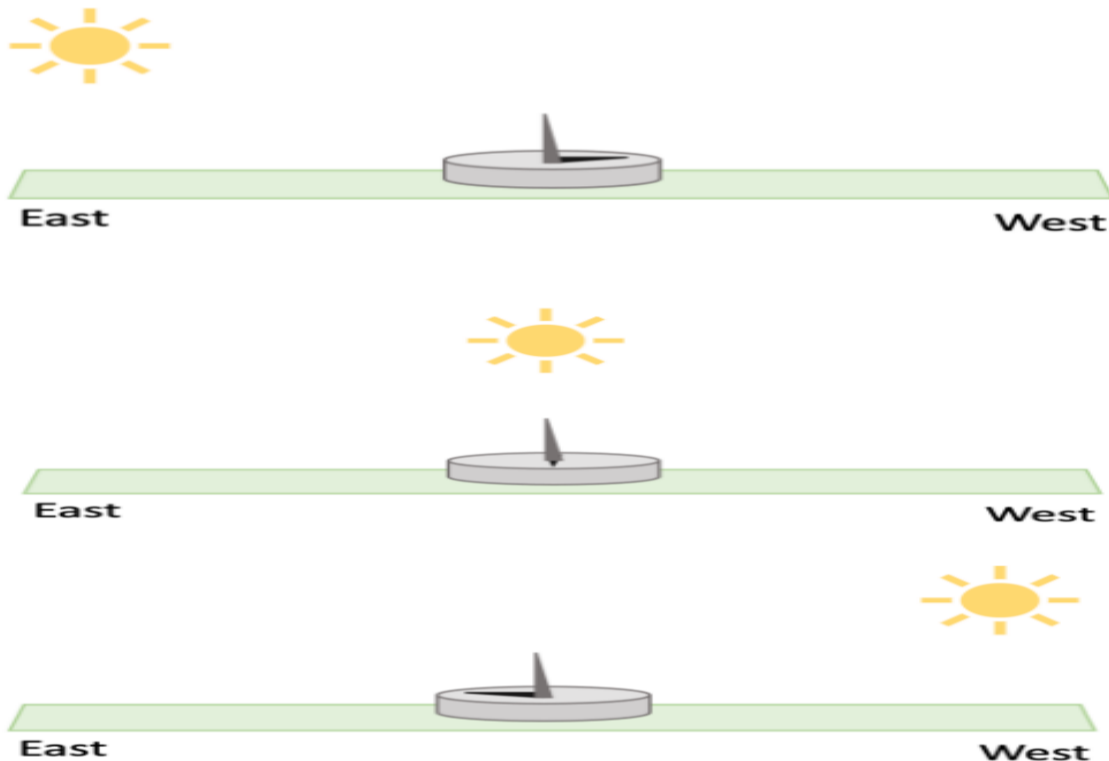
I was camping in the mountains and didn't have my watch or electricity to charge my phone. I needed to know about what time of day it was (morning, afternoon, or evening). I needed a way to measure where the sun was in the sky to help me guess the time.

Engineering Design Task:

In the tasks that follow, you will design a device that measures the patterns in daylight by tracking the movement of shadows throughout the day.

Gather:

These pictures show a sundial. A sundial casts a shadow on the ground that can help you know what time of day it is. Observe how the shadow changes throughout the day.



What do you notice about the patterns of the shadows through the day?

Reason:

Describe how your observations could be used to help determine the time of day (morning, afternoon, evening)?

Communicate:

Circle one of the following objects that would be the BEST to use for designing a device to measure the patterns of daylight throughout the day. Explain why you chose that object.

A piece of paper



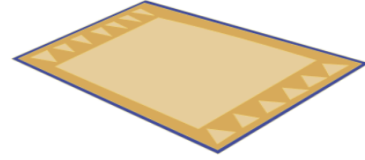
<https://www.picknik.com/paper-hand-business-card-man-holding-1868>

A traffic cone



[Download Traffic Cone, Traffic Pylon, Road Cone, Royalty-Free Vector Graphic - Pixabay](#)

A rug



<https://pixabay.com/vectors/carpet-rug-floor-pattern-texture-307744/>

Sentence Stem:

I chose the picture of _____
because _____.

Strand 2: The Needs of Living Things and Their Offspring

Strand Outline

- 2.1 Sun and Water (1.2.1)
- 2.2 Surviving Locations (1.2.2)
- 2.3 Traits of Parents (1.2.3)
- 2.4 Survival Behaviors (1.2.4)



Image by homecare119, Pixabay.com, CC0

People, plants, and animals depend on their surroundings to get what they need, including food, water, shelter, and a safe temperature. Plants and animals have parts that allow them to survive in different

environments. Young plants and animals are alike, but not exactly the same as their parents. In many kinds of animals, parents and offspring behave in ways that help the offspring survive.

1.2.1 Sun and Water

Phenomenon



Image by j bizzie, <https://flic.kr/p/c9XZ5d>, CC-BY

I moved my plant off of the shelf it was on so I could put my stuffed animal there. I sat it on the table. Two days later I noticed that the leaves were falling down and droopy.

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.2.1 Sun and Water

Plan and carry out an investigation to determine the effect of sunlight and water on plant growth. Emphasize investigations that test one variable at a time.



In this section, focus on what plants need to survive. What is the effect of these needs on their growth?

People, plants, and animals need things to survive.

Humans need food, water, and air.



Image by JWWelington, Pixabay.com CC0



Image by Gary G (GSquare), Pixabay.com, CC0

Plants need sunlight, water, and nutrients. Some plants need more sunlight and water than other plants.

If a plant does not get enough sunlight, nutrients, or water the plant will start to look sick. The leaves will change color and might droop. If a plant doesn't get enough of its basic needs, the plant will eventually die.



Image by JWWelington, Pixabay.com, CC0

Look at the trees below. The tree that gets more sunlight is healthier. It has more leaves and they are green.



Image by Annette Fannesbeck, CC0

Different plants need different amounts of sunlight and water but all plants need both to survive.

An iris needs a large amount of water and sunlight to survive. It will live and grow where it rains or where someone waters it often. It needs to be planted where the sun can shine on it for most of the day.



Image by Miki-Studio, Pixabay.com, CC0

A cactus loves a bright, sunny place but it needs very little water to live. This helps it survive in the hot, dry desert.



