

A young girl with brown hair is sitting on the grass under a large tree, reading a book. The background is a lush green field with trees. The text is overlaid on a dark brown wooden sign.

READ BEYOND THE
BEATEN PATH!
SUMMER 2022

An iREAD summer reading companion from

Illinois
AGRICULTURE
in the ClassroomSM

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Science



Literacy

THROW & GROW

Grade Level

2-5

Length of Lesson

45 minutes

Objective

By the end of this lesson, students will be able to explain the importance of pollinators.

Materials Needed

- Air dry clay
- Compost
- Wildflower seeds (native to your area)
- Small spray bottle with water

Standards

Common Core

CCSS.ELA-Literacy.RI.4.7; SL.4.1

NGSS

2-LS2-1; 3-LS1-1; 3-LS3; 3-LS4; 5-LS2-1

Lesson Summary

This lesson is a fun, hands-on activity designed to teach students more about the importance of pollinators. Students will also learn about seed germination and plant growth as you watch your flowers grow!

Suggested Sequence of Events:

1. Read "[Up in the Garden and Down in the Dirt](#)" by Kate Messner to snag student interest!
2. Read through the IL AITC Pollinator Ag Mag to learn about pollination. Interactive online versions can be found on our website.
3. Complete the activity following the procedures:
 - Have each student pull off a piece of clay and spread it out to be large enough to pour the compost on it.
 - Have them pour a pinch of compost on the clay and then pour the seeds on top of it.
 - Then, have students spray a small amount of water (one or two sprays) on their seeds.
 - Allow each student to fold together and knead the mixture until the mixture is thoroughly mixed together.
 - Have them roll it into a ball and bring it out to dry in the sun.
 - Now it is time to "throw and grow." Have them throw their seeds into their yard and wait for them to grow.
5. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Background Information:

Spring is the best time to toss your throw and grows into your yard or an approved location at your school. Try to time it before a heavy rainfall in order to help the seeds germinate.

The clay helps hold the soil and seeds together. Once thrown, the clay will hold the compost and seeds together so the seeds have a nutritious home to germinate. Over time, the seeds will root into the ground and weather conditions will break down the clay.

Extension Ideas:

- Read "[Our School Garden](#)" by Rick Swann and talk about the importance of flower gardens. Talk with your principal and maintenance staff and see if there's an approved location on the school grounds where you can grow a pollinator garden.
 - Have students measure, design, and build the garden before you complete this activity.
 - If there is no approved location, have students 'throw' their "Throw & Grows" into a flower pot and set the pots by your classroom windows.
- Have students draw or take pictures of their observations on their plant growth.
- Have students measure the growth of their plants and record the data on a graph.
- Have students research a native Illinois flower and its usual pollinators.
 - Students can write a paper about their findings.
- Have students think more deeply about the role each material played in their throw and go; What is compost used for? What would happen if we didn't water it? How does a seed become a plant?
- Learn about the difference of "soil" vs. "dirt."
- Learn about different pollinators!
 - Invite a beekeeper in to talk about bees.
 - Get involved and learn about the [Illinois Monarch Project](https://www.ilfb.org/resources/ifb-in-action/illinois-monarch-project-provides-resources/). Available at <https://www.ilfb.org/resources/ifb-in-action/illinois-monarch-project-provides-resources/>
 - Watch this [video](#) from the Illinois Farm Bureau all about pollinator habitats. Available at https://www.youtube.com/watch?v=_QYvaiozsFc
- Have students write a paragraph about the importance of pollinators.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!



PLANT MAZE

Grade Level

K-7

Length of Lesson

2-3 class periods

Objective

By the end of this lesson, students will have a better understanding of how light affects plant growth.

Materials Needed

- Cardboard shoeboxes
- Extra cardboard
- Tape or Glue
- Scissors
- Potting soil
- Small cups
- Pea seeds
- Copies of student worksheet
- [LED light emitting diodes](#) (optional)
- [Coin cell batteries](#) (optional)
- Black electrical tape (optional)

Standards

NGSS

K-LS1-1; 1-LS1-1; 2-LS2-1; 2-LS4-1; 3-LS1-1; 3-LS3-2; 3-LS4-3; 3-LS4-4; 4-LS1-1; 5-LS1-1

Lesson Summary

This lesson is designed to give students a hands-on activity that shows how light affects plant growth through a process called *phototropism*, the orientation of a plant or other organism in response to light. Students will design a “plant maze” to see if plant growth changes based on the availability of light.

Suggested Sequence of Events:

1. Set Up: Have students bring in cardboard shoe boxes to create their plant mazes. Teachers will also need to acquire additional sheets of cardboard.
2. Read [Seed Soil Sun](#) by Cris Peterson to introduce students to the necessary elements for plants to grow.
3. Complete the activity following the procedures:
 - Ask students: How does light affect how plants grow?
 - After writing down their guesses, challenge students to build a “plant maze” to see how plants will grow without light.
 - Using the student worksheet, students should design their plant maze and share ideas with their classmates.
 - Then, students should place their shoeboxes upright on their desks and begin to construct their mazes.
 - Students must leave enough room in the bottom of the box to place a small container with seeds and soil. There must also be a hole at the top of the box to allow light into the maze.
 - Once the mazes are complete, students must plant their seeds. Give each student potting soil or a peat pellet and have them place the soil into a small cup, moisten the soil, and then bury some pea seeds. (Soaking the pea seeds in water for about 8 hours prior to planting will dramatically speed up the time to germination.)
 - Place the cup of seeds in the bottom of the plant maze and close the lid.
 - After one week, check the plant growth. Each day, have students document the changes in plant growth.
4. After plants have grown, return to students’ guesses and see if the results confirmed their initial ideas about light and plant growth.

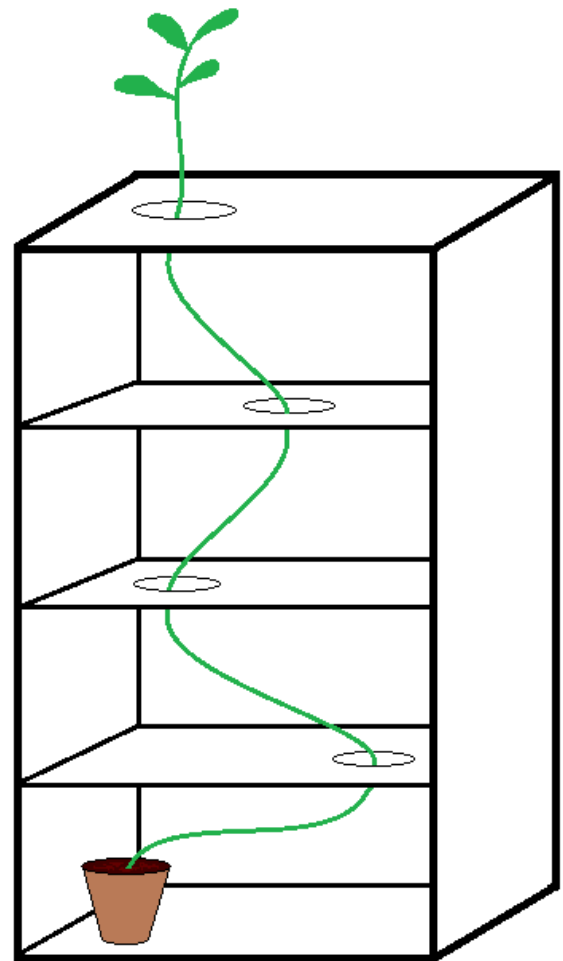
TEACHER RESOURCES

Suggestions and Options

- The lesson suggests waiting one week to open up the plant mazes. The pea seeds, under the right conditions, should germinate in just a couple days. It may be necessary to add water to the cups to give the seeds enough moisture to continue to grow for one week. Waiting a week allows for more of a “wow” factor when students open up their mazes, but is not necessary for the activity. Pre-soaking the seeds in water for approximately 8 hours ahead of planting will greatly speed up the time needed for the seeds to germinate.
- Students can also learn about the basics of electricity by taping coil cell batteries to LED light emitting diodes and inserting those into small holes in the box to serve as a light source. Placing these lights in different places and quantities in the mazes should change the results and allow for a more thorough experiment.

Extension Ideas:

- Introduce or teach about photosynthesis.
- Learn about how energy is moved throughout ecosystems, starting with the sun!
- Try different types of seeds in similar mazes to see how different plants react differently to light.
- **Scientific Inquiry:** Have students think more deeply about plant growth and create their own question, hypothesis, and experiment to test. What other variables can be tested to see how plant growth is affected? Students could try changing water, soil type, and temperature. Place some cups on their sides in the bottoms of the mazes. Do plants have to grow upright?
 - Have students use the “Student Inquiry Sheet” to test their variables.
- Watch a time lapse video of a plant growing.
- Read AITC’s Urban Ag Mag to learn more about how urban settings have inspired a variety of agricultural innovations to grow food in urban communities.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!





