Kindergarten Science

for Utah SEEd Standards

Kindergarten

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Utah State Board of Education OER

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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.

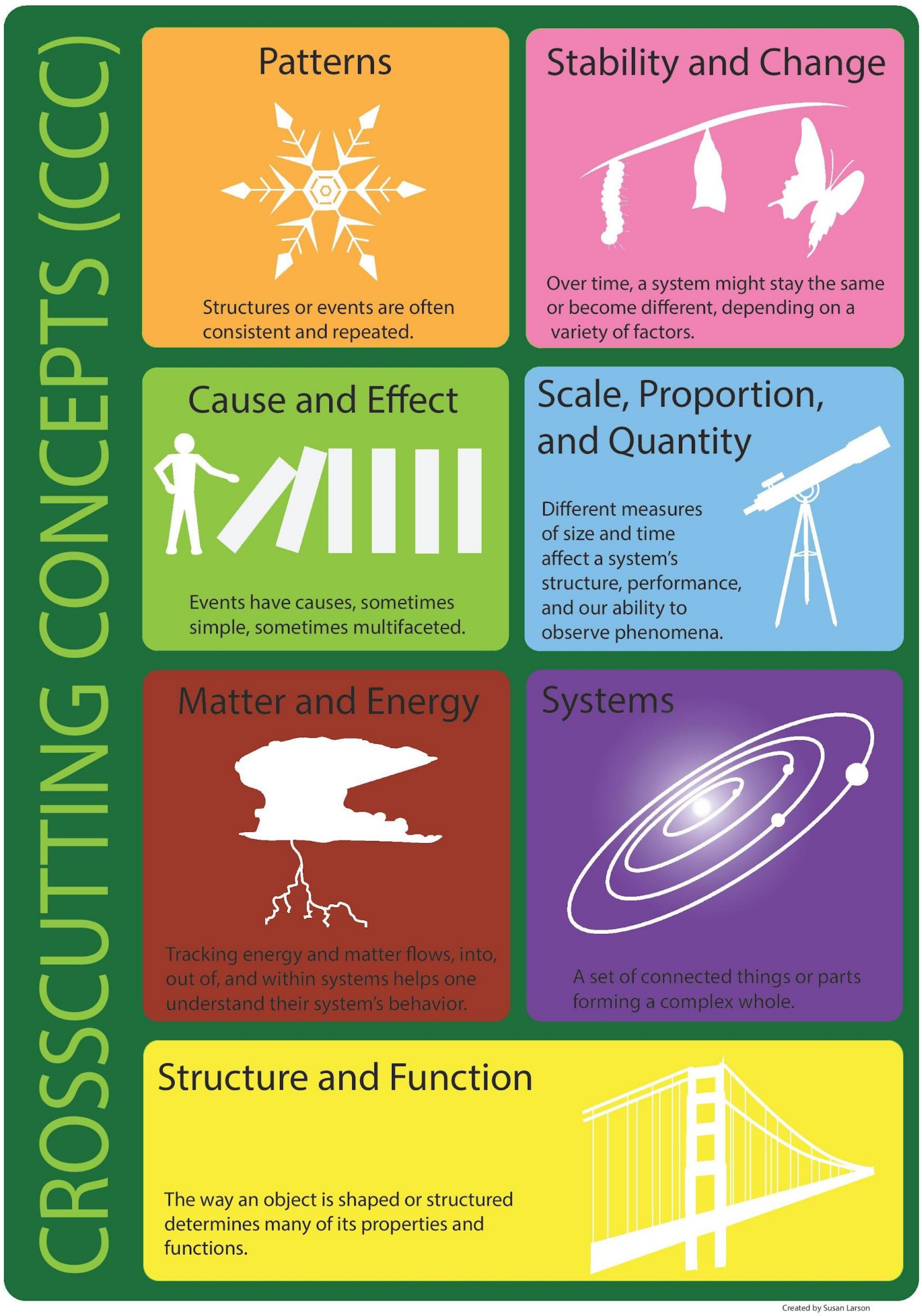
Adam Johnston
Weber State University

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.



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.

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CHAPTER 1

Strand 1: Weather Patterns

Chapter Outline

By: *Victoria_Borodinova / 1810 images, CC0*

Weather is made up of sunlight, wind, snow, rain, and temperature in one place at one time.

Scientists measure and record the weather to find patterns over time. They use patterns to predict the weather.

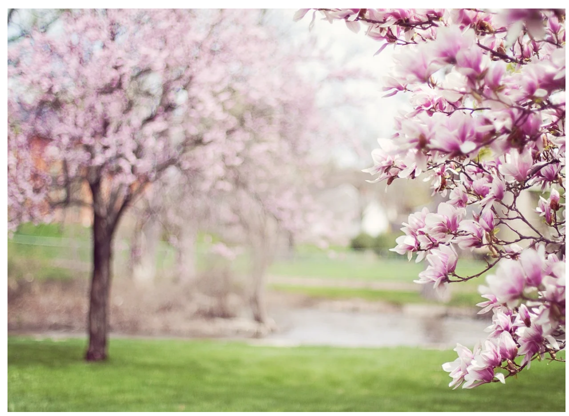
Weather scientists then tell communities the forecast so the people can prepare for good or bad weather.