Image by Pexels, Pixabay.com, CC0



Image by Nähe Bonn (Anelka), Pixabay.com, CC0

Pansies need a lot of sunlight. They need a small amount of water to survive. They live and grow best where there the sun can dry out the soil and shine on them. Too much water and shade will cause the pansy to stop growing and its leaves to change colors.

A Peace Lily needs very little light and moist soil. It needs to be watered once a week to keep the ground from drying out. It also needs shade to stop the sun from burning its leaves.



Image by Adriano Gadini, Pixabay.com, CC0

A scientist that studies plants is called a botanist. Botanists plan and carry out investigations to test what plants need to grow and survive.



DaemonNoire by Jennifer Cross at the Texas A&M University Herbarium, <https://commons.wikimedia.org/wiki/File:HerbPrepLG.jpg>, CC-BY-SA

Botanists test different amounts of sunlight and water plants get. They test one thing at a time.

They observe plants to determine the effect of different amounts of water and sunlight.

Botanists observe the structure, size, and

color of a plant's leaves and roots.

Botanists have found that plants with smaller leaves need a lot of sunlight. Plants that have larger leaves will likely need more shade. The smaller leaf structure protects the plant from burning and the larger structure allows the plant to collect more sunlight.

Be a botanist. Look at the structure of the leaves.

How would you describe them? Are they big or small?



Image by ekta.varia, pxhere.com, CC0

Roots are an important structure of plants. They help the plant stay in the ground. A plant gets nutrients from the soil through its roots. The plant gets water from its roots too. Water from roots helps a plant to keep its leaves and flowers standing upright.

Be a botanist. Look at the structure of the roots.

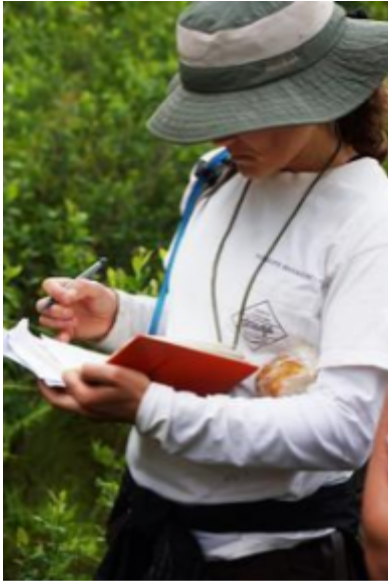
How would you describe them? Are they big or small?



Image by ekta.varia, pxhere.com, CC0

Botanists take good notes for evidence. They use their notes to help plants survive.

A botanist's notes include pictures and writing.



Gabrielle Graeter taking notes by U.S. Fish and Wildlife Service Southeast Region, <https://flic.kr/p/uyqqWv>, CC-BY

They show what happens to a plant when they give it different amounts of water and sunlight.



Image by Frederick Edwin Church, Public Domain

Remember, different plants need different amounts of sunlight and water but all plants need both to survive.

1.2.1 Sun and Water

Putting it Together

Let's revisit this phenomenon.



Image by j bizzie, <https://filc.kr/p/c9XZ5d>, CC-BY

I moved my plant off of the shelf it was on so I could put my stuffed animal there. I sat it on the table. Two days later I noticed that the leaves were falling down and droopy.

Writing Performance Task:

In the tasks that follow, you will be planning an investigation and providing an explanation to show the effect of sunlight on plant growth.

Gather:



Stock free image

What do you notice about this plant?

Reason:

Why does the plant look like it does, and what does the plant need to get better?

Communicate:

A. We're going to plan an investigation. Order the steps that would be used to conduct the investigation (use numbers 1,2,3,4).

- ☐ Record your observations about the plants each day for a week.
- ☐ Choose two plants that are the same size.
- ☐ Plan the investigation.
- ☐ Place one plant in a sunny place and one in the dark.

B. I put one plant in the windowsill and one in the cupboard. Which one would be more healthy? Why?

1.2.2 Surviving Locations

Phenomenon



Image by Free-Photos, Pixabay.com, CC0

My family and I watched a movie about desert animals. It showed a coyote, rabbit and squirrel. They were eating and playing during the nighttime and asleep in the daylight.



Image by Skeeze, Pixabay.com, CC0



Image by Tom Ferguson, Pixabay.com, CC0



Image by Skeeze, Pixabay.com, CC0

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.2.2 Surviving Locations

Construct an explanation by observing patterns of external features of living things that survive in different locations. Emphasize how plants and nonhuman animals, found in specific surroundings, share similar physical characteristics. Examples could include that plants living in dry areas are more likely to have thick outer coatings that hold in water, animals living in cold locations have longer and thicker fur, or most desert animals are awake at night.



In this section, look for patterns that help plants and animals survive in their environment.

Plants and animals have features or parts that help them survive in their environment. Some of these features help them to get food, stay protected, move around, and maintain a safe temperature.

Animal Features

Dogs are some of the most loved animals. Many people have them as pets. They have features to help them move, eat, and stay at a safe temperature.



Image by Claudia (bella67), Pixabay.com, CC0



Image by Darlie Worton, CCO

A dog uses its legs to move. It has a long tongue to help it lap up water and sharp teeth to chew its food. Dogs will often pant or breathe heavily to stay cool. They have fur to keep them warm.



Contemplative Pup by Normanack, <https://i.flic.kr/p/6X35Vw>, CC-BY



Jamie in the Snow by Normanack, <https://i.flic.kr/p/4hPXou>, CC-BY

A polar bear lives in the Arctic where it is very cold. The polar bear's fur also helps keep it safe by camouflaging. That means it helps the polar bear to hide or blend in with the white snow.



Image by User 358611, Pixabay.com, CC0

Both Polar bears and Brown bears have thick fur and a layer of fat to help protect them from the cold environments they live in.



Image by Robert Balog (bergadder), Pixabay.com, CC0

Bears have long, sharp claws used for getting food, digging, and walking in the snow. They like to catch and eat fish. Small bears use their claws to climb trees.



Image by User 12019, Pixabay.com, CC0

Birds have beaks that help them get food and gather items to build nests for shelter.