PLANT MAZE

STUDENT WORKSHEET

Background Information

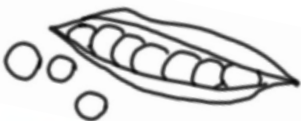
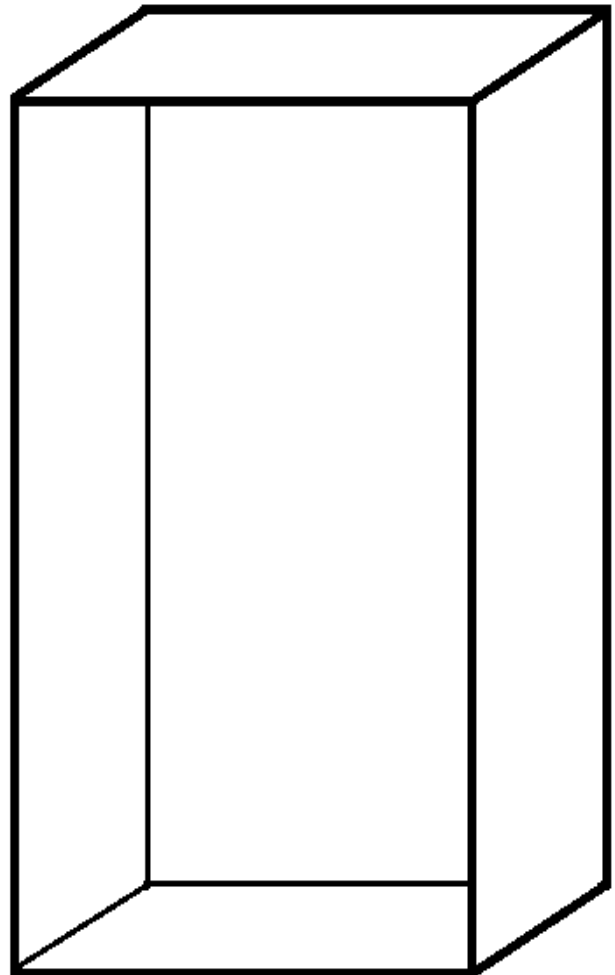
As you've already learned, plants need light to grow. But what affect does light have on plant growth? Can plants "find" the light they need? Today let's make a "plant maze" to test our hypothesis! You will use a cardboard shoe box, additional cardboard, and tape or glue to create a unique plant maze!

Make a Prediction!

How long will it take for your pea seeds to grow through the plant maze?

Directions

Draw your plans for your plant maze in the blank shoe box! Notes and ideas can be written in the blank space!





PLANT MAZE

STUDENT WORKSHEET

Chart Your Plant's Growth

After completing your plant maze and adding your cup of planted seeds in the bottom of the maze, wait until your teacher says it is time to open up the maze. How much have your plants grown? Are they growing towards the light?

Directions

Draw your plant maze as it actually looks after building, including your cup of seeds. Using a different color each day, draw your plant's growth below. Don't forget to fill in your key with the correct colors and numbers!

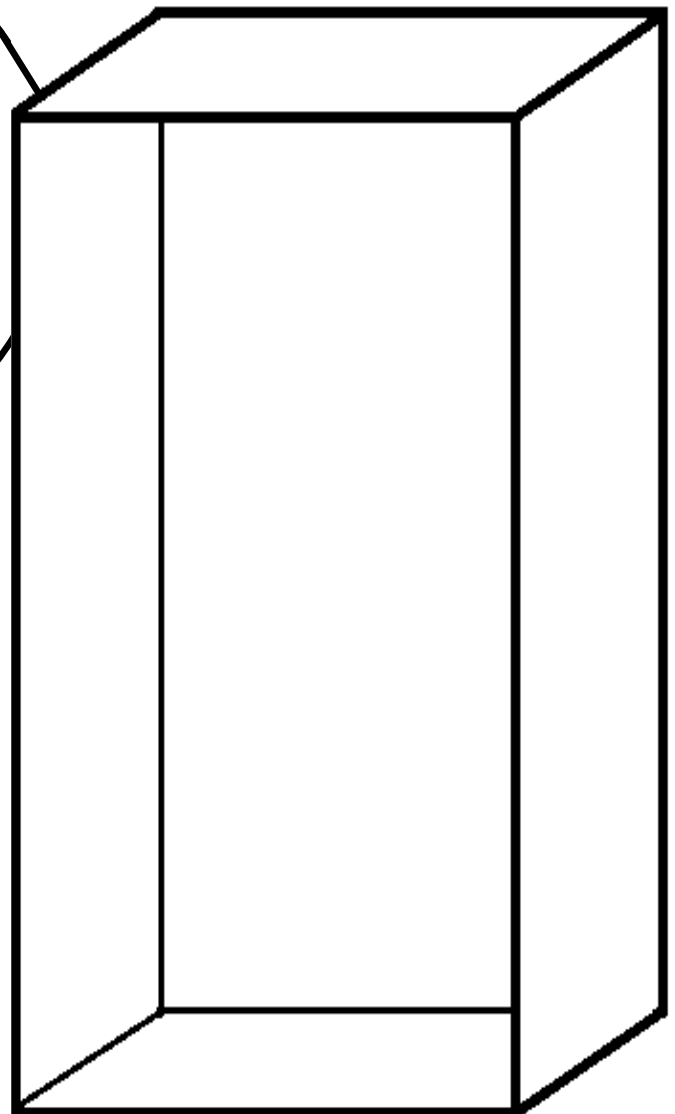
KEY

- 1st check, ____ days since planting
- 2nd check, ____ days since planting
- 3rd check, ____ days since planting
- 4th check, ____ days since planting
- 5th check, ____ days since planting

REFLECTION QUESTIONS

How did light affect the growth of your plant?

Was your prediction from the first page correct?
What are some other things that would affect the growth of the plant?



Beneficial Bugs Scavenger Hunt



POLLINATORS



Butterfly



Bee



PREDATORS



Praying Mantis



Ladybug



DECOMPOSERS/RECYCLERS



Pill Bug
(Rollie Pollie)



Ground
Beetle



Fly



Earth
Worm





Science



Literacy

CIRCLE OF EARTH BRACELET

Grade Level

K-4

Length of Lesson

30 minutes

Objective

After completing this lesson, students will better understand the inter-connected “circles” of the life systems on Earth.

Materials Needed:

- 1 pipe cleaner per student
- 1 small clear pony bead (people)
- 1 small blue pony bead (water)
- 1 small green pony bead (plants)
- 1 small brown pony bead (soil)
- 1 small orange pony bead (day)
- 1 small black pony bead (night)
- 1 small white pony bead (air)
- 1 small yellow pony bead (sun)
- 1 small red pony bead (animals)

Standards

Common Core

Language Arts: CCSS.ELA-Literacy.RI.4.3; RI.4.4; RI.4.5; RF.4.3a

NGSS

3-LS2-1; 3-LS4-3; 3-LS4-4; 3-LS1-1; 3-LS3-1; 3-LS3-2; 3-LESS2-1; 3-ESS3-1; 4-LS1-1; 5-ESS3-1

Lesson Summary

This lesson is designed to help students recognize the important resources our Planet Earth provides us. Students will learn about protecting the planet and will be more prepared for Earth Day!

Suggested Sequence of Events:

1. Listen to “[Earth: Where Would we be Without It?](#)” by Kathleen Kranking to get students thinking about protecting the Earth.
2. Pre-Activity Discussion:
 - Pass out materials to each students
 - Talk about what the beads represent
 - Blue: Water is a circle. Water rains down on land. Water collects in oceans, rivers, lakes, and streams. It evaporates back up into the sky and collects in clouds. The clouds become heavy, and rain falls down to land again.
 - Green and Brown: Plants and soil are circles. Plants grow from soil. Plants provide food for animals.
 - Red: Animals provide food for other animals. Animals die and decompose. New soil is made. New plants grow.
 - Black and Orange: Earth is a circle. Earth is spinning through space, rotating on its axis, revolving around the sun. The Earth and sun give us the circle of the seasons and the circle of night (black) and day (orange).
 - White: Air is a circle. Animals breathe in oxygen and exhale carbon dioxide. Plants take in carbon dioxide, use it to make food, and give off oxygen. Animals breathe it in again.
 - Yellow: The sun is a circle. The sun provides warmth for light for all of the Earth’s circles. Without the sun, plants and animals would not survive. The sun binds us together.
 - Clear: People move in circles. The earth provides us with everything we need to survive. The survival of our planet hinges on how well we, the people, are stewards of Earth’s resources.
3. Complete the activity following the procedures:
 - String the colored beads on to the pipe cleaner to represent the circles of the Earth.
 - String opposite end of the pipe cleaner back through the clear “People” bead. Now your clear “People” bead is an adjuster for the bracelet since everything “hinges” on the people.