Sunlight warms Earth's surface.

1.1 Local Weather (K.1.1)

Phenomenon

The weather in my neighborhood changes throughout the year.



Images from pixabay.com; CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

Which picture shows cold weather?

Which picture shows hot weather?

Is there a pattern between the way the trees look and the weather?

K.1.1 Local Weather

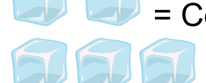
Obtain, evaluate, and communicate information about local, observable weather conditions to describe patterns over time. Emphasize the students' collection and sharing of data. Examples of data could include sunny, cloudy, windy, rainy, cold, or warm. (ESS2.D)

In this section, look for patterns about weather at different times of the year.

Weather Charts

This chart shows the weather for 10 days in a specific month.

Symbols Key:

Condition	Temperature	Temperature
 = Sunny = Cloudy  = Partly Cloudy  = Raining  = Snowing  = Windy	 = Warm  = Hot  = Very Hot	= Chilly  = Cold  = Freezing

Month	January									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										
Month	April									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										
Month	July									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										
Month	October									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										

Putting It Together

1. What do you notice about the weather from the chart?

2. What patterns do you see?

3. What kind of weather goes with each tree in the picture?

Final Task:

Observe and record the weather for one week to find weather patterns in your town. Count the sunny, windy, snowy, and rainy days.

1.2 Human Reaction (K.1.2)

Phenomenon

Month	April									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										

The weather report helps us decide how to prepare for the day.

Boy

Girl

Images from pixabay.com, CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

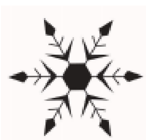
What day of the month of April could these pictures be from?

How does the girl know to wear her rain gear?

How is the boy responding to the weather?

K.1.2 Human Reaction

Obtain, evaluate, and communicate information on the effect of forecasted weather patterns on human behavior. Examples could include how humans respond to local forecasts of typical and severe weather such as extreme heat, high winds, flash floods, thunderstorms, or snowstorms. (ESS3.B)



In this section, look for patterns of when humans use weather data to change their behavior.

Human Choices

You learned about different weather patterns in section 1, now let's look at how understanding weather patterns can be useful. Scientists, called meteorologists, look at weather patterns and make predictions about what will happen. This prediction is called a weather forecast.

How can we use weather forecasts to help us prepare for the day?

Look at the next picture and determine what you would do if the type of weather shown were predicted.

image by john_loanndis, pixabay.com. CC0

Floods can happen quickly and put people in dangerous situations.

What type of weather pattern would help you decide if a flood was going to happen?

How would you prepare if you heard a flood was forecasted?

Morpeth Flood by johndal, CC-BY-SA https://flic.kr/p/5jBSSY

Playing outside on a sunny summer day is fun.

How would you prepare for a day like the picture?

What are some things you could do or wear on a day like this?

Image by pixexid, pixabay.com, CC0

Putting It Together

Month	April									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										

Boy

Girl

Images from pixabay.com, CC0

Has there been a time when you weren't prepared for the weather?

What information would have helped you be prepared?

Final Task:

Choose one day from the forecast below. Draw a model of what you would do and wear for that day. Be able to explain your thinking and describe your drawings.

Month	January									
Day	1	2	3	4	5	6	7	8	9	10
Conditions										
Temperature										

1.3 Local Weather (K.1.3)

Phenomenon

The playground slide is hotter in the afternoon than in the morning.

Image by MikeGoad, pixabay.com, CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

What could be making the slide feel different?

Why would the slide be different temperatures at different times of the day?

Which senses did you use to help you gather this information?

K.1.3 Local Weather

Carry out an investigation using the five senses, to determine the <u>effect</u> of sunlight on different surfaces and materials. Examples could include measuring temperature, through touch or other methods, on natural and man-made materials in various locations throughout the day. (PS3.B)

In this section, use your five senses to see if you can identify the effect of sunlight on different surfaces and materials.

Hot or Cold?

Look at the pictures of the slides. What materials are the slides made of?

Images by apriljlamb and ErikaWittleb, pixabay.com, CC0

Compare the sun's effect on each of the three materials: grass, sidewalk, and road. What would each surface feel like on a hot sunny day?

770_sidewalks by Chris Monsere, CC-BY-NC, https://flic.kr/p/pcD1cc

If you were walking to a friend's house on a hot summer day, which surface(s) would feel too hot on your bare feet?

Which part of the beach would feel hotter on your bare feet, the sand that is in the sun or the sand that is in the shade?

