Blended learning covering science, technology, arts and mathematics for grades K-3.

Connections to Next Generation Science Standards.



School Kit

GARDENING

- Grow Garden -









Grow Garden School Kit



The focus of the Grow Garden School Kit lays on life cycles of plants and the relationship between soils and plant growth. Through a digital game and classroom activities, students investigate what soils are made of, what a seed needs to germinate, different methods of composting and the important role microorganisms play in food production.

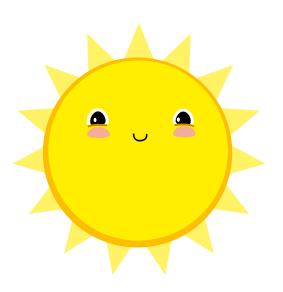
You will find extensive material enabling a longer theme work or the possibility for picking parts that fit the purposes of your needs. The material is aimed at students in pre-school class up to grade three. All lessons are linked to the curriculum.

The Game Grow Garden

Grow Garden is the fun place to learn about organic gardening and sustainable farming. Students get to learn and understand what a plant needs to grow and the importance of soils.

In the game we get to meet Connie Compost and her friends the Microorganisms. They live under the trees in your Grow Garden, right next to the animals, and they love old food scraps! When you feed Connie and her friends, magical things start to happen. They start producing nutritious soil that makes your crops grow faster and taste better. So after harvesting your tasty vegetables, you can treat Banja the bunny and all the other animals in the cottage. Along the way, your Item Collection will also grow with cool items, great food, and badges to reward your progress.





Grow Play Education

Grow Play Education offers School Kits for students in grades K-3 in science, technology, mathematics and arts - all with a sustainability perspective. School Kits include lesson plans, student assignments and digital games in areas such as recycling, upcycling, ecological cultivation, renewable resources, and biodiversity. Grow Play School Kits are free and available at Groplay. com/Education.

A free web-based version of Grow Recycling is available on www.groplay.com/web-games/garden/ and for downloading the game on tablets and phones go to Apple App Store or Google Play.

Connections to the Next Generation Science Standards

Science and Engineering Practices

Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

• Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.

• Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

LESSON 1 INTRODUCTION

Introduction to Farming and Life Cycles In Nature

Introducing the Topic

Vegetables and cereals are some of the most common foods that we eat every day, but how much do the students know about the relationship between soils and plant growth, and what plants need to grow? Start by playing the game Grow Garden and make a mind map to discover what your students already know and what they would like to know more about.

Play Grow Garden

Begin with letting the students play the Grow Garden game as an inspiring start and common ground for classroom discussions. A web-based version is available for free at: www.groplay.com. The Grow Garden app is available for purchase for IOS and Android. After having played the game, you can continue with discussions involving the whole class, or in smaller groups.







Questions to Discuss

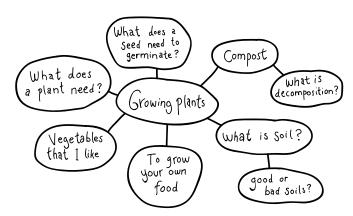
- What do you think the Grow Garden game is about?
- The game doesn't have an ending: it just goes around, like a circle. Why do you think it works like that?
- Have you ever planted or grown anything?
- What do you know about growing vegetables?
- Have you ever eaten something that you have grown yourself?
- Are there any benefits of growing your own food?
- What happens to the food waste in the compost?
- What do you do with the food waste at home or in your school?



LESSON 1 INTRODUCTION

Make a Mind Map

Create a mind map during or after the discussions. You can use an app or a computer program, a whiteboard or a large sheet of paper. Let the mind map be displayed during your continued theme work, so the students can add and extend it with new knowledge that they discover.



Objectives:

To visualize the students' pre-understanding and creating a common ground for your theme work on farming and cycles in nature.

Grades: K-3

Materials needed: Access to tablets or computers as well as the Grow Garden game. An app or program, a whiteboard, or pen and paper to make a mind map.

Connections to the Next Generation Science Standards

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.