Image by Skeeze, Pixabay.com, CC0

A hummingbird eats small insects and nectar from flowers. Its long, pointed beak allows it to get deep inside a flower and suck out the nectar. Most hummingbirds live in forests, meadows, and grasslands where there are lots of flowers.

This bird is called an Oystercatcher. It has a long, flat beak that is good for grabbing things like insects, worms, grass and small twigs.



Image by Kobus van Leer, Pixabay.com, CC0



Image by congerdesign, Pixabay.com, CC0

This parrot has a curved beak. It is useful for cracking and eating seeds and nuts. It also eats fruits and vegetables. Parrots live in warm places.

Squirrels use their hands to hold their food. They usually live in wooded areas and like to be in trees where there are a lot of nuts, seeds and fruit for them to eat.



Image by PublicDomainPictures, Pixabay.com, CC0

A giraffe eats leaves and shrubs. Its long neck helps it to get food off of the tall trees in the Savannah where it lives.



Image by HowardWilks, Pixabay.com, CC0

A fish has fins to help it move in the water. Its body covering is made of slippery scales that help protect it and make it hard for other sea animals to catch it.



Image by Pexels, Pixabay.com, CC0



Image by Karsten Paulick, Pixabay.com, CC0

Both of the animals below live near water.

The stork is using its beak to get twigs to build a nest high in the trees for shelter. Its long legs and pointy beak helps it to walk in the shallow water and catch fish to eat.



Image by Alexas_Fotos, Pixabay.com, CC0



Photo by bodellia, goodfreephotos.com, Public Domain

A beaver has teeth made for chewing wood. They can take down a tree using nothing but their teeth! Beavers make their shelters out of sticks, mud, and rocks.



Image by Asifort5, Pixabay.com, CC0



Image by IStock Free Image #937298644

Chameleons live in the desert or rainforests. They are the masters of camouflage. When they live in the desert, they are brown. When they live in the rainforest, they are green. This helps them stay safe. Chameleons have a long, sticky tongue used for catching insects.

Some desert animals are cold blooded. Their skin is tough and scaly. This helps them to survive in the dry desert. Unlike people, they need the sun to keep their bodies at a safe, warm temperature.



Image by LoggaWiggler, Pixabay.com, CC0

In their desert environment, the daytime temperature is very hot. This is perfect for them to find a warm rock and soak up the heat.

These reptiles include chameleons, iguanas and snakes. At nighttime, they rest because the desert temperature gets really cold.



Image by FotoRabe, Pixabay.com, CC0

There are so many different features that help animals live in their environment. Can you think of other animal features that help an animal to survive?

Plant Features

Plants also have features that help them.

Plants have leaves to absorb sunlight.



Image by Ilona (Couleur), Pixabay.com, CC0

A tree has bark to protect it from animals and weather.



Image by Peter H (Tama66), Pixabay.com, CC0

A cactus has needles to protect it from animals. It has thick outer covering to help hold water in and keep it from drying out.



Image by stanbalk, Pixabay.com, CC0



Image by Albert Dezetter (DEZALB), Pixabay.com, CC0



Image by Ulrike Leone (ulleo), Pixabay.com, CC0

Other plants that live in dry places have tough, waxy surfaces to hold in water too.



Image by tammd, Pixabay.com, CC0



Image from Pixabay.com, CC0

1.2.2 Surviving Locations

Putting it together



Image by Free-Photos, Pixabay.com, CC0

My family and I watched a movie about desert animals. It showed a coyote, rabbit and squirrel. They were eating and playing during the nighttime and asleep in the daylight.



Image by Tom Ferguson, Pixabay.com, CC0



Image by Skeeze, Pixabay.com, CC0



Image by Skeeze, Pixabay.com, CC0

Writing Performance Task:

In the tasks that follow you will construct an explanation to describe the patterns in animal features that help them to survive in their environments.

Gather:



Image by Free-Photos, Pixabay.com, CC0



Image by Skeeze, Pixabay.com, CC0



Image by Tom Ferguson, Pixabay.com, CC0



Image by Skeeze, Pixabay.com, CC0

Describe the patterns in the environment and animal features you see in the pictures.

Reason:

A. What patterns in animal features help them survive in warm and cold temperatures?

B. What clues do you see that can tell you if it is a warm or cold environment? Is the temperature warmer or colder during the daytime in this environment?

Communicate:

A. Choose an animal from the pictures below and complete the sentence by circling the correct answers.



Image by FotoRabs, Pixabay.com, CC0



Image by Duckycards

The *snake/bunny* will be *asleep/awake* during the daytime because it has *fur/scales* and needs to stay *warm/cool* to survive in the desert.

B. Construct an explanation about why you chose those specific words to complete your sentence.

1.2.3 Traits of Parents

Phenomenon



Image by Robert Greene, Pixabay.com, CC0



Image by Christine Sponchia, Pixabay.com, CC0

This lion is the parent of the lion cub on the right.

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.2.3 Traits of Parents

Obtain, evaluate, and communicate information about the patterns of plants and nonhuman animals that are alike, but not exactly like, their parents. An example could include that most carrots are orange and shaped like a cone but may be different sizes or have differing tastes.



In the section, identify patterns in plants and animals that are alike, but not exactly like their parents.

Animal and Plant Groups

There are millions of different types of plants and animals! Some types of animals share the same features, but they are very different from each other.



Image by Surprising_Shots, Pixabay.com, CC0



Image by AnnaER, Pixabay.com, CC0



Image by maxmann, Pixabay.com, CC0

For example, all birds have two legs, beaks, and feathers, but they are very different from each other.

All fish have fins, a backbone, and live in the water, but they are not all the same size or color.



Image by usefoto, Pixabay.com, CC0



Image by christels, Pixabay.com, CC0

All insects have three body parts, six legs, compound eyes, and antennae.



Image CCO Flickr

There are over a million different types of insects in the world!



Images by TieuBaoTruong (left), Ralphs_Fotos (center), and petrshule (right) Pixabay.com, CC0

Inherited Traits

Plants and animals of the same type share some of the same features. However, they are very different! When plants and animals have babies, or offspring, they are more alike. Yet they still aren't exactly the same as their parents.

A chick looks like an adult chicken but not exactly.



Image by Phillip Kleindienst (onefox), Pixabay.com, CC0



Image by Hung Nguyen (vipbum), Pixabay.com, CC0

How are they the same?