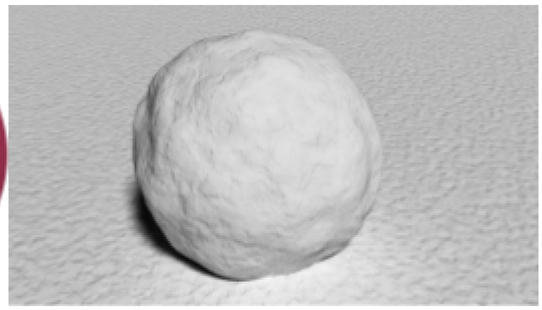
Image by Life-Of-Pix, CC0

Look at the picture of the sun's effects on the lake surface. What part of the icy lake has gotten the most sunlight? How do you know?

Image by bones64, pixabay.com, CC0

Putting It Together

A plastic beach ball, a snowball, a metal marble/ball


Images from pixabay.com, CC0

Focus Question

Now that you have observed the sun's effect on different materials and surfaces, what are your predictions about the effects sunlight would have on these objects?

Ball:

Snowball:

Melta ball:

What are ways you can test your predictions?

Final Task:

Look at your school playground. Determine what materials and surfaces will be the warmest at the end of the day. Come up with a plan to test your predictions.

1.4 Reduce Warming (K.1.4)

Authentic Situation

On hot sunny days, some animals like to sit in the shade.

Images by pasja1000 and music4life; pixabay.com, CC0

Observations and Wonderings:

What is the problem in this situation?

How are the animals solving the problem?

Focus Questions:

How do you know the duck is sitting in the shade?

What would be some effects if the animals were sitting in the sunlight?

K.1.4 Reduce Warming

Design a solution that will reduce the warming effect of sunlight on an area. *Define the problem by asking questions and gathering information, convey designs through sketches, drawings, or physical models, and compare and test designs*. (PS3.B, ETS1.A, ETS1.B, ETS1.C)

In this section, see if you can find ways to lower the temperature of an object that sits in the sun.

Too Hot?

When it is hot outside, the playground can get very hot from the sun. What could you create or add to keep this playground from getting too hot? How does your creation solve this problem?

Image by Leeza, pixabay.com, CC0

The eating tables can become very hot in the summer. What can you create or add to help them from getting too warm in the sun? How does your creation solve this problem?

Image by Oshomah Abubakar, CC0

Dogs sometimes stay outside on hot summer days. What would the problem be with the dog staying outside on a hot day? What can you create to help the dog? How does your creation solve this problem?

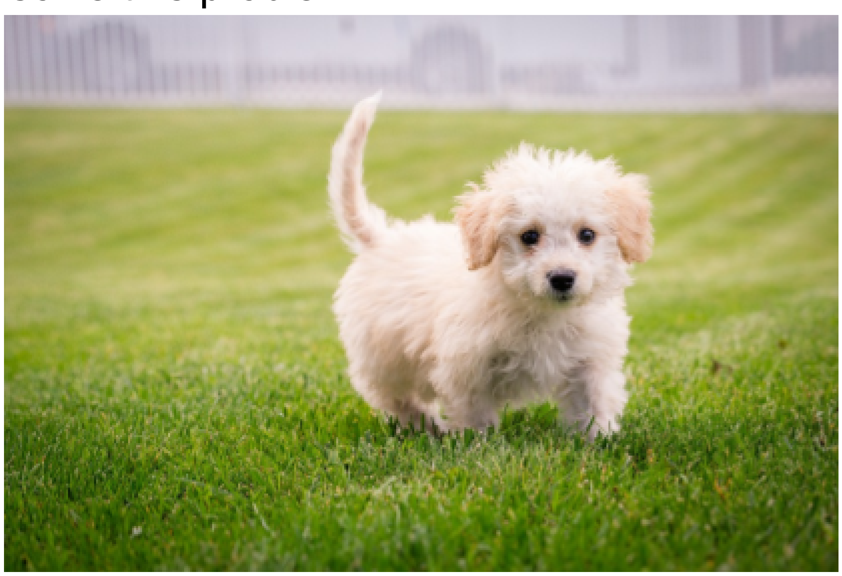


Image by Cparks, pixabay.com, CC0

Putting It Together

People playing basketball outside in the summer must play in the evenings.

Image by Stocksnap; pixabay.com, CC0

Focus Questions:

1. Why do they only play in the evenings?

2. What can you create or add so that they can play in the daytime?

Final Task:

Design a solution to the hot basketball court problem. Show your thinking by creating a model using drawings and words.

CHAPTER 2

Strand 2: Living Things and Their Surroundings

Chapter Outline

Image by Christian Bowen, CC0

Living things, like plants and animals (including humans), depend on their surroundings to get what they need. Food, water, shelter, and a favorable temperature are some of the needs of living things. The characteristics of their surroundings influence where living things are naturally found. Plants and animals affect and respond to their surroundings.