LESSON 2

CHECK YOUR LUNCH

Check Your Lunch

In the Grow Garden game, you grow your own crops, serve it to Banja and her friends, and bring the waste to the compost, where it gets composted and returns to soil. Everything happens in the same place. Today we often live far from places where food is produced and it's not obvious to everyone how a tomato grows, or how spaghetti is produced. In this exercise, the students take a closer look at their lunch.

What Did You Have For Lunch?

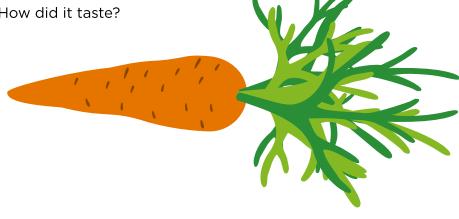
Do this lesson after you have eaten lunch. Ask the students what they just ate and write the food items on the board. For example; corn, peas, lettuce, spaghetti, bolognese sauce, ketchup.

Let the students work in pairs.

• Write down as much about each food item as possible. What ingredients are included? Sort the ingredients. What comes from animals and what comes from plants? What can we grow in our country and what has to be grown in other countries?

• What happened to your meal before it ended up on your plate? Was it cooked before you ate it? How did it taste?

Give the students some paper and tell them to, individually or in pairs, draw and color the food they had for lunch. Cut out the pictures and glue them onto a paper plate. Glue the plate to a larger piece of paper and ask the students to draw lines from the various foods and to write down things they found in the discussions earlier. Let the students report their findings to each other.





CHECK YOUR LUNCH

Lunch A Long Time Ago

Does the lunch of today differ from a lunch eaten a hundred years ago? What crops were grown here at that time, and did we eat foods from other countries? How was the food transported? Discuss how you can find these things out: perhaps ask a historian, search the internet, or ask an older relative.

Perhaps you can repeat the previous exercise, but this time whilst showing an example of lunch served a hundred years ago. **Objectives:** The students get a better knowledge of some common foods, such as how and where they were produced as well as a historical backdrop.

Grades: K-3

Materials needed: paper plates, paper, markers or crayons.

Connections to the Next Generation Science Standards

- *K-LS1-1.* Use observations to describe patterns of what plants and animals (including humans) need to survive.
- K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.



LESSON 3 SPECTACULAR SEEDS

Spectacular Seeds

In the game Grow Garden, the plants need soil, water and sunlight to grow. But what does a seed need in order to germinate? In the following exercise, students get to design an experiment to investigate this.

Seed Experiments

Split the students into groups, and let them design experiments where they test what conditions a seed needs for germination. Start by discussing what the students think are important conditions. They should then be asked to design experiments to find out if the seed is affected by light, moisture, air, soil and temperature. Before they begin, instruct them to write and draw the

experiment design, and make hypotheses on what they believe will happen in the experiments before they start.

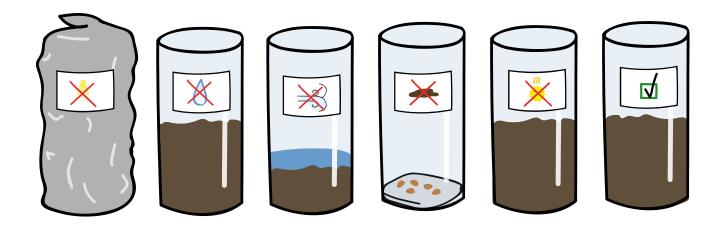
Give the groups glasses or cups, soil, water, aluminum foil, pencil, paper, tape, and about 30 seeds (eg sunflower seeds, peas or oats).







LESSON 7 SPECTACULAR SEEDS



An Example of Experiment design

- In glass No 1, light is excluded. Fill half the glass with soil and plant 5 seeds. Water enough to make the soil moist, but not wet. Cover the entire glass with aluminum foil so that no light gets through.
- In glass No. 2, moisture is excluded. Fill the glass with dry soil. Plant the seeds, but don't add any water.
- In glass No. 3, air is excluded. Place 5 seeds in the bottom of the glass and add about an inch of soil. Gently pour water until the glass is full, but make sure no seeds are floating at the surface. When covered like this in water, the seeds don't get any air.