How are they different?

A puppy looks like an adult dog but not exactly.



Image by Free-Photos, Pixabay.com, CC0



Image by Petra (Pezibear), Pixabay.com, CC0

How are they the same?

How are they different?

A tadpole looks like an adult frog but not exactly.



Image by Kei Rothblack, Pixabay.com, CC0



Image by Couleur

How are they the same?

How are they different?

Can you think of other animals whose offspring look similar but not exactly the same?

How are they the same?

How are they different?

Plants have offspring too. Like animals they are not exactly the same as their parents. This may include size, shape, color, and taste.

A corn shoot looks like a full grown corn stalk but not exactly.



Corn by vistavision, <https://flic.kr/p/6wP2X4>, CC-BY-NC-ND



Image by Pexels, Pixabay.com, CC0



Image by Nicole Pankalla (Medienservice), Pixabay.com, CC0

How are they the same?

How are they different?

A bean sprout looks like a full grown bean plant but not exactly.



Image by annawaldl, Pixabay.com, CC0



Image from Pixabay.com, CC0

How are they the same?

How are they different?

Plants and animals look similar to their offspring but they are not exactly the same. All living things have their own unique features.

1.2.3 Traits of Parents

Putting it Together



Image by Robert Greene, Pixabay.com, CC0



Image by Christine Sponchia, Pixabay.com, CC0

This lion is the parent of the lion cub on the right.

Writing Performance Task:

In the tasks that follow you will be obtaining, evaluating, and communicating information about how patterns observed in the features of a parent and offspring can be alike, but not exactly the same.

Gather:



Retrieved from: <https://gather.com/en/photos/2445153> Creative Commons license

What patterns do you notice about the parent and offspring in this picture?

Reason:



Retrieved from: <https://gather.com/en/photos/2445153> Creative Commons license

A. How are the animals the same and how are they different?

B. Evaluate why none of the offspring look exactly like the parent?

Communicate:

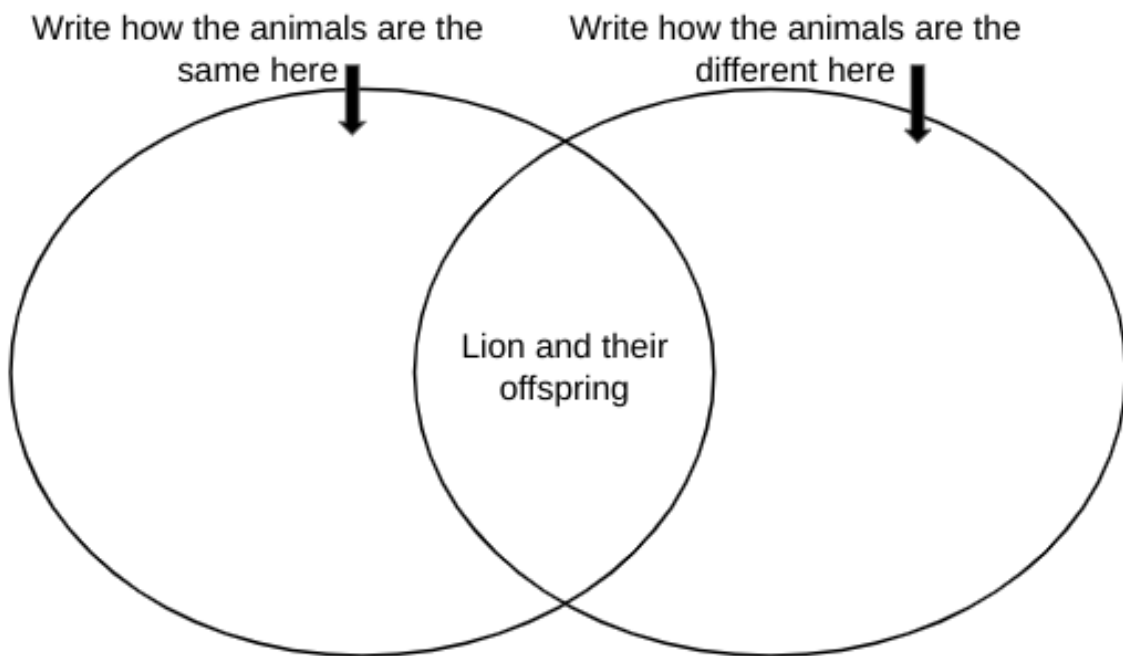


Image by Robert Greene, Pixabay.com, CC0



Image by Christine Sponchia, Pixabay.com, CC0

Using the pictures above, complete the following venn diagram:



1.2.4 Survival Behaviors

Phenomenon



Image by jcrane, pixabay.com, CC0

We are learning about penguins at school. My teacher said that some types of penguins build a nest of rocks, and they keep their baby eggs between their legs.

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.2.4 Survival Behaviors

Construct an explanation of the patterns in the behaviors of parents and offspring which help offspring to survive. Examples of behavioral patterns could include the signals that offspring make such as crying, chirping, and other vocalizations or the responses of the parents such as feeding, comforting, and protecting the offspring.



Look for patterns in the behaviors of animals that help the offspring survive.

Behaviors of Animals

Plants, animals and people behave in ways that protect their offspring. Even the babies do things to keep themselves safe.

Some dangers include other animals or predators, weather, getting lost and starving.

Here are some patterns of behavior that scientists have observed.

Birds build nests to protect their eggs and chicks. The nest protects them from other animals, bad weather and keeps them warm.



Image by Dean Ward, Unsplash.com, CC0



Image by Maurice Shaulker, unsplash.com, CC0

Sea Turtles bury their eggs to protect them from predators. Burying the eggs keeps their shells moist and helps them to stay at a safe temperature.



Image by Skeeze, pixabay.com, CC0



1st leatherback sea turtle nest by U.S. Fish and Wildlife Service Headquarters, <https://flic.kr/p/bAmcTt>, CC-BY

Elephants stand in circles around the young elephants. The babies are protected by other large elephants.



Image by cocoparisienne, pixabay.com, CC0

Kangaroos carry their young in their pouches on their stomachs. This keeps them close to their mother and makes it easier to travel.



Image by Ethan Brooke (seoulinspired), pixabay.com, CC0

Penguins sing a song that only their young know. Their stone nests keep their babies safe from the sinking wet ground where they live.