2.1 Needs for Survival (K.2.1)

Phenomenon

Young swans and young tomato plants both grow.

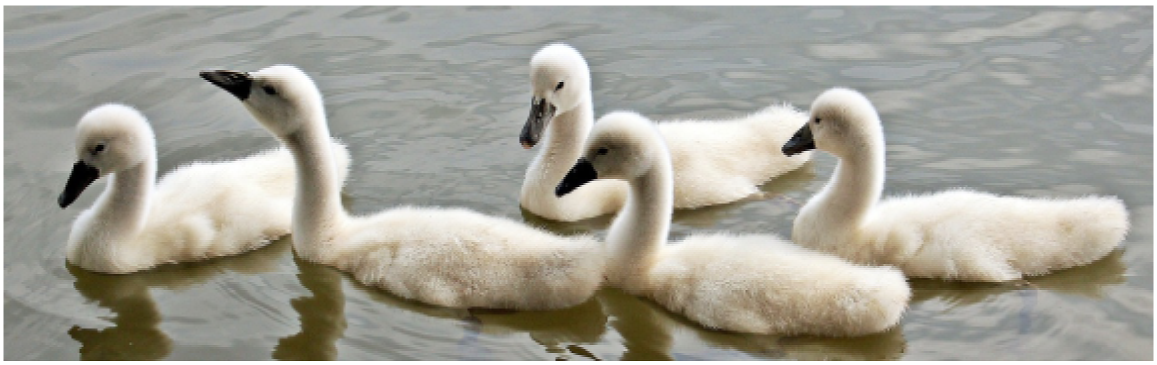


Image by S. Hermann & F. Richter (pixel2013), CC0

Image by Kruscha, CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

How are plants and animals similar?

What do plants and animals need to survive and grow?

K.2.1 Needs for Survival

Obtain, evaluate, and communicate information to describe patterns of what living things (plants and animals, including humans) need to survive. Emphasize the similarities and differences between the survival needs of all living things. Examples could include that plants depend on air, water, minerals, and light to survive, or animals depend on plants or other animals to survive. (LS1.C)

In this section, see if you can identify a pattern about what all living things need to survive.

Staying Alive

Think about your house, how does it help you survive?

Image by Scott Webb, CC0

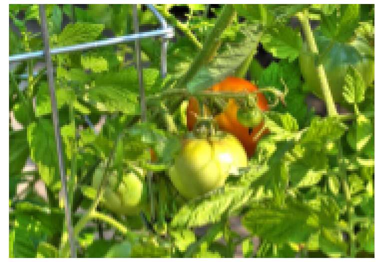
What are some things in your kitchen that help you survive?

Image by deborah flöden, CC0

What changes do you notice when looking at the different pictures of this plant?

Seedling by Pepper with a Camera https://flic.kr/p/bDGV3e, CC-BY

Large Tomatoes - Plant Alpha by Chris Vaughan, CC-BY-SA



2016 August 16 Tomato plant by gardener41, CC-BY-SA

What did this plant need for the changes you noticed?

Image by Phichit Wongsunthi (9lnw), CC0

Image by Patrick Selin, CC0

What changes do you see in these pictures of the deer?

What do deer need to survive?