- In glass No. 4, soil is excluded. Put some paper tissue in the bottom of the glass and place 5 seeds on top. Water so that the paper is moist.
- Glass No. 5 excludes heat. Fill half the glass with soil and plant 5 seeds. Water so that the soil becomes moist, but not wet. If the outside temperature is between 0 and 4 degrees, you may put the glass outdoors. Otherwise, put it in the refrigerator with a lit flashlight next to it.
- Glass No. 6 is a control glass where all the conditions are included. Fill the glass half with soil, put down 5 seeds and water the soil to that it's moist.



SPECTACULAR SEEDS

About Seed Germination

Most commonly, no seeds grow in conditions where moisture, air and heat are excluded. A seed knows if the environment is right. A plant needs light to grow, but a seed can grow without light. However, after a while the first leaves on the plant become yellow and pale not green. A seed can also grow without soil, but only if it gets enough moisture. Yet, for the seed to grow up into a healthy plant, soil is needed soon after the germination.

Do you want to see how the seed develops after germination? Observe how the root is forming and how the sprout grows by putting the germinated seed together with a little bit of damp paper in a transparent plastic pocket folder, that you tape onto the window pane. Remember to moisten the paper regularly.

Objectives: After the lesson, students will have knowledge about the life cycle of plants. They also practice formation of a hypothesis, setting up an experiment design, documentation and evaluation of a science experiment.

Grades: K-3

Materials needed: Glasses or cups, soil, water, aluminium foil, pens, paper, sticky tape, seeds (e.g. peas, sunflower seeds, or oats.)

Connections to the Next Generation Science Standards

- *K-LS1-1.* Use observations to describe patterns of what plants and animals (including humans) need to survive.
- 2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.
- 3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

LESSON 4 SOIL EXPERIMENTS

Soil Experiments

The soil where we grow our food is vital to us. If we don't have healthy soil that can contain moisture and is full of nutrients, we can't produce much of the food we eat. But what does the soil consist of? Go outside and get some samples of soil, and investigate it!

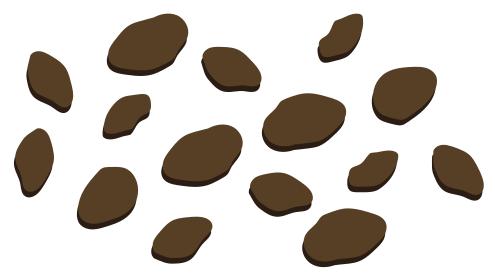
What Does Soil Consist of?

Soil consists of mineral particles and organic matter in different ratios and compositions. Let the students collect soil from the schoolyard or from the neighborhood. Make sure to collect from different locations, such as a flowerbed, a forest grove, or a lawn. Let the students put the soil on a tray. They now get to examine the soil with a magnifying glass, and preferably also through a microscope.

The students are likely to find small "stones" (mineral grains of different sizes), roots and other parts of plants, some "sticky stuff" (humus = degraded organic material) and perhaps a few small living animals.

To further investigate the soil you collected, you can take plastic bottles and fill them to a quarter with soil from the different locations. Then fill the bottles with two-thirds of water and shake the bottles thoroughly. Observe the content in the bottles and then see how different layers are formed.

First, large sand and mineral grains sink to the bottom of the bottle. Then, fine sand and clay form layers on top. Floating in the water are small particles of clay and organic matter.



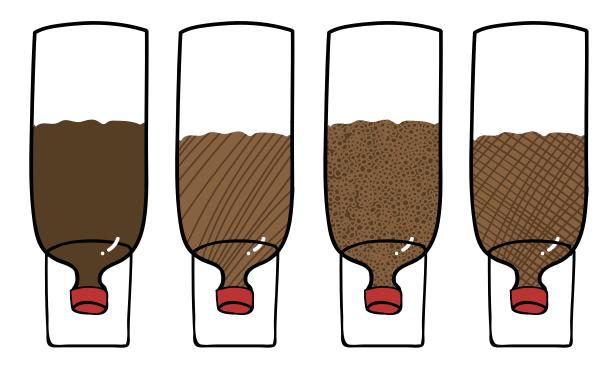


LESSON 4 SOIL EXPERIMENTS

Is There Good or Bad Soil?