Gentoo Penguin with Chicks by Liam Quinn,
<https://flic.kr/p/ak21az>, CC-BY-SA

A female deer is called a doe and a baby deer is called a fawn. The doe will leave their fawns in tall grass to hide them from predators.



Image by smarko, pixabay.com, CC0



Image by Robert Jones (bones64), pixabay.com, CC0

Female sheep are called ewes and baby sheep are called lambs. Ewes recognize their baby lambs by smell.



*Image by David Porter (pooch_eire),
pixabay.com, CC0*

Puppies whine to let their mom know they are hungry.



Mom and Her Puppies by born1945, <https://flic.kr/p/93qmGR>, CC-BY

Ducklings follow their mothers everywhere. They don't want to get lost!



Image by skeeze, pixabay.com, CC0

Human babies cry when they are hungry or hurt. This tells their parents that they need something.



Image by Joffi, pixabay.com, CC0

Plants even behave in ways that help their offspring survive. They will produce seeds when the weather is safe. This allows the seed to live and grow.

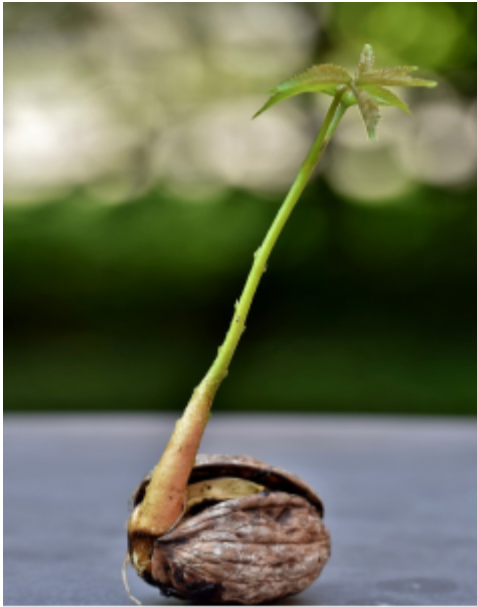


Image by Ralphs_Fotos, pixabay.com, CC0



Image by Konevi, pixabay.com, CC0

1.2.4 Survival Behaviors

Putting it Together

Let's revisit the phenomenon.



Image by jcrane, pixabay.com, CC0

We are learning about penguins at school. My teacher said that some types of penguins build a nest of rocks, and they keep their baby eggs between their legs.

Writing Performance Task:

In the tasks that follow, you will be using patterns in behaviors in both parent and offspring to construct an explanation as to why these behaviors lead to survival.

Gather:



Picture found from: <https://www.gettyimages.com/detail/photo/stock-photos-images/1111111111> Creative commons license



Picture sourced from: https://commons.wikimedia.org/wiki/File:Turned_Lark_-_Cremophila_alberta_realiza_hopping_baby_birds_gape_soon_hopping_in_nest_Alberta_Canada_3201523.jpg Creative commons license.

What behaviors do you see?

Reason:



Picture sourced from: <https://www.shutterstock.com/image-photo/young-drinking-milk-bottle-in-hands-of-mother-72323101> Creative commons license.



Picture sourced from: <https://i.pinimg.com/originals/c/7/7/c/77c954c77c959148044306d956ab75298863222.jpg> creative commons license.



Picture sourced from: <https://www.deviantart.com/takosart/art/Scorpion-Mother-and-Babies-251462076> creative commons license.

How do the patterns of behavior in animals that you have observed help them to survive?

Communicate:

A. Draw a line from the picture to the sentence that describes the survival behavior shown:

This parent is protecting its offspring.



Picture sourced from:
<https://www.pexels.com/photo/young-woman-holding-baby-in-hands-of-car-seat-723012/> Creative Commons license.

This parent is feeding its offspring.



Picture sourced from:
<https://i.pinimg.com/originals/c/7/7/c/959148044386056ab7556883222.jpg> creative commons license.

This parent is comforting its offspring.



Picture sourced from: <https://www.dailymail.co.uk/science/article?search=Scorpion-Mother-and-Babies-21486079> relative commons license.

B. Explain to a partner why behaviors like these are needed to help the offspring survive.

Strand 3: Light and Sound

Chapter Outline

- 3.1 Sound Vibrations (1.3.1)
- 3.2 Effects of Light (1.3.2)
- 3.3 Light Pathways (1.3.3)
- 3.4 Communication (1.3.4)



Image by Jill Wellington, pixabay.com, CC0

Sound can make matter like air, water and other things vibrate. Vibrating matter can make sound. Objects can only be seen when light is there to shine on them. Some objects give off their own light. Some materials allow light to pass

through them, others allow only some light to pass through them, and still others block light and create a dark shadow on the surface beyond them where the light cannot reach. Mirrors can be used to change the direction of light. People use a variety of devices that may include sound and light to communicate over long distances.

1.3.1 Sound Vibrations

Phenomenon



Adapted from image by truthseeker08, pixabay.com, CC0



Image from OpenClipArt-Vectors, pixabay.com, CC0

Misha likes to do yoga poses. She hums while she exercises, making an “mmmmmmmmmm” sound and she feels the vibration in her throat. She tried to hum while exercising the other day. She had a stuffy nose and couldn’t make the sound or feel any vibrations.

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.3.1 Sound Vibrations

Plan and carry out an investigation to show the cause and effect relationship between sound and vibrating matter. Emphasize that vibrating matter can make sound and that sound can make matter vibrate.



In this section, learn how vibrations cause and effect sound.

Sound



Image by lookpic, pixabay.com, CC0

Put your hand on your throat.

What do you feel when you talk?

What do you feel when you are not talking?

When you talked did you feel a buzzy feeling? This feeling is a vibration. Vibration means to quickly move back and forth or up and down. People have vocal cords in their throats. When we speak or sing our vocal cords vibrate and we breathe air out. This is how we make sound.

When your vocal cords vibrate they create waves in the air. This is how some sounds are made.

The vibrations from your vocal cords make vibrations in the air. When the air waves travel to another person they hear the sound.



Image by GraphicMama-team, pixabay.com, CC0

The vibrating air or sound goes to a person's ear and causes a part of our ears called the eardrum, to vibrate. This is how we hear.