TEACHER RESOURCES

Extension Ideas:

- Read “[Earth Day Hooray!](#)” By Stuart J. Murphy to learn more about recycling.
 - Have a discussion about recycling. Talk about different ways you can help recycle.
 - Take a field trip to a park and have students help clean it up.
- Bring in items that can or can’t be recycled. Have students vote on if the items are recyclable or trash.
- Have students play [Recycle Round Up](#) on National Geographic Kids to further their recycling knowledge while playing a fun online sorting game!
- Teach students consumption, conservation, and preservation.
 - Divide your students into 3 groups and pass out a small piece of candy to each student
 - Tell Group 1 that they may eat their candy. They represent consumption – the utilization of the resource.
 - Tell Group 2 that they have to make their candy last by unwrapping it slowly, eating small bites, licking on it, savoring it, etc. They represent conservation – the careful use of the resource.
 - Tell Group 3 that they get to admire their candy but they cannot eat it. Ask them to admire the wrapper, the shape, the smell, etc. They represent preservation – saving of the resource for the future.
 - Let all students eat their candy when you’re done.
- Read “[The ABCs of Habitats](#)” by Bobbie Kalman to help students learn more about natural animal habitats.
- Go on a nature walk.
 - Upper Grade Levels: Have students take a nature notebook with them to keep track of the things they see or find on their walk. After the walk, have students write a paragraph about their findings.
 - Lower Grade Levels: Talk about different animals or plants you see as you are walking. After the walk, have students draw a picture of something they saw.
 - Allow both grade levels to share their work with a partner and/or the rest of the class.





THE BEES KNEES AND MORE!

Grade Level

3-6

Length of Lesson

45 minutes

Objective

By the end of this lesson, students will know the different parts that make up a honeybee.

Materials Needed

- Copies of the labeled bee diagram
- Copies of anatomy flashcards*
- Copies of the student worksheet

StandardsCommon Core

CCSS.ELA-Literacy.RI.3-8.4; SL.3.6

NGSS

2-LS2-2; 4-LS1-2; MS-LS1-4

Lesson Summary

This lesson is designed to help students learn the different parts of a honeybee. Students can use the hexagon-shaped flashcards to deepen their understanding and learn more about the functionality of each part!

*If you want the flashcards printed so that the information is on the back side of the matching anatomical part, make sure your settings are changed to print double-sided, flipping on the long edge.

Suggested Sequence of Events:

1. Set Up: Print enough flashcards to have a few classroom sets. Print and cut the flashcards out and laminate to last longer!
2. Read through the IAITC Pollinator Ag Mag to learn more about pollination and other pollinators! Interactive online versions can be found on our website.
3. Complete the activity following the procedures:
 - Read "[Honeybee: The Busy Life of Apis Mellifera](#)" by Candace Fleming to snag student interest and introduce students to honeybee life.
 - Give each student a labeled honeybee diagram. As a class, read through the names of each of the parts. Talk about their location, structure, function, and uses.
 - Have students use the flashcards to deepen their understanding about the function and use of each part. Students can work individually or with a partner.
 - When students are ready, test their knowledge! Give each student a copy of the blank honeybee diagram and have them use the word bank to fill in the blank lines.
 - Give students crayons or colored pencils to color their honeybee when they finish!
4. Whole class discussion and reflection of activity. Ideas for discussion starters: How are the parts of a honeybee important for their survival? Why is important/helpful that honeybees have hair; what does this help with?

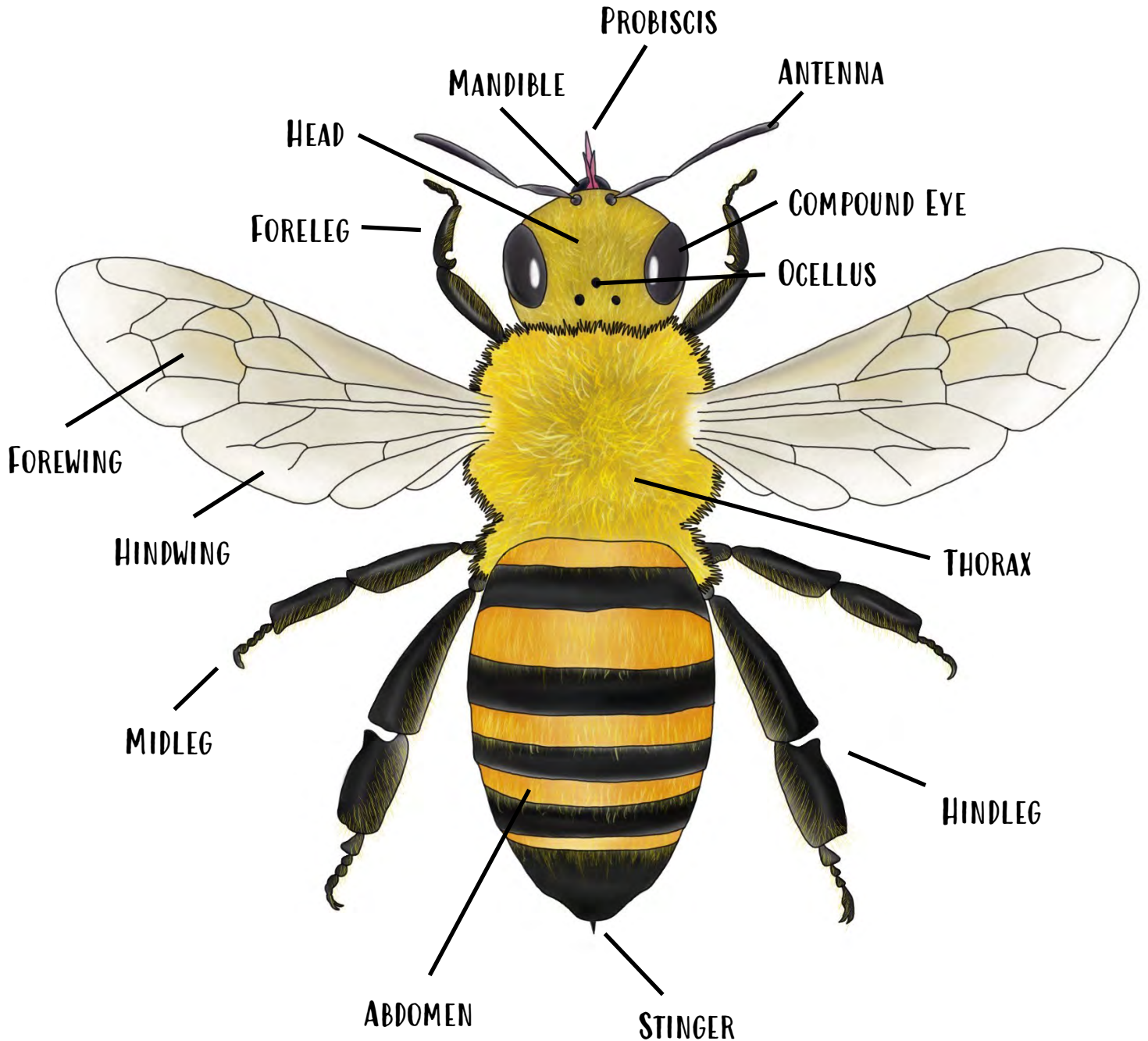
TEACHER RESOURCES

Extension Ideas:

- After reading “Honeybee: The Secret Life of *Apis Malifera*” by Candace Flemming, have students look at the pictures and analyze the images.
- Have multiple books around for students to read and learn more about honeybees and other types of bees! Here are some of our favorites:
 - [Give Bees a Chance](#) by Bethany Barton
 - [The Bee Book](#) by Charlotte Milner
 - [The Honey Makers](#) by Gail Gibbons
 - [Flight of the Honey Bee](#) by Raymond Huber
 - [Bee Dance](#) by Rick Chrustowski
 - [Please Please the Bees](#) by Gerald Kelley
- Use the IAITC Pollinator Ag Mag and complete the Pollinator Ag-Venture worksheet to strengthen non-fiction literacy skills.
- Watch the IAITC “Bee School” videos to learn more about bee keeping. These can be accessed on the Illinois Agriculture in the Classroom YouTube Channel.
- Learn about how honey is made in the hive and then harvested. Bring in different types of honey for students to taste test.
- Compare the anatomy of a honeybee to other types of bees and insects. What are the similarities and differences?
- Have students research other pollinators (in your state, in the U.S. and/or around the world) and share their information with the class.
- Learn about native wildflowers that are beneficial to pollinators.
- Learn about the structure of flowers and the process of pollination.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!