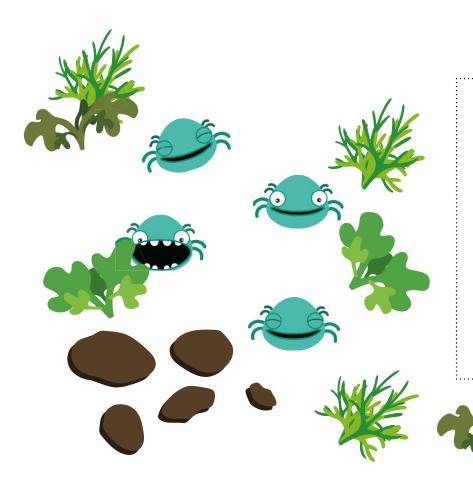
The structure of the soil depends on the size and composition of mineral particles and on how much organic matter the soil consists of. When it comes to the soil's ability to retain water it depends primarily on the size of the mineral grains and how densely they are packed. Investigate this through a simple experiment.

Cut off the bottom of some plastic bottles with lids and put each bottle in a cup with the lid facing down. Fill the bottles with two-thirds of different types of dry soil. Pour the same amount of water in all the bottles, so it covers the soil. Let stand for a while, letting the soil absorb the water. Unscrew the corks and measure how much water that comes out in the cups. Discuss what you think gives the soil types different abilities to absorb or retain water.





LESSON 4 SOIL EXPERIMENTS



Objectives: Getting to understand soils and what soil consists of. To understand that soil structure differs and have different qualities, as well as understand the importance of soil to humans.

Grades: K-3

Materials: Containers for collecting soil samples, a white tray, magnifying glass or microscope, plastic bottles.



- *K-ESS3-1.* Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
- *K-ESS3-3*. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- 2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.



LESSON 5

SYMMETRY IN THE GARDEN

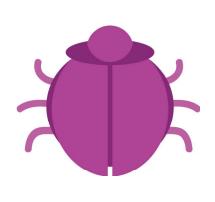
Symmetry in The Garden

Introduce symmetry

You can find mirror symmetry everywhere. For example: in a flower, a ladybug or in the butterfly's pattern. Symmetry provides an expression of harmony and is also found in architecture and art. Go out in nature and practice to find symmetry and make a drawing or collage of your findings.

Symmetrical Figures

Start by explaining the basics of symmetry. In order to explain the concept and lines of symmetry, folding is a useful method. You can draw and cut out shapes and try to fold them so that one half of the figure matches the other half. The fold line is then the line of symmetry. A character can have zero, one or more lines of symmetry.





LESSON 5

SYMMETRY IN THE GARDEN

Draw Symmetry

There is a lot of symmetry in nature, so it's a great start to go looking outdoors. Go to the schoolyard, to a forest nearby or to a park or garden, and let the students look for symmetrical shapes. There are many examples of symmetry among insects: ladybugs, ants, butterflies and spiders - and many more! Plants often show symmetry in the shape of flowers and leaves.

You can make sketches outside and finish the drawings in the classroom, or draw the whole picture on the excursion. A good way is to draw the line of symmetry first. Then it's easier to see how the symmetrical shape looks on both sides of the line. In the end, you can make a whole collage with all the pictures the students have been drawing.

Objectives: To provide students with an understanding of the concept of symmetry and to practice to see symmetry in their environment.

Grades: K-3

Materials: Paper, magazines and newspaper, paint, crayons.

Connections to the Next Generation Science Standards

- *K-2-ETS1-2.* Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- 1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
- 2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.



LESSON 6 BUILDING WITH SEEDS

Building With Seeds

Build your own geometrical figures with seeds. They are a great building material and nice to eat!

What Shapes are We Already Familiar With?

Ask the students about their knowledge of geometrical shapes. Which ones do they know? Do they know the correct names of the shapes? Do they know how many corners each shape has?

Build Geometrical Shapes

Let the students examine the shapes by building them with chickpeas and toothpicks. Through watching, building, and speaking about geometry the students will have an easier time remembering what they learn.

Use the attached student sheets with instructions and images, or experiment by just building shapes freely.