Image by AsoylD, pixabay.com, CC0

Isn't it interesting how vibrations cause sound and sound causes vibrations?

When you stretch a rubber band out and then pluck it. It makes a sound! This is because when you pluck it, the rubberband moves back and forth really fast, or vibrates, and creates a sound.

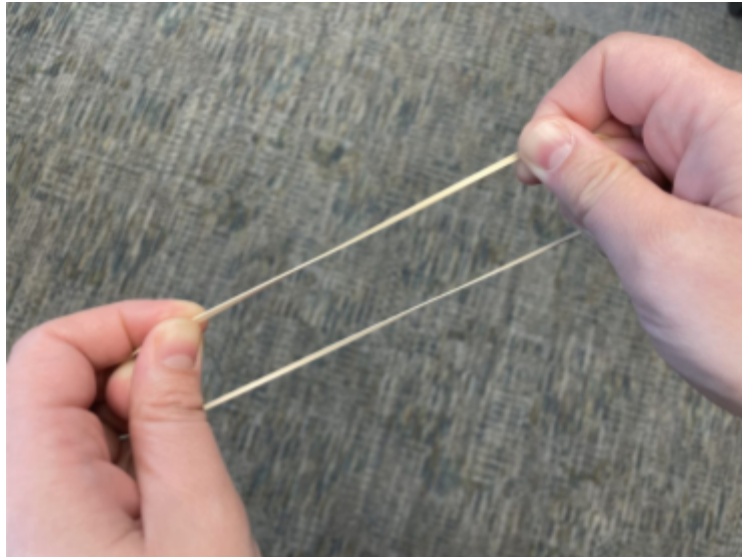


Image by Annette Fonnesbeck, CC0

An example of sound making vibrations is creating a tin can phone. When you talk into the can, the sound from your voice makes the string vibrate. The string transfers the vibration to the other can and makes the sound on the other side.



3D Tin Can Phones by Chris Potter, <https://flic.kr/p/dvylH1>, CC-BY



Image by RyanMcGuire, pixabay.com, CC0

Vibrations can travel through different kinds of matter. This can include air, water, the ground, and many other objects.

Some animals use other parts of their bodies to hear. However, they still need vibrations.



Image by polyfish, pixabay.com, CC0

Elephants make sounds that travel in waves underground for very long distances. Other elephants can hear the sounds or vibrations with their feet!

A grasshopper hears through parts on its tummy! They have small drum-like parts on their body under the wings. These parts vibrate from air waves, allowing the grasshopper to hear the sound.



Image by Huskyherz, pixabay.com, CC0

Musical Instruments

Musical instruments use vibration to make sound. Many are played with certain types of strings. Some examples are a guitar, cello, banjo, and harp.

The boy is playing the guitar. The boy moves the strings of the guitar to make them vibrate. This makes vibrations in the air. The air waves create sounds. These sounds make music.

Drums have a material stretched tightly on the top of them.



Image by Pexels, pixabay.com, CC0

When they are hit with a drumstick, the surface vibrates to make sounds.



Image by Couleur, pixabay.com, CC0

Some people make music with horns. They blow air through the horn to create vibrations and beautiful music.



Image by ReinhardThrainner, pixabay.com, CC0

Can you think of any other ways instruments make vibrations and make sound?

1.3.1 Sound Vibrations

Putting it Together



Adapted from image by truthseeker08, pixabay.com, CC0



Image from OpenClipArt-Vectors, pixabay.com, CC0

Misha likes to do yoga poses. She hums while she exercises, making an “mmmmmmmmmm” sound and she feels the vibration in her throat. She tried to hum while exercising the other day. She had a stuffy nose and couldn’t make the sound or feel any vibrations.

Focus Questions

How does the “mmmm” sound happen?

Where does the air go when a person makes the “mmmm” sound?

What is happening to the air when Misha tries to hum with a stuffy nose?

How can we show how sound is made?

Final Task

The sound of the letter “M” isn’t the only letter sound that you cannot make with your nose plugged. Plan and carry out an investigation to tell what letters you can say with your nose plugged and which ones you cannot.

Fill in the following graphic organizer and complete the sentence at the bottom.

Can you say these letters with your nose plugged? Write the letter in the right column.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Yes

No

Explain your investigation by completing the sentences.

The letter sounds cannot be made because _____

_____.

Sound is made by _____.

When we hear something the vibrations in the air make our eardrum _____.

1.3.2 Effects of Light

Phenomenon



Image by Anja (cocoparisienne), pixabay.com, CC0

My sister and I like to take walks during the nighttime in the city where we live. We went to visit my grandparents in the woods. When we went to take our nightly walk, we were surprised because we couldn't see where we were going and had to bring a flashlight.

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.3.2 Effects of Light

Use a model to show the effect of light on objects. Emphasize that objects can be seen when light is available to illuminate them or if they give off their own light.



In this section, focus on the effect light has on objects and how it causes us to see.

How We See Things



Ck12.org, CC-BY-SA

I need light to see the world.

When something is illuminated it has light shining on it.

Objects need to be illuminated by a light to see them. Some objects create their own light. They are called light sources.

Most of the time, there is light from something and we are able to see. Without any light it would be pitch black!

Light illuminates objects so I can see them. Without any light, we are unable to see anything.

No Light	 Adapted from image by OrangeHippo, pixabay.com, CC0, by Annette Farnsworth, CC0
Some Light	 Adapted from image by OrangeHippo, pixabay.com, CC0, by Annette Farnsworth, CC0
Lots of Light	 Image by OrangeHippo, pixabay.com, CC0

What differences can you see when more light is added?

I can see the apple so there must be a light source illuminating the apple.



Image adapted from Summer Red_CMD1506093 copy
by Apple and Pear Australia Ltd,
<https://flic.kr/p/vJfDvW>, CC-BY

I can see the coins so there must be a light source illuminating the coins.



Image by g ntler (moritz320), pixabay.com, CC0

The street lights are a source of light and illuminate the road so we can see it at night.



Image by Jan W. (photographer2575), pixabay.com, CC0

The sun is a very bright light source and creates daylight. It is burning hot!



Image by PublicDomainPictures, pixabay.com, CC0

A fire is a light source. It is burning hot like the sun.



Images by Pexels (left) and janwardenbach (right), pixabay.com, CC0

Some people use candles as a light source when it is too dark to see.