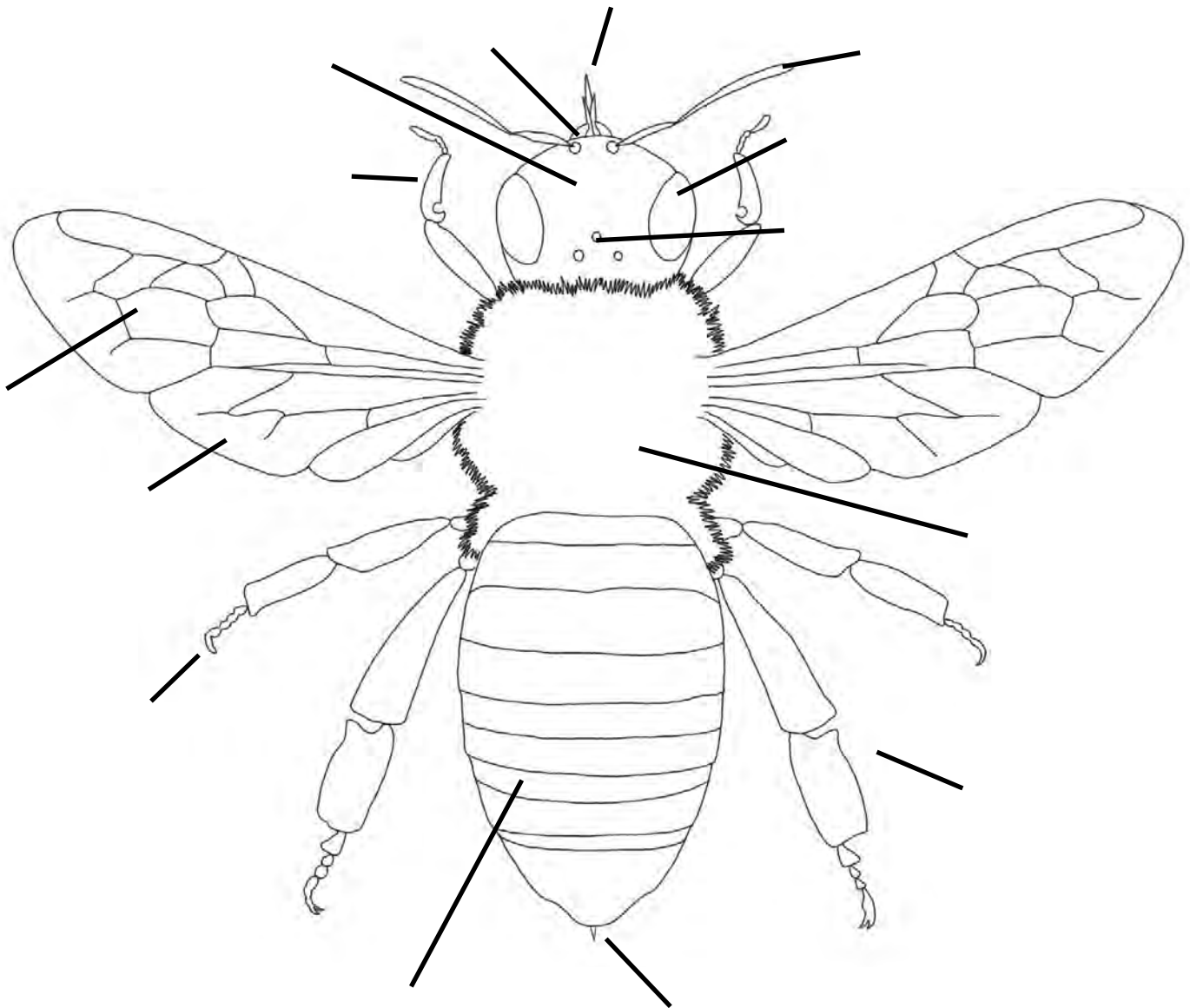
THE BEES KNEES AND MORE!





THE BEES KNEES AND MORE!

STUDENT WORKSHEET



WORD BANK

Ocellus

Thorax

Foreleg

Mandible

Forewing

Hindwing

Abdomen

Head

Midleg

Hindleg

Proboscis

Stinger

Antenna

Compound Eye



ANATOMY FLASHCARDS: A

HEAD

- Front segment of the bee
- Contains important sensory parts for sight, smell, taste, and touch

ANTENNAE

- Found on the forehead
- Used for detecting scent since bees don't have noses!
- Also used for feeling around in the dark hive

MANDIBLES

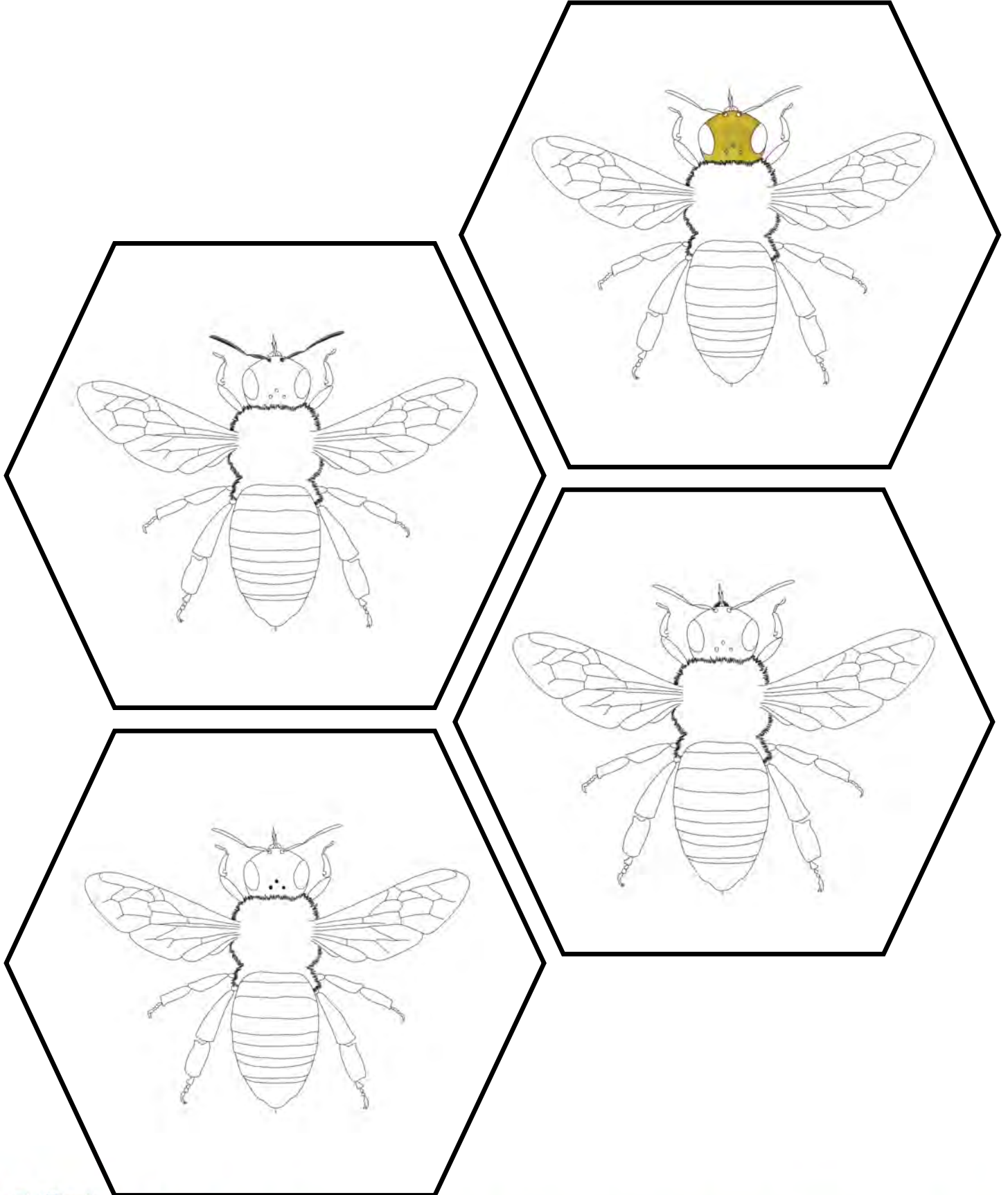
- The powerful jaws of the bee
- Used for:
 - Moving, cutting, and shaping the wax to build the honeycomb
 - Grooming
 - Fighting off predators
 - Holding on to surfaces

OCELLI

- 3 dots on the top of the head, found in a triangle pattern
- Used for detecting brightness and intensity of light



ANATOMY FLASHCARDS: A





ANATOMY FLASHCARDS: B

COMPOUND EYES

- Two large eyes that take up most of the head
- Have over 3,000 lenses that allow the bee to see ultraviolet light — this helps them see which flowers are full of nectar!

THORAX

- Torso of the bee, the segment of the body between the head and abdomen
- All wings and legs attached to the thorax
- Black in color and is covered in hair which helps collect pollen

PROBISCIS

- Long, straw-like tongue
- Used for:
 - Sucking up nectar from flowers
 - Transferring and forming beeswax in the hive to build the honeycomb
 - Transferring nectar from bee to bee, a part of the process in making honey!