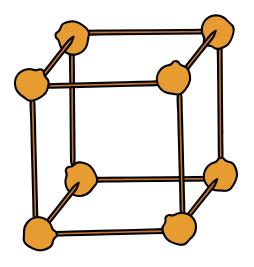
Start with the two-dimensional shapes: square, rectangle, triangle.

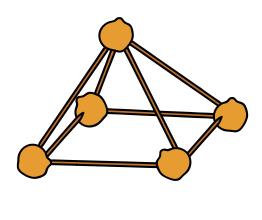
Then proceed with the three-dimensional shapes: cube, pyramid, cuboid, tetrahedron.

square \Longrightarrow cube and pyramid

rectangle 🖒 cuboid

triangle 🖒 tetrahedron







BUILDING WITH SEEDS

Get Creative!

Let the students experiment with their own shapes and combinations. For example, can they build a house using the geometric shapes they have built (cube + pyramid)? Can they build a bridge?

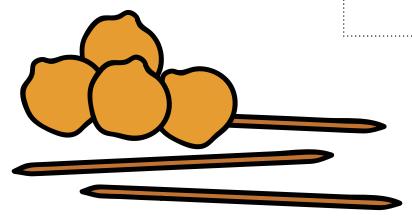
Objectives:

To learn about basic geometrical shapes and how to construct these using chickpeas and toothpicks.

Grades: K - 3

Materials:

Chickpeas (soaked overnight), toothpicks.



Connections to the Next Generation Science Standards

• K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

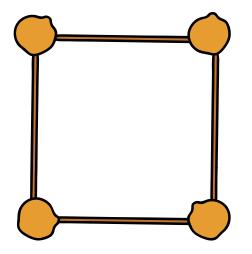


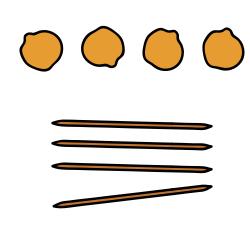
LESSON 6 BUILDING WITH SEEDS

Building With Seeds

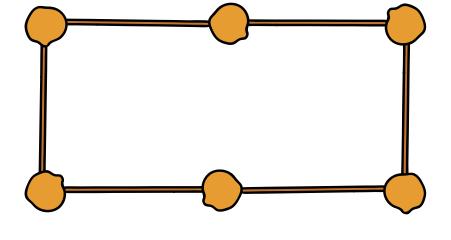
Seeds can be useful in many ways. Chickpeas, for example, are both nice to eat and make a great building material. Build simple constructions, shapes, and geometric figures using toothpicks and soaked chickpeas.