Some light sources use light bulbs to create light.



Image by geralt, pixabay.com, CC0

A street light and lamp are both light sources. They create light so people can see.



*The Sun Goes Down in London by flyheatherfly,
<https://flic.kr/p/4qhvin>, CC-BY*



*Just a Bit Shady... by Tony Fischer,
<https://flic.kr/p/64ZrqD>, CC-BY*



Image by BrickBard, pixabay.com, CC0

A flashlight is also a light source. People often use them to show things they cannot see when there isn't enough light coming from other sources.

Some animals are light sources! They can make their own light.



Jellyfish can make their own light. They are an underwater light source.

Image by Janice Trayers (lieliand), pixabay.com, CC0

A firefly makes its own light. People can see them in dark areas like the woods or forests at nighttime. They cannot be seen at night in the city.



glow by Jessica Lucia, <https://flic.kr/p/9Uy6wi>, CC-BY-NC-ND

Unlike the woods, the city has a lot of light sources at night. Houses, streetlights, car lights, and businesses are often lit up at night in the city.



Image by LUM3N, pixabay.com, CC0

1.3.2 Effects of Light

Putting It Together



Image by Anja (cocoparisienne), pixabay.com, CC0

My sister and I like to take walks during the nighttime in the city where we live. We went to visit my grandparents in the woods. When we went to take our nightly walk, we were surprised because we couldn't see where we were going and had to bring a flashlight.

Writing Performance Task:

In the tasks that follow, you will be able to draw a model to show the effects of light on objects in the woods.

Gather:



Image by Anja (cocoparisienne), pixabay.com, CC0

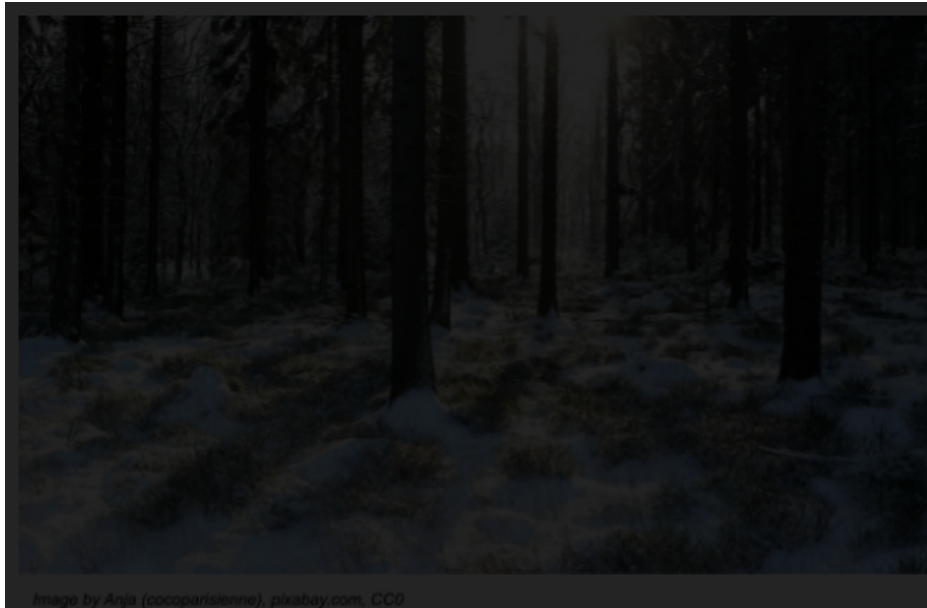
My sister and I like to take walks during the nighttime in the city where we live. We went to visit my grandparents in the woods. When we went to take our nightly walk, we were surprised because we couldn't see where we were going and had to bring a flashlight.

A. What can you see in the woods in this picture?

B. What is the light source in the woods that made it so my sister and I could see when we started our walk?

Reason:

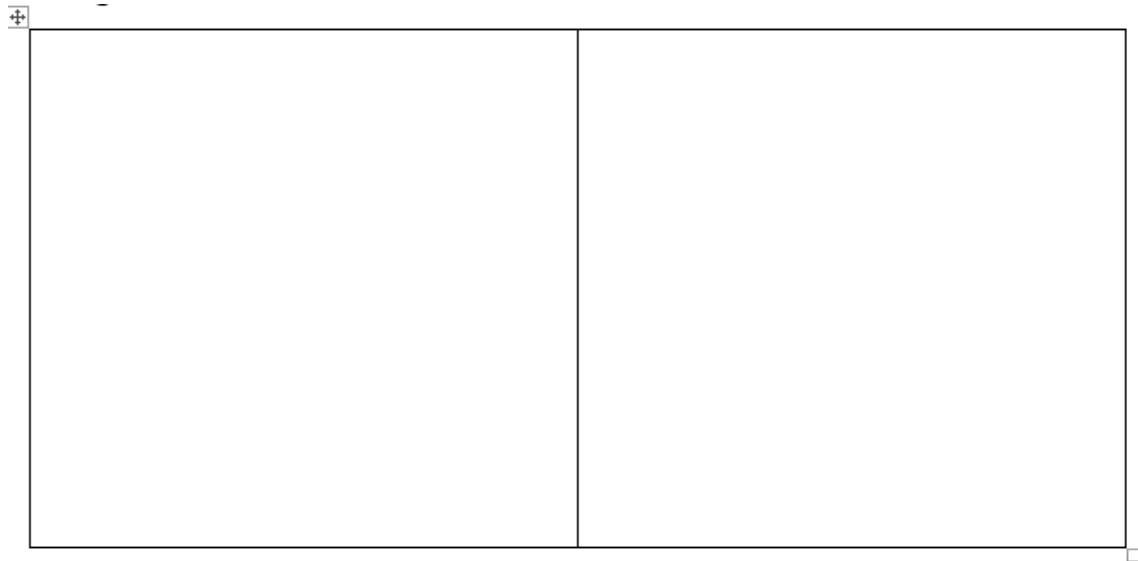
After walking for a while this is what the woods looked like.



- A. What can you see in the woods now?
- B. Why do the woods look so dark now?
- C. What could you use to see in the woods at night?

Communicate:

A. Draw a model of the woods without light and a model of the woods with lights.



WITHOUT LIGHT

WITH LIGHT

In the picture with LIGHT, label your light source.