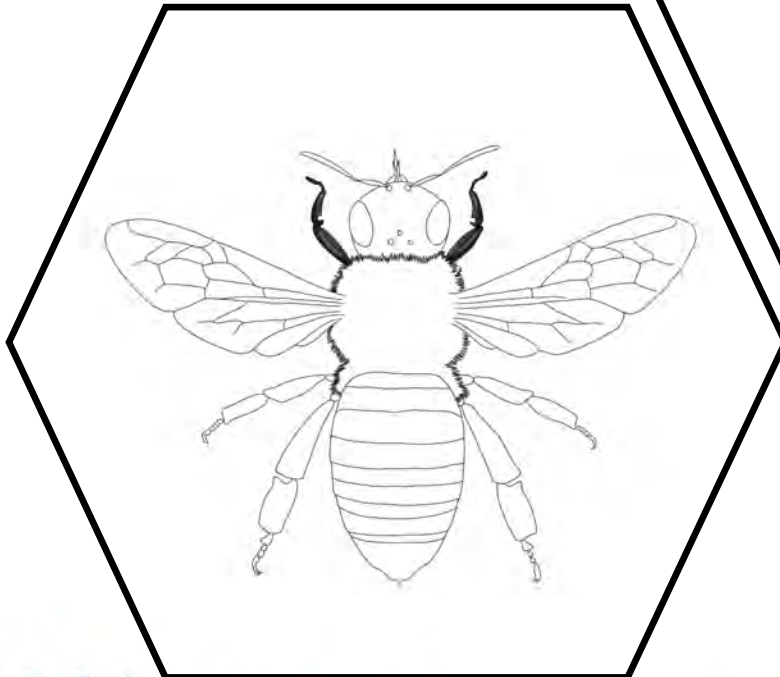
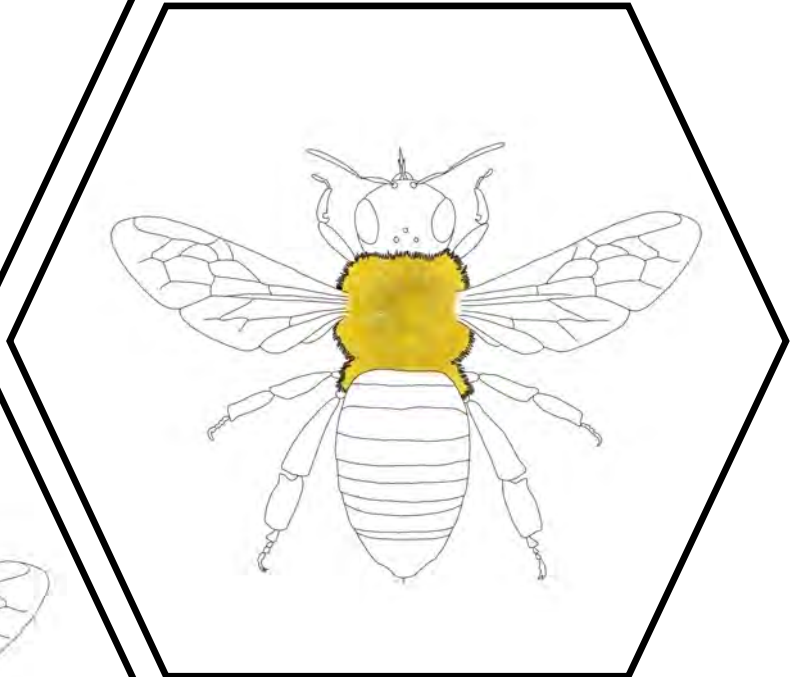
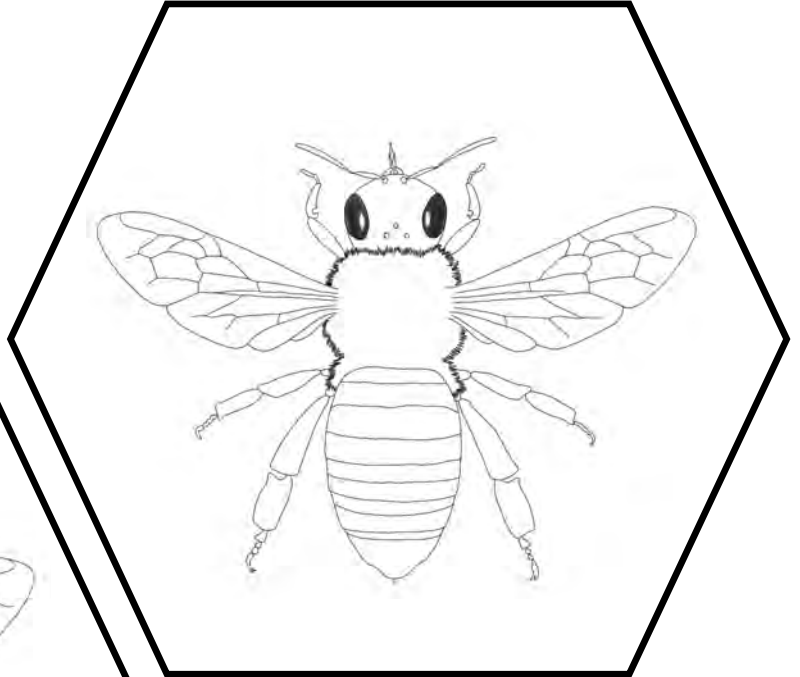
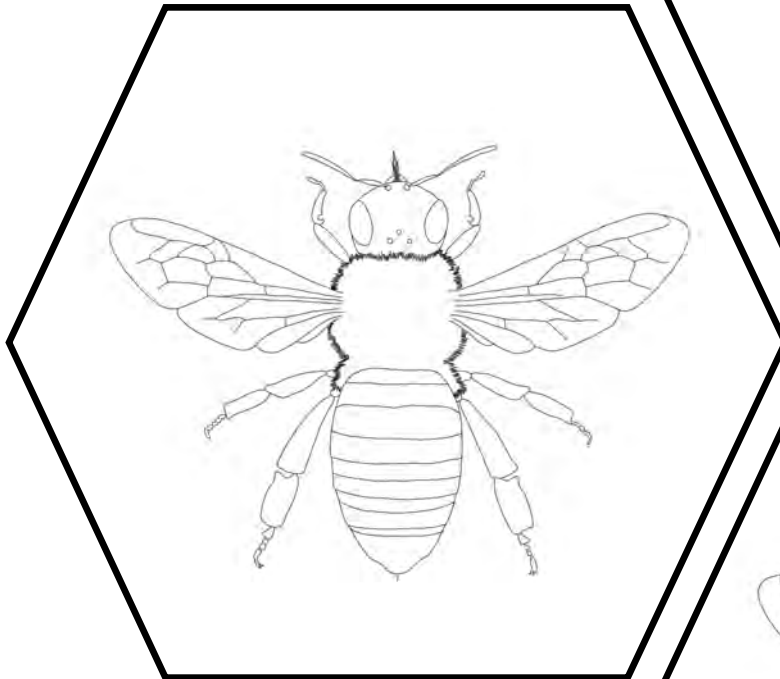
FORELEGS

- Attached to the thorax near the head
- Used for:
 - Dusting off their head and antennae from dust and pollen
 - Moving around flower parts to get to the nectar
 - Brushing pollen caught in the hair of the mid legs into “pollen baskets” found on the hind legs



Science

ANATOMY FLASHCARDS: B





ANATOMY FLASHCARDS: C

WINGS

- 2 pairs attached to the thorax
- Forewings are larger and closer to the head, hindwings smaller and behind the forewings
- Beat 230-250 times per second!
- Can fly between 12-20 mph (miles per hour)

MID LEGS

- Attached to the middle of the thorax
- Covered in little hairs that collect pollen
- Used for walking

HIND LEGS

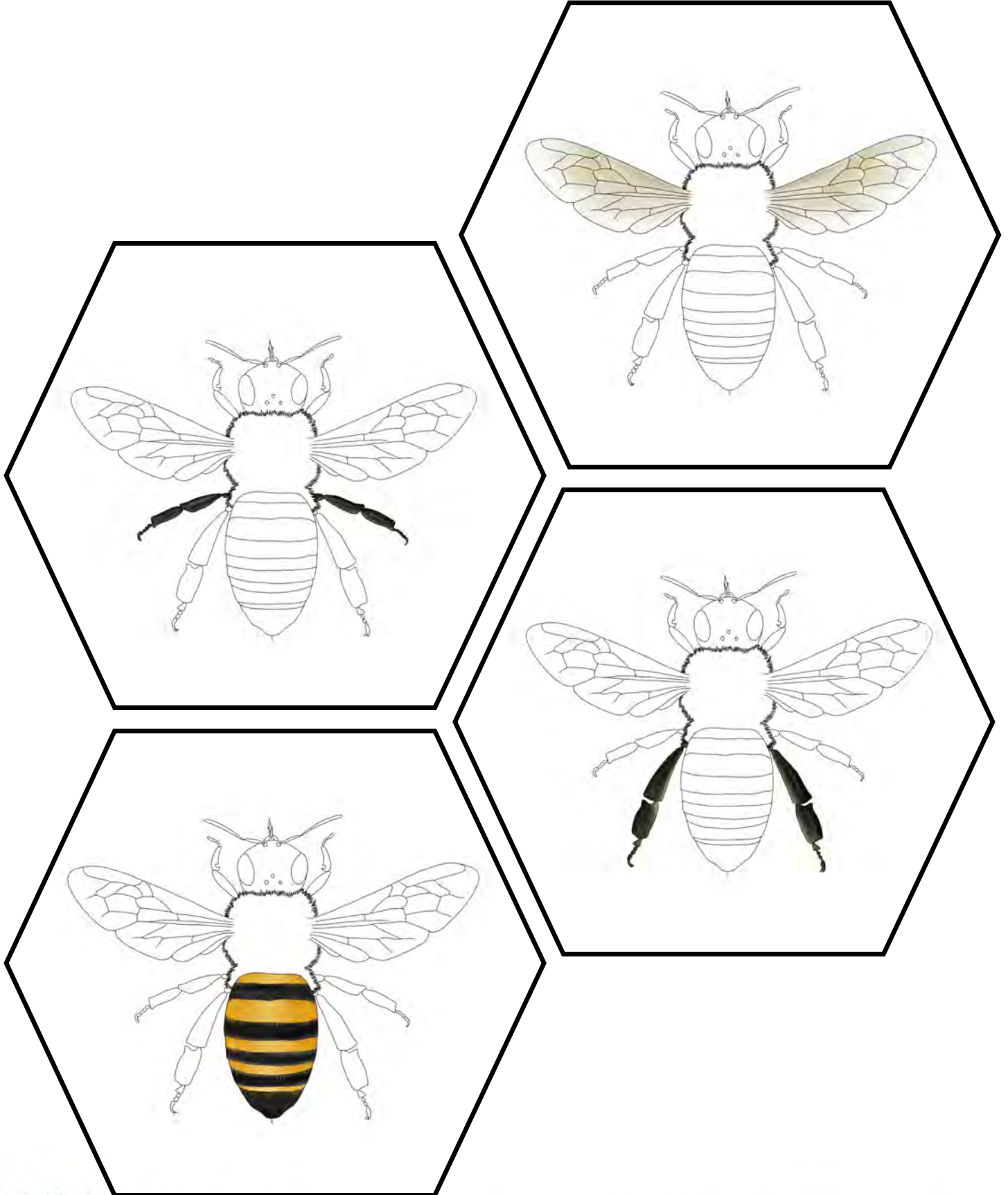
- Attached to the back of the thorax, near the abdomen
- Used for movement and walking
- Contain “pollen baskets”, special hairs on the outside of the leg that are used to store pollen