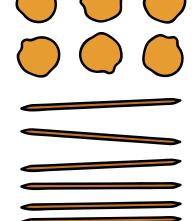
The shape is called ______ I need





The shape is called I need



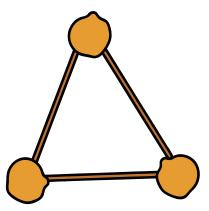


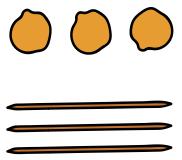


LESSON 6 BUILDING WITH SEEDS

The shape is called

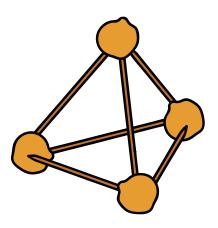


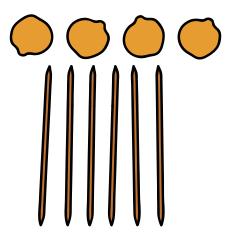




The shape is called

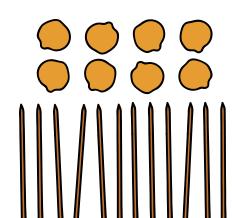
I need



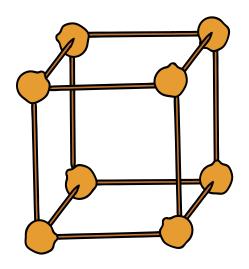


LESSON 6 BUILDING WITH SEEDS

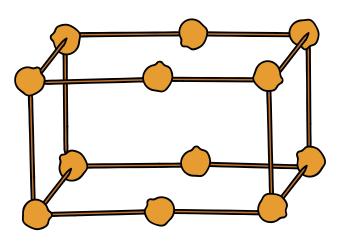
The shape is called _____



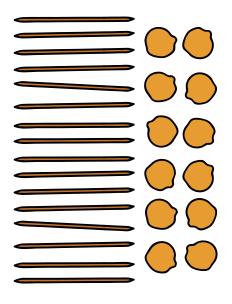
I need



The shape is called



I need

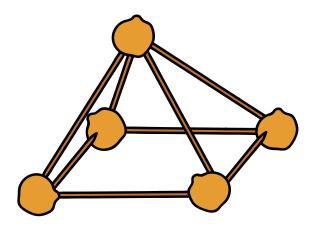


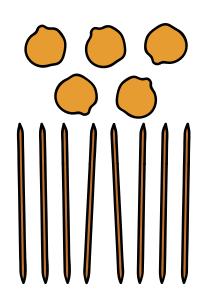
LESSON 6

BUILDING WITH SEEDS

The shape is called

I need





Get Creative!

Experiment with your own shapes and combinations.

Can you build a house using the geometrical shapes you've built?

Can you build a bridge? Can you build something really tall?





lesson 7 Worship the Wormsi

Worship The Worms!

Decomposers like worms, microorganisms and fungi release nutrients locked up in dead plants and animals, and make them available for use by living plants. Earthworms have been called 'ecosystem engineers' for a reason; much like human engineers, earthworms change the structure of their environments. They make burrows through which oxygen and water can enter, and carbon dioxide can leave the soil. In this experiment, students examine how worms break down food residues into compost.

Build a Worm Compost

You can dig up earthworms in your schoolyard, but best of all is to try and find composting worms (Eisenia foetida). They can be found in composts or can be ordered online. The advantage of composting worms is that they can handle higher temperatures and eat more in relation to their body weight compared to earthworms.

Begin by filling both plastic boxes with a layer of approximately 4 inches of soil. Place the carrot or apple peels on top of the soil layer in both boxes. Place the peels near the walls of the boxes to make it easier to see when the worms work. Cover the layer of

peels with more soil, approx. 4 inches.

Then put the worms in one of the boxes so that the other box remains without worms as a control container. Explain to the students why researchers use controls in their experiments.

Both compost boxes should be kept slightly moist, but not wet, to avoid mold formation. Use a spray bottle with water to keep it moist.

When you don't observe the worms, put both boxes in a dark place. Worms dont like light, and are more active in the dark.

Questions to Discuss

- What happened to the food waste in the compost box with worms?
- What happened to the food waste in the compost box without worms?
- What do you think the worms do in the box?
- What can the nutritious soil that the worms produce be used for?
- Are there more experiments you can do, such as feed the worms with something else?



LESSON 7

WORSHIP THE WORMS!

Make Hypotheses and Observations

Let the students write down their hypotheses about what they think will happen in the two boxes, what they think it will look like, and why. Use the student sheet that comes with this lesson.

Over two weeks, the students should take care of the boxes and ensure that the soil remains moist. Let the students observe and compare changes in the boxes. You can also document them with photos, movies, drawings and text in an app, and create digital stories.



Objectives: The lesson will give the students an understanding of degradation and why these are important processes in the ecosystems. The students also practice on how to form hypotheses, make observations and document.

Grades: K-3

Materials needed: Two transparent plastic boxes with lids (about 10x10x5 inches). The lids should have air holes in them. Approx. 15 earthworms or compost worms, carrot or apple peels.

Connections to the Next Generation Science Standards

- *K-LS1-1.* Use observations to describe patterns of what plants and animals (including humans) need to survive.
- K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
- 2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
- 3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