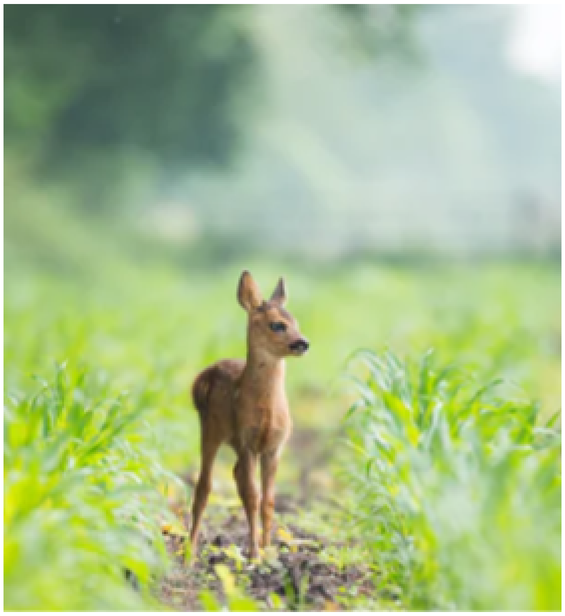


Image by Vincent van Zalinge, CC0

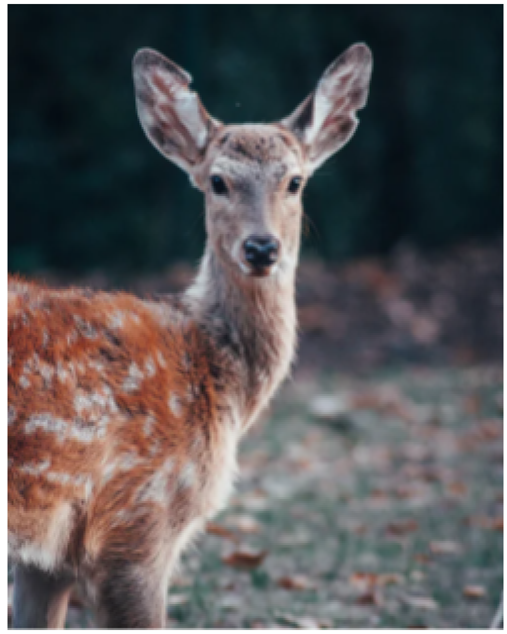


Image by Benjamin Raffetseder, CC0

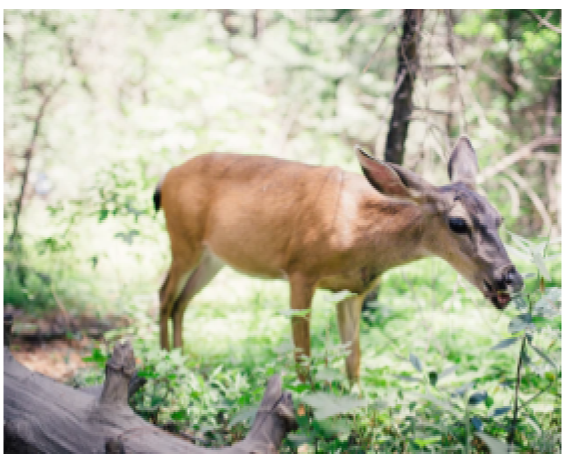


Image by Alysa Bajenaru, CC0

Image by Revolver Creative Company, CC0

Putting It Together

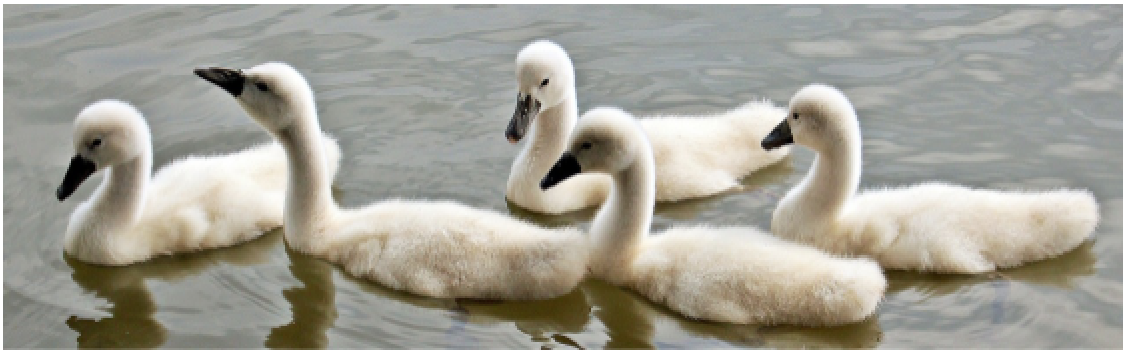


Image by S. Hermann & F. Richter (pixel2013), CC0

Image by Kruscha, CC0

Focus Questions:

1. What do all living things need to survive? Do you see a pattern?

2. What are the differences you see between what plants need to survive compared to what animals need to survive?

Final Task:

Draw a model to show what you need to survive. Be able to explain how each part of your drawing helps you survive.

Also, explain how your needs are similar to what other animals, like swans, need to survive.

2.2 Needs Relationships (K.2.2)

Phenomenon

These plants are living in the middle of a desert.

Image by victorrdyrnes, Pixabay.com, CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

How are these plants surviving?

What are the essential things the plants need to survive?

K.2.2 Needs Relationships

Obtain, evaluate, and communicate information about patterns in the relationships between the needs of different living things (plants and animals, including humans) and the places they live. Emphasize that living things need water, air, and resources and that they live in places that have the things they need. Examples could include investigating plants grown in various locations and comparing the results or comparing animals with the places they live. (LS2.B, ESS3.A)

In this section, identify a pattern about the needs of living things and where they live.

Where do you live?

We just learned about what living things need to survive. All living things have similar needs, but live in different surroundings. Explore how the needs of living things are met in different surroundings.

Each of these living things live in a different type of surroundings. In the pictures below identify what needs are being met by each living thing. Which patterns do you notice?