ABDOMEN

- Largest segment of the body, found at the back of the bee
- Hides the stinger — only female bees can sting. Stinging leads to death so a honeybee will only sting if she or her hive are threatened.



ANATOMY FLASHCARDS: C





RUMINATION NAVIGATION

Grade Level

4-6

Length of Lesson

45-60 minutes

Objective

By the end of this lesson, students will have a better understanding of the digestive system of ruminant animals.

Materials Needed

- Containers (resealable snack size baggies or solo cups)
- Plastic spoons
- [Paint cone strainers](#)
- Paper Towels
- Carbonated drink
- Water
- [Potato Sticks](#)*
- Pop Rocks candy
- Measuring cups: 1/4 cup, 1/8 cup, 1 tablespoon, 1/2 teaspoon
- Permanent markers
- Copies of student worksheet

Standards

NGSS

4-LS1-1; 5-PS1-4; 5-PS3-1; MS-LS1-3; MS-LS1-7

Lesson Summary

This lesson is a fun, hands-on activity designed to help students understand the process of rumination and how digestive systems break down food for energy. It is best to be used as an extension lesson as some understanding of the ruminant digestive system is beneficial to understand the steps in the activity.

*If you don't have access to potato sticks, any type of potato chip or even a half slice of bread would work just fine.

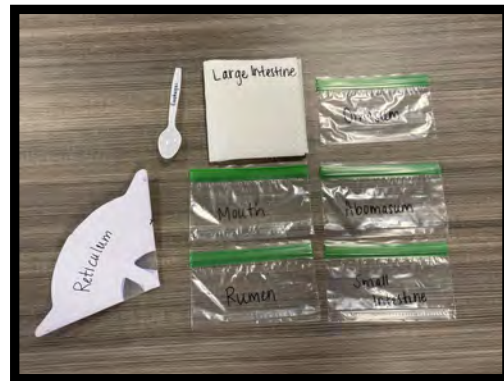
Suggested Sequence of Events:

1. Set Up: To save time, have the materials divided so that all the materials for one group are together. If time allows, you can have the 1/4 cup of potato sticks measured and ready in a container.
2. Read through the IAITC Beef Ag Mag and Dairy Ag Mag to learn more about two important ruminant animals! Interactive online versions can be found on our website.
3. Complete the activity following the procedures:
 - Divide students into groups of 2-3 and have one person from each group collect the materials.
 - Hand out the student worksheets so that each student has their own, and read through the introduction together.
 - Read through the "Set Up" on the first page of the student worksheet as a whole class so students are aware of what they need to do first.
 - Students need to label their baggies and strainer, measure the 'digestion' materials and put them into the appropriate baggies, and then follow the steps on their student worksheets.
 - When finished, have students clean up their materials according to your classroom instructions!
 - Once cleaned up, have students work together, or individually, to answer the questions on the student worksheet.
4. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Extension Ideas:

- Have students color code the steps to the cattle diagram by coloring in the instruction shape and the matching digestive system part the same color.
- Have students write map directions for the route food takes in ruminant digestive systems.
- Read through our “Moovin’ On Through” non-fiction text that explains the different parts of the ruminant digestive system in more detail.
- Compare and contrast the ruminant digestive system to a monogastric digestive system.
- Have student define the word ‘rumination’. Compare that definition with the definition for ‘monogastric’.
- Invite a beef cattle farmer into your classroom to talk with your students!
- Learn more about beef by-products.
- Learn about the history of cattle in the United States.
- Have students share their favorite beef recipes.
- Learn about what cattle eat and how they are cared for by farmers and ranchers.
- Research cattle breeds in the United States and compare to cattle breeds around the world.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!





RUMINATION NAVIGATION

STUDENT WORKSHEET

Introduction: Food is made up of ingredients that provide nutrients and minerals to our bodies! All animals, including humans, need these nutrients and minerals for our bodies to function properly and to have energy. The digestion system is responsible for breaking down the food we eat, taking as many of those nutrients and minerals as the body needs, and then gets rid of what is not needed. Unlike humans, ruminant animals (like sheep, cattle, goats, and even camels) have a more intricate digestive system. This is because they eat plants, like grass, that is harder to break down than the foods we eat. Let's get a hands-on understanding of what happens to the food during rumination.

Set Up

Let's get the materials set up so that you can easily navigate your way through the ruminant digestive system!

1. Check to make sure you have all of the following materials:

- 5 baggies
- 6 paper towels
- 1 strainer
- Carbonated drink
- Pop Rocks candy
- Food
- Water
- Spoon

2. **Label** your materials so that you know which material represents which part of the digestive system.

- Baggie 1: Mouth
- Spoon: Esophagus
- Baggie 2: Rumen
- Strainer: Reticulum
- Baggie 3: Omasum
- Baggie 4: Abomasum
- Baggie 5: Small Intestine
- 2 Paper towels: Large Intestine

3. Now we need to measure out some of our materials and put them into the correct baggies!

- Rumen: 1/4 cup water
- Abomasum: 1/8 cup carbonated drink
- Omasum: 2 folded paper towels
- Small Intestine: 2 folded paper towels

Now that your materials are set up, it's time to ruminate! The instructions on the next pages will refer to all the containers as the **scientific name** of the digestive system section they are modeling. Start with the mouth and follow the arrows!



RUMINATION NAVIGATION

STUDENT WORKSHEET

MOUTH

Add 1/4 cup of food to the **mouth**. Then add 1 tablespoon of water and seal the baggie!

Keep the baggie closed and use your fingers to break apart the food into smaller pieces. Form the food into a wad!

ESOPHAGUS

Using the **esophagus**, move the wad of food from the mouth and into the rumen!

RUMEN

The rumen liquids and walls are home to millions of microorganisms that are now starting to eat the food that the cattle just swallowed. Add 1 teaspoon of the Pop Rocks candy and listen to them 'eating'!

Seal that baggie closed and set it on your table. Lightly pull up on the top of the baggie and then let go. What just happened? The rumen just had a contraction which moved the liquids, food, and microorganisms around so that they all come in contact. Kind of like stirring ingredients together when cooking!

RETICULUM

A contraction spilled some rumen liquids and a wad of food into the reticulum. Put the **reticulum** over the opened **omasum**. Then pour everything from the **rumen** into the **reticulum**.

The wad of food is too big to pass into the omasum and needs to be chewed more. Use the **esophagus** to "regurgitate" the wad of food to the **mouth**!

MOUTH

Close the mouth and use the bottom of your measuring cup to lightly smash the food into smaller pieces—it will get a little mushy!

This is called "chewing the cud"



RUMINATION NAVIGATION

STUDENT WORKSHEET

LARGE INTESTINE

Carefully drop the undigested food onto the large intestine. Microorganisms in this area will break down anything of value that's left in the food. Add 1/2 teaspoon of Pop Rocks candy.

The remaining undigested food is considered waste and excreted. Yep—it's the poo!

SMALL INTESTINE

Carefully dump everything from the **abomasum** into the **small intestine**! The small intestine will absorb the rest of water.

ABOMASUM

Carefully dump the wad of food from the **omasum** into the **abomasum**!

The abomasum is most like the human stomach and produces acidic liquids to break down the food even further!

OMASUM

Use the paper towels to absorb more liquid from the wad of food.

ESOPHAGUS

Using the **esophagus**, move the wad of food from the **mouth** and into the **omasum**!

Form the food into a wad!

MOUTH

In real life, the cow would re-chew the food, swallow it, and the wad of food would go back into the rumen to be further broken down by the microorganisms. The food can only pass through the reticulum once it's broken down, or digested, enough. This would be a repeat of the previous page, but today we are going to fast forward to the omasum!