B. What effect did the light source have on the objects in the woods?

Sentence Stem:

The light source made it so that we _____.

1.3.3 Light Pathways

Phenomenon



Mirror Ball Amsterdam by Ewan Topping, <https://flic.kr/p/rmE9o>, CC-BY

A mirror ball fills a room with sparkling light along the walls.

Observations & Wonderings

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

1.3.3 Light Pathways

Plan and carry out an investigation to determine the effect of materials in the path of a beam of light. Emphasize that light can travel through some materials, can be reflected off some materials, and some materials block light causing shadows. Examples of materials could include clear plastic, wax paper, cardboard, or a mirror.



As you read, determine how different materials affect rays of light.

How Materials Affect Light

A ray of light waves travels in a straight line.



Image by TheOtherKev, pixabay.com, CC0

It will keep moving until it reaches an object. The material an object is made of determines where the light rays go next.

If the material is clear the light will travel through.



/135/365 Bulb of inspiration by Maarten Takens,
<https://iic.kr/p/9RFRy5>, CC-BY-SA

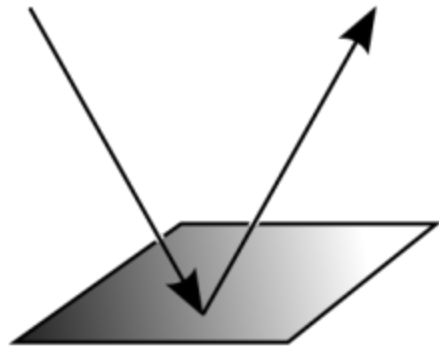
A glass window is clear and lets light through.



Image by PIRO4D, pixabay.com, CC0

Can you think of other materials that would let light through?

If an object is shiny it will reflect the light. Reflect means the light bounces off the object.



Light mirror reflection by Klaus-Dieter Keller, CC-BY



Image by Annelle Forrester, CC0

A mirror, aluminum foil, and sequins can reflect light.



Mirror by eltpics, <https://i.flic.kr/p/y8ooa>, CC-BY-NC



Image by Skeezie, pixabay.com, CC0

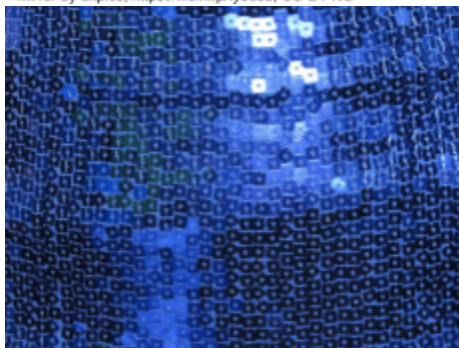


Image by Hans Braumeler, pixabay.com, CC0

Can you think of other materials that would reflect light?

If an object is solid, it will block light.

A door is solid.
A door blocks the light.

When light is blocked
shadows appear.

Shadows appear when light cannot pass through an object.



<https://www.maxpixel.net/Door-Light-Corridor-2126910>, CC0



Shadows by henry..., <https://flic.kr/p/60VH4>, CC-BY-NC-ND



Image by ykaiavv, [pixabay.com](https://www.pixabay.com), CC0



Image by Johannes Planio, [pixabay.com](https://www.pixabay.com), CC0



The Ultimate Car Of Sabah (North Borneo) by Jason Thien,
<https://flic.kr/p/7zizge>, CC-BY

A tree, car, chair, and even you block light and create shadows.



Chair Shadow by Scott Meis, <https://flic.kr/p/amvxQQ>, CC-BY-ND



14/365 - 10/11/09 [365 Days @ 50mm] - Our next soccer start! by Shardayyy Photography, <https://flic.kr/p/76xR1g>, CC-BY

Can you think of other materials that would block light?

How could you test materials to see how they affect light?

1.3.3 Light Pathways

Putting it Together



Mirror Ball Amsterdam by Ewan Topping, <https://flic.kr/p/rmE9o>, CC-BY

A mirror ball fills a room with sparkling light along the walls.

Focus Questions

How does a mirror ball cause spots of light along the wall?

How would changing the ball to a basketball affect the room?

If you wanted to test how an object affects light rays what would you do?

Final Task

Describe what you would make your door out of if you wanted more sunlight in your house?

1.3.4 Communication

Authentic Situation



Image by Free-Photos, pixabay.com, CC0

Colton has been grounded. He would like to let his friend next door know. However, he can't use a cell phone or go outside.

Observations & Wonderings

What is the problem in this situation?

What are possible criteria (positive outcomes) to this situation?

What are constraints (limitations) with this situation?

1.3.4 Communication

Design a device in which the structure of the device uses light or sound to solve the problem of communicating over a distance. *Define the problem by asking questions and gathering information, convey designs through sketches, drawings, or physical models, and compare and test designs.* Examples of devices could include a light source to send signals, paper-cup-and-string telephones, or a pattern of drum beats.



As you read, focus on how different structures communicate information from a distance.

Devices Used for Communication

People use devices to communicate over long distances.

Light can help communicate with others. A stoplight communicates to drivers.



Image by John R Perry (j025jp), pixabay.com, CC0

A green light means go.
A red light means stop.

A yellow light means
prepare to stop. All
drivers need to know
what each light means.

A lighthouse communicates to ships.

A lighthouse means there are rocks nearby.

Can you think of any other examples where lights communicate information?



Lighthouse at Pigeon Point before the fog by Waqas Mustafeez, <https://flic.kr/p/78jjwF>, CC-BY

Sound can help communicate with others.

A fire alarm communicates to people in a building. The alarm sound means we need to exit the building.



Image by Rensse Gaudel, pixabay.com, CC0

A phone rings to communicate to its owner. A ringtone means someone is calling.



Image by Free-Photos, pixabay.com, CC0

Can you think of any other examples where sounds communicate information?

1.3.4 Communication

Putting it Together



Image by Free-Photos, pixabay.com, CC0

Colton has been grounded. He would like to let his friend next door know. However, he can't use a cell phone or go outside.

Focus Questions

How could you design a structure with light or sound to help Colton communicate to his friend?

How would Colton's friend know that he was grounded?

Final Task

Draw a picture of your design and describe how it would help Colton communicate with his friend.