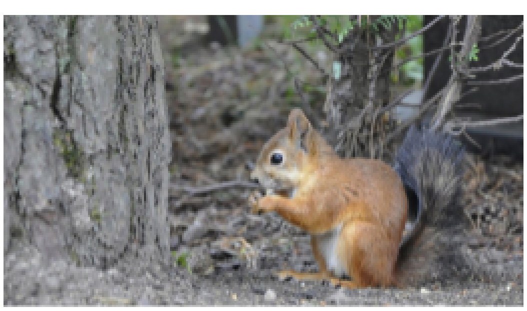


Image by agata822, Pixabay.com, CC0

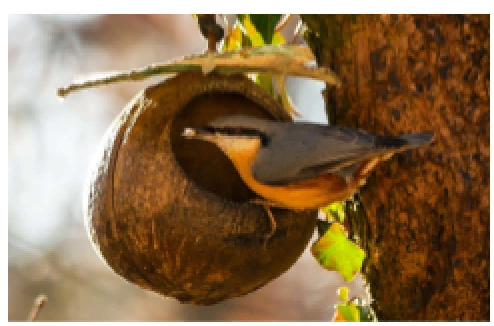


Image by Gerhard Gellinger, Pixabay.com, CC0

Image by Cytis, Pixaby.com, CC0

Image by Free-Photos, Pixabay.com, CC0

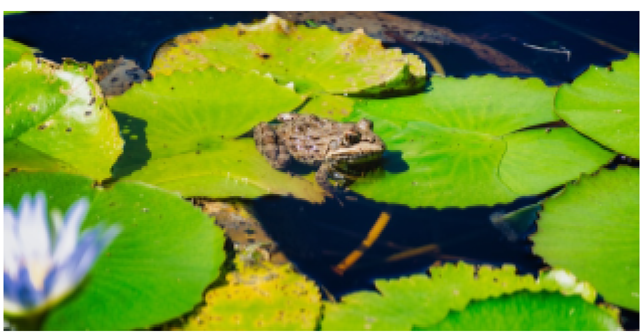


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Image by Christels, Pixabay.com, CC0

Image by Skeeze, Pixabay.com, CC0

Image by Taken, Pixabay.com, CC0

Image by Skeeze, Pixabay.com, CC0

Putting It Together

Image by victorrdyrnes, Pixabay.com, CC0

Focus Questions:

1. Besides plants, what other living things could live in the middle of this desert?

2. What would these living things need to survive in this place?

3. Do you see any patterns between the needs of different living things and the places they live?

Final Task:

Draw a model to show what a fish would need to survive in water. Be able to explain how each part of your drawing helps the fish survive in water.

2.3 Effects on Surroundings (K.2.3)

Phenomenon

The plant is growing from a crack in the blacktop.

Image by Skeeze, Pixabay.com, CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

1. How is the plant surviving in the blacktop?

2. How is the plant affecting its surroundings?

K.2.3 Effects on Surroundings

Obtain, evaluate, and communicate information about how living things (plants and animals, including humans) <u>affect</u> their surroundings to survive. Examples could include squirrels digging in the ground to hide their food, plant roots breaking concrete, or humans building shelters. (ESS2.E)

In this section, see if you can find ways that living things affect their surroundings.

How do you affect your surroundings?

Look at the pictures below. In what ways do plants, animals, and humans affect their surroundings?

Image by MabelAmber, Pixabay.com, CC0

Image by Steve Buissinne (stevepb), Pixabay.com, CC0

Image by Kevin (Kevsphotos), Pixabay.com, CC0

IMG_0227.jpg by Paul Carmona, https://flic.kr/p/dA1jrd, CC-BY-NC-ND

Putting It Together

Image by Skeeze, Pixabay.com, CC0

Focus Questions:

1. How do animals affect their surroundings?

2. How do humans affect their surroundings?

3. How do plants affect their surroundings?

Final Task:

Draw a model to show how the plant growing from a crack in the blacktop is affecting its surroundings. Be sure to be able to explain each part of your model.

2.4 Survival Designs (K.2.4)

Authentic Situation

This bird, called the burrowing owl, builds its home in the ground. Sometimes this bird will use holes that were dug by other animals to build their nests.

Burrowing Owls at VTA Cerone by Yosemite James, https://flic.kr/p/9i5f13, CC-BY

Observations and Wonderings:

What is the problem in this situation?

How are the burrowing owls solving the problem?

Focus Questions:

Why would an animal that flies want to build their home in the ground?

Name some positive (good) and some negative (bad) effects of living in the ground.

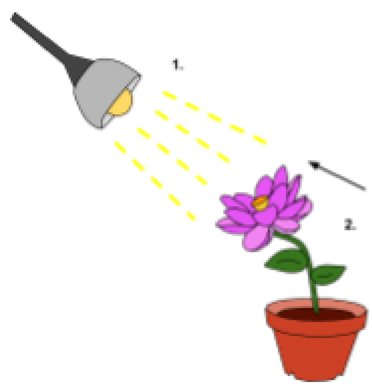
K.2.4 Survival Designs

Design and communicate a solution to address the <u>effects</u> that living things (plants and animals, including humans) experience while trying to survive in their surroundings. *Define the problem by asking questions and gathering information, convey designs through sketches, drawings, or physical models, and compare designs*. Emphasize students working from a plant, animal, or human perspective. Examples could include a plant growing to get more sunlight, a beaver building a dam, or humans caring for the Earth by reusing and recycling natural resources. (ESS3.C, ETS1.A, ETS1.B, ETS1.C)

In this section, see if you can design a solution to a problem that living things have while trying to survive in their surroundings.