Keep in mind that nutrients and minerals are being absorbed from the food, through the walls in each section, and are sent throughout the body for use!

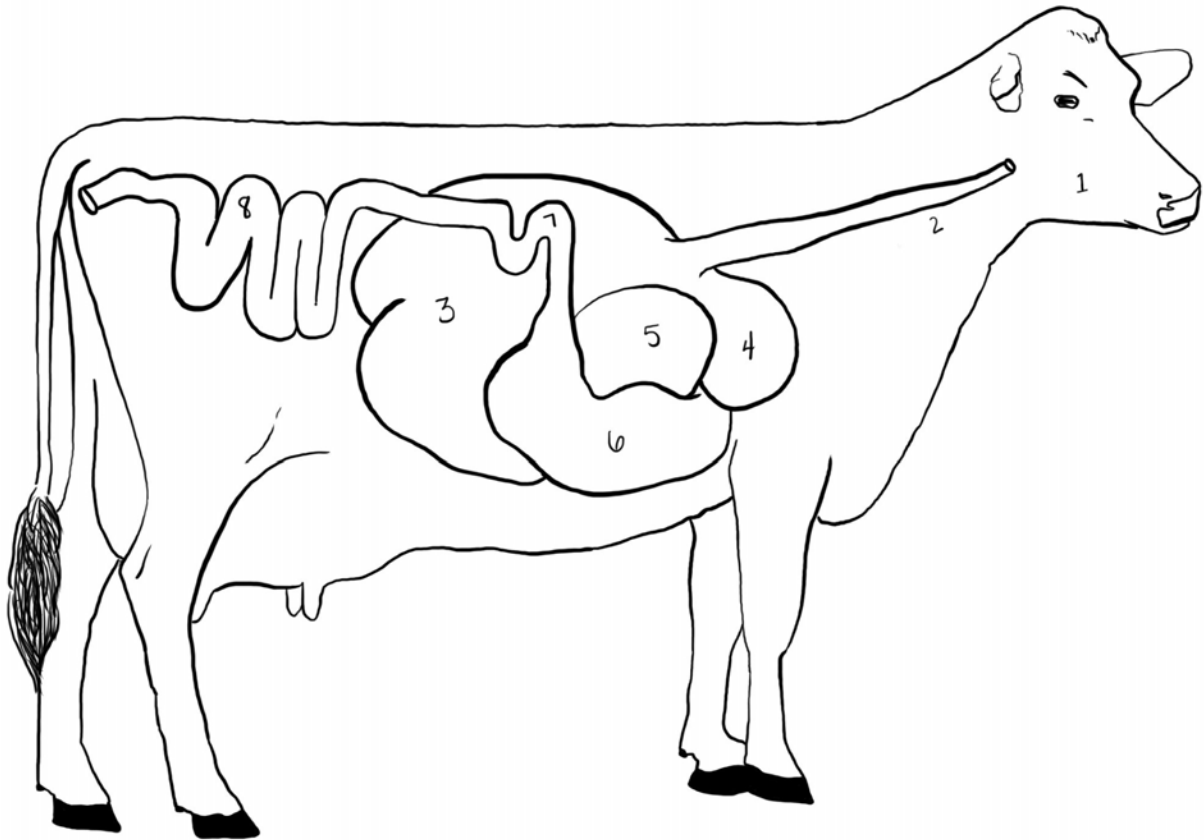
PIT STOP!

(CONTINUE HERE)



RUMINATION NAVIGATION

STUDENT WORKSHEET



-
1. You added water to the mouth to help break down the food. What did that water represent? Think about what happens when you chew your food.

 2. You added Pop Rocks candy two different times in the activity. What did the Pop Rocks candy represent and why are they important in digestion?

 3. Why do cows regurgitate their food?



POWDER-POWERED POLLINATION

Grade Level

K-3

Length of Lesson

45 minutes

Objective

By the end of this lesson, students will have a better understanding of the process of pollination.

Materials Needed

- Juice boxes
- Boxed Macaroni & Cheese
- Paper Flower Cutouts
- Black Pipe Cleaners
- Paper Plates
- Hand Lens (optional)
- Copies of student worksheet

Standards

NGSS

K-LS1-1; 2-LS2-2

Lesson Summary

This lesson is designed to give students a hands-on activity that shows how pollinators like butterflies pollinate flowers.

Suggested Sequence of Events:

1. Set Up: Collect materials for each student/group.
2. Read *Flowers are Calling* by Rita Gray to help students better understand why pollinators are attracted to certain plants.
3. Read through AITC Pollinator Ag Mag to learn about the importance of pollinators. Interactive online versions can be found on our website.
4. Pre-Activity Discussion: What is pollination? Why is pollination important to humans? Who pollinates the food that we eat? How do pollinators actually do this important work?
5. Complete the activity following the procedures:
 - Give each student or group of students a paper plate, hand lens, pipe cleaner, juice box, and paper flower.
 - Students should tape or glue the paper flower to the top of the juice box and insert the straw into the juice box.
 - As they do this, the teacher should come around and pour some of the cheese powder from the boxed macaroni onto each plate. Students can share plates to reduce the quantity needed.
 - Next, students should bend their pipe cleaners onto the pointer finger of their non-dominant hand to form the legs of their pollinator (see picture on next page).
 - Using the student worksheet as their guide, students should complete the remainder of the activity steps.
 - Students will “visit” the first flower on the paper plate and rub their “legs” onto the cheese powder.
 - Then, they should visit the next flower on the juice box. Students should drink nectar with their proboscis (straw) and then gently bounce their “legs” on the flower to allow some of the pollen to fall off.
 - As they do each step, students should record their findings on the student worksheet.
6. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Extension Ideas:

- Have students color/draw on the flowers to reflect what they would be drawn to if they were pollinators.
- Read *Flower Talk: How Plants Use Color to Communicate* by Sara Levine to learn more about what attracts pollinators to different plants.
- Have students create a comic strip showing the process of pollination.
- Have students learn about the body parts of a butterfly by creating a version of our Bag Butterfly lesson and attach their butterfly wings (ziplog bag and tissue paper pieces) to their finger using another pipe cleaner.
- Find videos online of different pollinators collecting nectar and pollen from flowers.
- Use the leftover macaroni to complete our Commas in a Series worksheet. Students can glue the macaroni to represent where the commas should go.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!





POWDER-POWERED POLLINATION

STUDENT WORKSHEET

How do pollinators help plants grow?

Attach your new "legs" to your finger to turn into a butterfly! Take your butterfly to visit the flower on the table. Walk your butterfly legs through the pollen on the plate. What happens?

Draw what you see:

Tell a friend and then write what you see:

Next, land your butterfly on the other flower. Have your hungry butterfly use its proboscis (straw) to drink some nectar (juice). Gently tap your legs on the small flower. What happens?

Draw what you see:

Tell a friend and then write what you see:

What happened when your butterfly visited each flower? Why are these hungry butterflies and other pollinators important to our daily lives? Tell a friend and then write about how butterflies and other pollinators help plants grow.