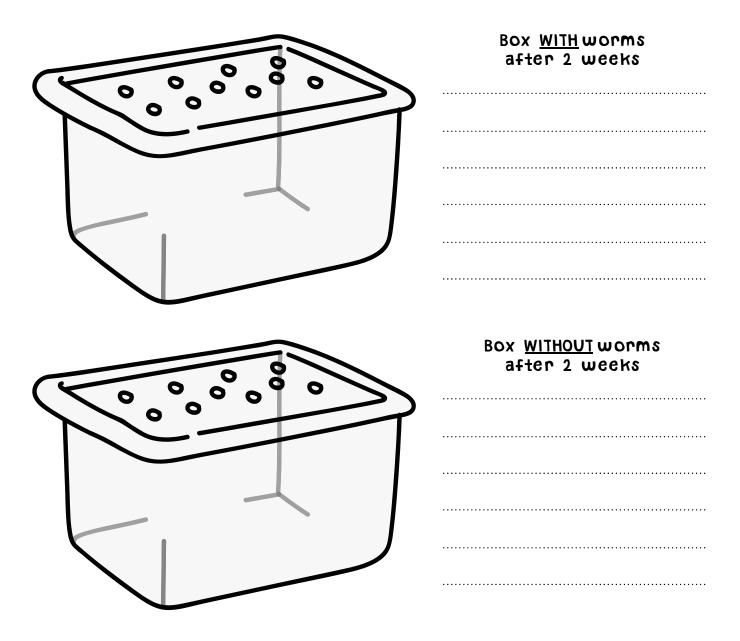


LESSON 7

WORSHIP THE WORMS!

Worship The Worms!

What will the two compost boxes look like after 2 weeks? Draw and write what you think will happen.



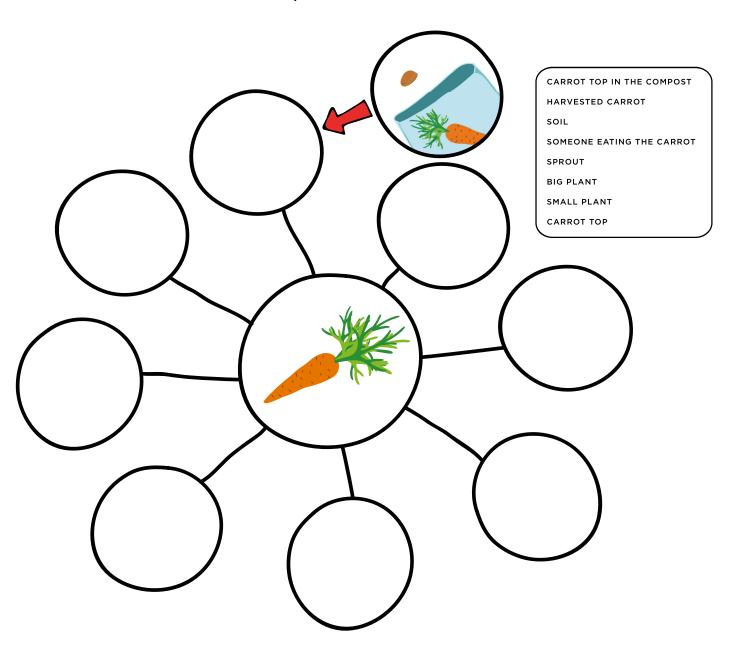


STUDENT ACTIVITY

THE LIFE CYCLE OF A CARROT

The Life Cycle of a Carrot

Draw a carrot's way from seed to fully grown carrot, and how the carrot top gets decomposed and becomes soil again. Draw the pictures in the correct order in the circles. In the box below are clues on what pictures should be included.





STUDENT ACTIVITY DRAW THE BUGS

Draw The Bugs

Do you know what a spider looks like? Or a butterfly or an ant? Draw the right number of parts that the body consists of and how many legs the bugs have. First draw what you think they look like and then look at a picture to compare. Then do the math!

SPIDER	BUTTERFLY	ANT
	儿	

How many body segments do the bugs have together?	ANSWER:
How many legs do the bugs have together?	ANSWER:
How many antennas do the bugs have together?	ANSWER:
How many wings do the bugs have together?:	ANSWER:



STUDENT ACTIVITY THE STORY OF A WORM

The Story of a Worm

Write a story about the life of an earthworm. At least three of the words in the box should be included in your story.

SOIL RAIN LEAVES BURROWS COMPOST MOLE DARK SUN NUTRIENT SCARED BIRD EARTHWORM FUNGUS PUDDLE HUMAN WOODLOUSE ROOTS GARDEN HAPPY



STUDENT ACTIVITY WHERE IS THE EXIT?