Survival

We learned that plants need light to grow. Plants will grow toward the light, bending around obstacles or reaching out of small areas to get light for survival.



Phototropic Response to Stimulus by Mtomanelli15, https://commons.wikimedia.org/wiki/File:Phototrophic_Response_to_Stimulus.svg#/media/File:Phototrophic_Response_to_Stimulus.svg, CC-BY-SA 4.0

The plant below is growing in a crack in the sidewalk. If you were a plant would you choose to grow in the sidewalk crack?

Why or why not?

What if this was the only place you could live?

What things would you do to survive?

Lawnless dandy lion by Whatnot, *https://flic.kr/p/Vvw3WE, CC-BY-NC-ND*

Humans use their surroundings to build houses. Trees are cut down to be used for building materials. Trees are living things that provide shelter and food for other living things. As trees are removed from the surroundings, other living things may have trouble finding ways to meet their survival needs.

What are some living things that might be affected by the removal of trees from their surroundings?

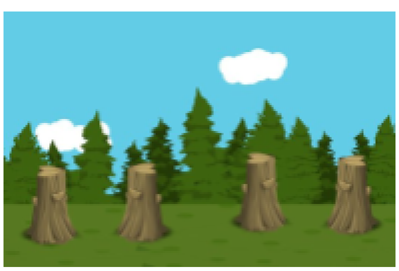


Image by mohamed_hassan, Pixabay.com, CC0

Image by Wolfgang Brauner (John-Silver), Pixabay.com, CC0

Image by Dennis (Garak01), Pixabay.com, CC0

Humans understand that trees are important for building houses, but are food and shelter for other living things.

How does the next picture show a solution to the problem of cutting down trees to build houses?

What other solutions can you think of?

Seedling Planting by Pacific Southwest Region 5, https://flic.kr/p/6tWQJp, CC-BY

Beavers are animals that live near rivers and streams. They build structures called dams. The dam blocks the water and creates a small pond.

Image by Graham Hobster (Graham-H), Pixabay.com, CC0

The beaver builds their home, called a beaver lodge, in the pond. The lodge provides protection for the beaver and gives them a place to store food.

Image by USDA, Public Domain

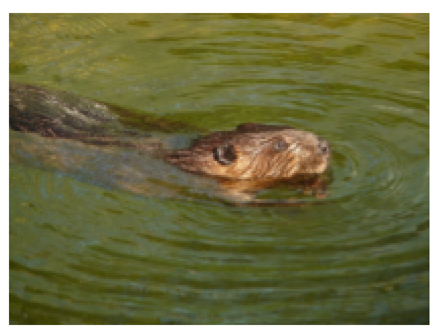


Image by Hans Braxmeier (Hans), Pixabay.com, CC0

Why would an animal that is not a fish want to build a house in water?

What problems do you think the beaver faces when trying to build its house?

Beavers must breathe air to survive, how does the beaver build its house so that it can still breathe while in its house.

Putting It Together

Students go outside for recess in cold and rainy weather.

Final Task:

Design a solution to prevent students from getting wet and cold while at recess. Show your thinking by creating a model using drawings and words.

CHAPTER 3

Strand 3: Forces, Motions, and Interactions

Chapter Outline

IMG_3756 by Justin Walther, https://flic.kr/p/4vGtjg, CC-BY-NC

The motion of an object can be observed and described. Pushing or pulling an object can change the speed or direction of an object's motion and start the object moving or stop it. Pushes and pulls can have different strengths and different directions. A bigger push or pull makes things go faster. When objects touch or collide, they push on one another and their motion can change.

3.1 Motion (K.3.1)

Phenomenon

The kids are making their scooters move.

Image by Kelly Sikkema, Unsplash.com, CC0

Observations and Wonderings:

What are you observing about this phenomenon?

What are you wondering about this phenomenon?

Focus Questions:

How are the children making the scooters move?

Describe the motions you make with your body to make a scooter move.

K.3.1 Motion

Plan and conduct an investigation to compare the effects of different strengths or different directions of forces on the motion of an object. Emphasize forces as a push and pull on an object. The idea of strength should be kept separate from the idea of direction. Non-contact forces, such as magnets and static electricity, will be taught in Grades 3 through 5. (PS2.A, PS2.B, PS2.C, PS3.C)

In this section, determine how different “strengths and directions” change the motion of an object.

Moving

Look at the following pictures. What are these children doing?

How are the children affecting the car?

How are they moving the cars differently?

Image by Cengizhan Konuş, Unsplash.com, CC0

Image by Dayron Villaverde (DayronV), Pixabay.com, CC0

Do the cars always move the same speed? Why or why not? Do the cars always move in the same direction? Why or why not?

What other things can you think of that might move in the same way?

Image by Peter Dlhy, unsplash.com, CC0

How could they move this tree?

What are the differences in forces applied between the boy and the dad?

What other things can you think of that might need to be moved in a similar way?

Image obtained from Pixabay.com, CC0

How does a wheelchair help people?

What forces make the wheelchair move?

Look at all of these pictures of a baseball game.

During a baseball game, the pitcher throws the ball towards home plate. Then a player in the outfield who is behind the pitcher catches the ball.

Image by Keith Johnston, unsplash.com, CC0

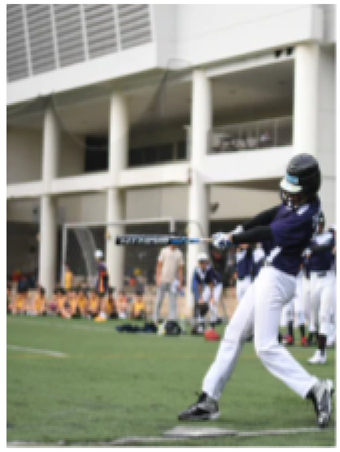


Image by Nathaniel Yeo, unsplash.com, CC0

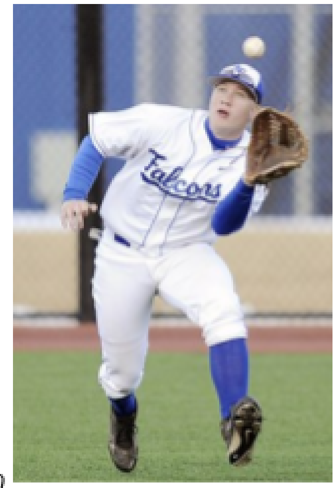


Image by Skeeze, Pixabay.com, CC0

What happened to cause the baseball to move in a different direction than the direction that the pitcher threw it?

This girl has been riding her bike and wants to go home now.

What does she need to do to make her bike move?

What can she do to change the direction of the bike?

Image by Caroline Hernandez, unsplash.com, CC0

Putting It Together

Image by Kelly Sikkema, Unsplash.com, CC0

Focus Questions:

1. How could the children cause the scooters to go faster?

2. How could the children cause the scooters to move in a different direction?

Final Task:

Find an object to push and/or pull. Determine how you make it move. See if you can make it move at different speeds.

3.2 Change in Speed (K.3.2)

Authentic Situation

Soccer players on different teams are trying to kick the same ball.

Image by Philipp Kofler (flooy), pixabay.com, CC0

Observations and Wonderings:

What is the problem in this situation?

How could the soccer players solve the problem?

Focus Questions:

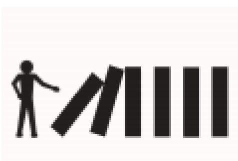
How could you get the soccer ball to move faster?

What happens to the ball if your opponent gets in the way?

How does speed change the way the ball is moved?

K.3.2 Change in Speed

Analyze data to determine how a **design solution** <u>causes</u> a change in the speed or direction of an object with a push or a pull. *Define the problem by asking questions and gathering information, convey designs through sketches, drawings, or physical models, and compare and test designs*. Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, or knock down other objects. (PS2.A, PS2.B, PS2.C, PS3.C, ETS1.A, ETS1.B, ETS1.C)



In this section, use the information given to observe how a ‘design solution’ causes a change in the speed or direction of an object.

Speed

Have you ever watched a very slow moving bowling ball? How many pins did it knock over? How many pins could it knock over if it was going really fast?

These kids are playing tag. The girl that is running away is trying to not get tagged. There are different ways she can try to get away:

- She can run in a straight line.
- She can run in a zigzag line.
- She could walk.

What do you think is the best way for her to move to not get tagged?

Image by JudaM, Pixabay.com, CC0

Look at the following picture: What would need to happen to the track if you wanted a train to go in the direction of the arrow?

Image by The DigitalArtist, Pixabay.com CC0

Putting It Together

Image by Philipp Kofler (flooy), pixabay.com, CC0

A ball was kicked 3 different times. Which trial showed a change in direction? How do you know?

Trial	Direction the ball moved
Trial 1	Stayed Straight
Trial 2	Moved left
Trial 3	Stayed Straight

Carter kicked his ball across the grass. He measures how long it took to roll into the goal. Each time, he kicked the ball harder. Which trial did Cater kick the ball the hardest? How do you know?

Trial	Time to Roll into the Goal
Trial 1	11 seconds
Trial 2	8 seconds
Trial 3	4 seconds

Final Task:

A soccer player kicked the ball hard and in a straight line directly toward the flat goal post. The ball bounced off the goal post and did not go into the goal. The soccer player kicked the ball the same way two more times and the ball did not go into the goal. Why did the ball not go into the goal? Show your thinking by creating a model using drawings and words.