Where is the Exit?

Banja is lost in the garden! How is she going to get to the exit without stepping on the plants? Cut Banja out of the paper with a pair of scissors and write instructions for her by using arrows. Swap instructions with a classmate to make sure it works.

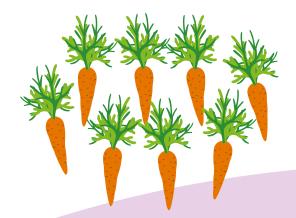
means take one step forward. and means turn. **Exit** start



STUDENT ACTIVITY COUNT WITH BANJA

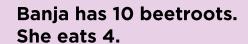
Count with Banja

Banja is really hungry. She has just harvested loads of vegetables from the garden. Cross over each vegetable she's eating. How many are left?

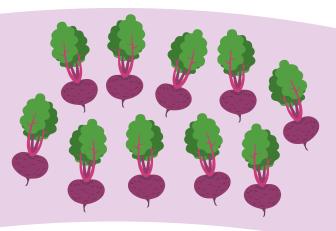


Banja has 8 carrots. She eats 6.

....are/is left.



....are/is left.





Banja has 15 asparagus. She eats 9.

.....are/is left.

Now Banja is really full.

But she still has _____ vegetables left to eat tomorrow!



student activity WHAT IS BANJA EATING?

What is Banja Eating?

Cut out Banja and place her with her nose facing forwards on the square marked with "start". Then follow the arrows.

means take one step ahead. and means turn.

Banja stops at the end of each row of arrows, and what she ends up on she eats!



1. What is it called when we put garden or vegetable waste to make it degrade and become soil?

- 1. CONCRETE
- 2. COMPOST
- 3. COMBAT

2. Which of these can be called a decomposer?

- 1. MAGPIE
- 2. RABBIT
- 3. EARTHWORM



3. Which of these things does a seed need to germinate?

1. WATER, WARMTH, AIR

2. WATER, SOIL, LIGHT

3. SOIL, LIGHT, WARMTH



4. Why is soil so important?

- 1. BECAUSE WE NEED SOMETHING TO STAND ON
- 2. BECAUSE THE WORMS NEED SOMEWHERE TO STAY
- 3. BECAUSE ALL OUR FOOD ORIGINALLY COMES FROM THE SOIL



5. Are all bugs and insects bad when you do farming?

1. NO - MANY OF THEM ACTUALLY HELP OUT

2. YES - ALL INSECTS EAT WHAT WE GROW

3. YES - ALL INSECTS CAN BITE YOU



6. Why is it good to put compost in your vegetable garden?

1. IT GIVES THE GARDEN A NICE COLOR

2. IT MAKES THE SOIL BETTER

3. THERE IS NO OTHER PLACE TO PUT IT



7. What does soil consist of?

1. MINERAL PARTICLES AND ORGANIC MATTER

2. ROCKS AND SAND

3. CEMENT AND ORGANIC MATTER



8. How do carrots grow?

1. ON A TREE - LIKE FRUITS

2. ON STEMS - LIKE FLOWERS

3. IN THE SOIL - AS A ROOT



9. What does organic farming mean?

1. TO FARM WITHOUT CHEMICALS AND FERTILIZERS

2. TO ONLY FARM VEGETABLES

3. TO FARM THINGS
THAT BUGS LIKE TO EAT



10. How many legs do insects have?

1.8 LEGS

2. 6 **LEGS**

3.4 LEGS

11. What does a plant need to grow bigger?

1. WATER, NUTRIENTS, SUNLIGHT

2. WATER, CHEMICALS, SUNLIGHT

3. WATER, SAND, SUNLIGHT







Correct Answers

Question 1	2. Compost
Question 2	3. Earthworm
Question 3	1. Water, warmth, air
Question 4	3. Because all our food originally comes from the soil
Question 5	1. No - many of them actually help out
Question 6	2. It makes the soil better
Question 7	 Mineral particles and organic matter
Question 8	3. In the soil as a root
Question 9	1. To farm without chemicals and fertilizers
Question 10	2. 6 legs
Question 11	1. Water, nutrients, sunlight