Science

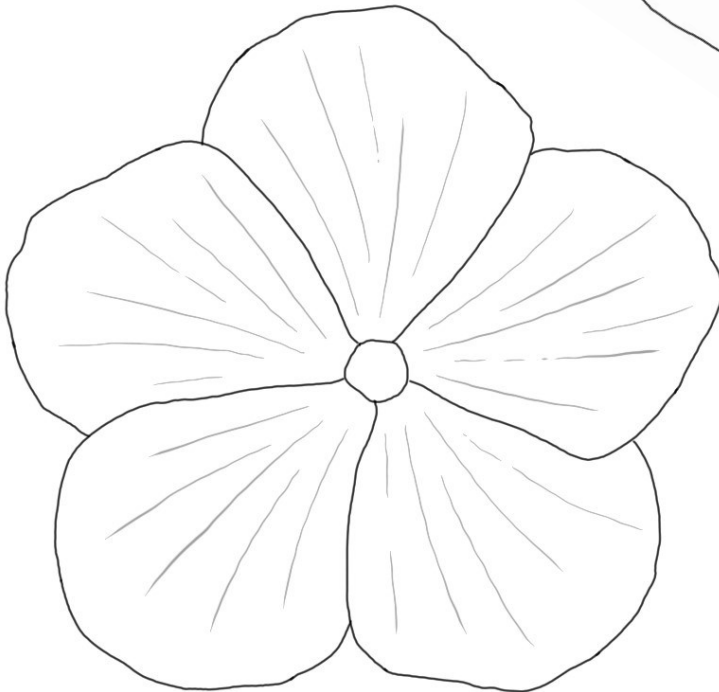
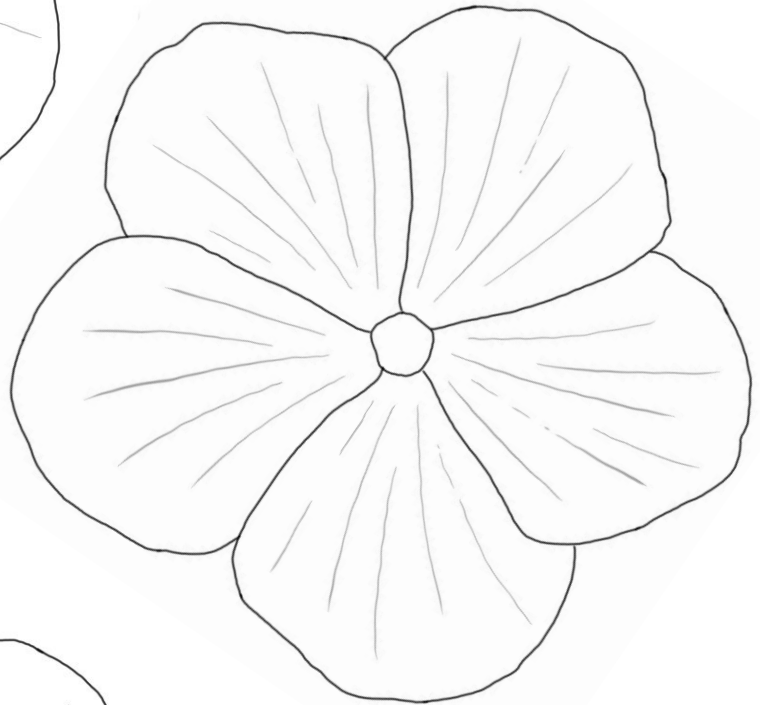
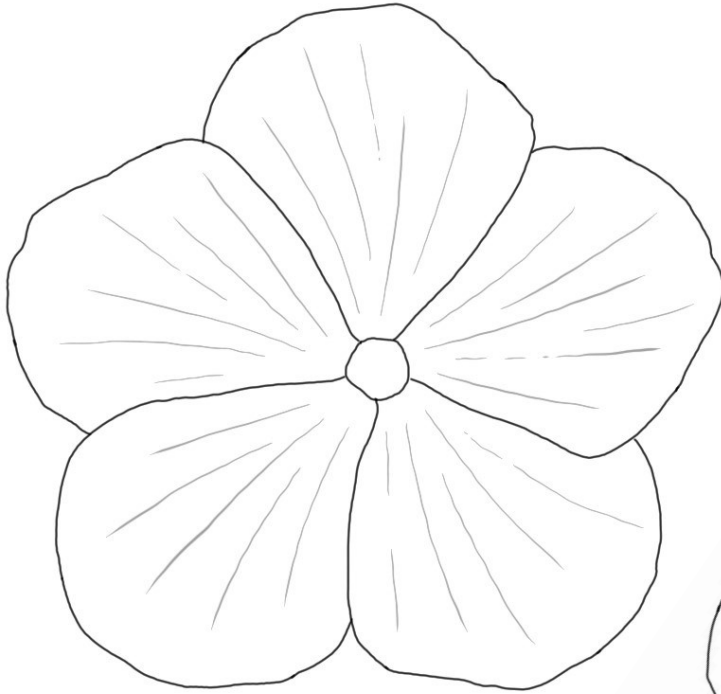
POWDER-POWERED POLLINATION





Science

POWDER-POWERED POLLINATION





POWDER-POWERED POLLINATION

COMMAS IN A SERIES WORKSHEET

Glue the leftover macaroni to each sentence wherever there is a missing comma.

1. Important pollinators include bees
bats butterflies birds moths flies and
small mammals.
2. The petals stamen pistil and sepal
are some important parts of a flower.
3. Bee species include honeybees
bumblebees squash bees carpenter
bees and many more!
4. We can help pollinators by adding
flowers plants and habitat to our
yards.



PLAY-DOH CORE SAMPLING

Grade Level

4-6

Length of Lesson

1 class period

Objective

By the end of this lesson, students will have a better understanding of the different layers of the soil and the impact that human activity can have on these layers.

Materials Needed

- Small disposable aluminum loaf pans
- Four colors of Play-Doh
- Large plastic straws
- Colored pencils (same colors as Play-Doh)
- Student handouts
- *Optional:* AITC Soil Ag Mag

Standards

NGSS

4-ESS1-1, 4-ESS2-1, 4-ESS2-2, 5-LS2-1, 5-ESS3-1, MS-LS2-4, MS-ESS3-3

Lesson Summary

This lesson is a fun, interactive way to teach students about the different layers of the soil profile and introduce important concepts related to soil conservation, particularly erosion.

Suggested Sequence of Events:

1. Set Up: Fill the disposable loaf pans with four layers of play doh. Try to create varying depths of the layers throughout the pans so that each layer is not the same size throughout. Students should be able to see that the layers of the soil are different depths at different locations.
2. Complete the activity following the procedures:
 - Have students read the AITC Soil Ag Mag to increase background knowledge and interest in soils.
 - Divide students into groups of three to four students.
 - Give each group a pan of Play-Doh “soil,” a straw, colored pencils, and the student handouts.
 - Explain to students that they will be taking core samples of their “soil” to determine the soil horizon/soil profile.
 - Students will push the straws into the play doh and remove a sample. They will then document these samples on their worksheet to get a better idea of the soil profile on their “property.”
 - After completing their samples, students will attempt to draw the soil profile based on the data they compiled from their soil samples.
 - Finally, students will use their research to answer some questions related to the soil on their property.
4. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Background Information:

For the purposes of this lesson, we only have four layers of Play-Doh soil. We recommend having students assume that the humus and topsoil layer are one color together, and then the three remaining colors are the remaining soil layers. This simplifies the lesson, and also reduces the number of colors of Play-Doh required for each student group.

Though not necessary, it may be helpful for students to understand the meanings of these key terms:

- Bedrock
- Clay
- Compost
- Leaching
- Organic matter
- Parent material
- Sand
- Silt
- Soil horizon
- Subsoil
- Topsoil

Extension Ideas:

- The NRCS publication “Lines on the Land” is an excellent resource to introduce students to many of the conservation practices that farmers employ on their fields to protect their soil. The resource can be accessed here: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_006156.pdf
- Soils4Teachers is a great source for everything soil-related: <https://www.soils4teachers.org/>
- Learn more about Illinois State Soil, Drummer Soil with this student-friendly handout: <https://www.soils4teachers.org/files/s4t/k12outreach/il-state-soil-booklet.pdf>
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!



PLAY-DOH CORE SAMPLING

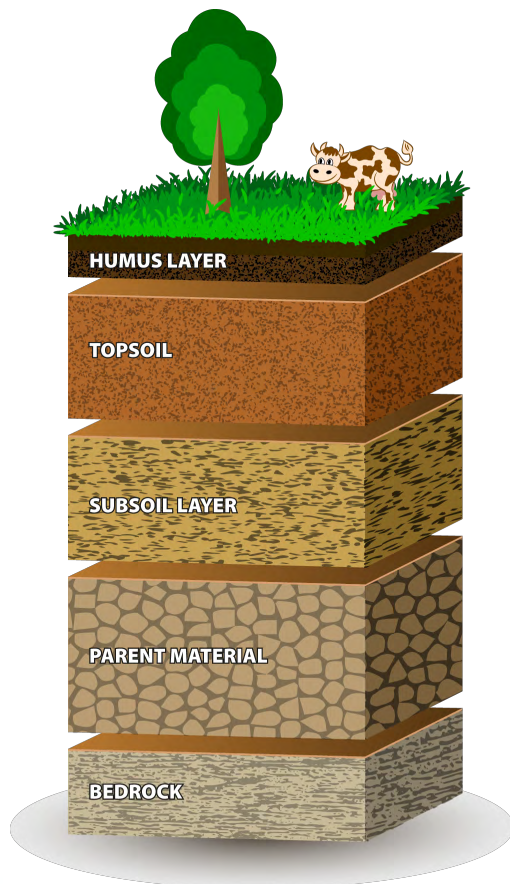
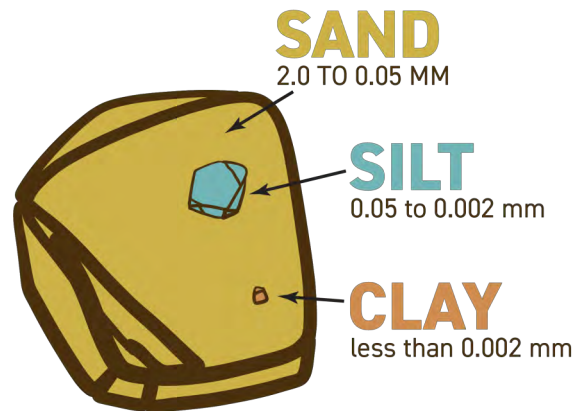
INTRODUCTION TO SOILS

You might think that all soil is the same, but that is just not true! Soil is a complex and amazing substance that we depend on for our very existence. Let's learn a little bit about the soil under our feet.

Soil Particles

Soil is made up of organic matter (once living plant and animal matter, mineral particles (sand, silt, and clay), and pore spaces (open areas potentially filled with air, water, and living organisms).

The percentage of the sand, silt, and clay particles in a soil determines the soil's texture. To the human eye, these particles all seem small, but they are actually very different in size. If you imagine that a sand particle is the size of a basketball, then a silt particle would be the size of a golf ball, and a clay particle would be the size of a dot made by a piece of chalk!



Soil Layers

Soil is also divided into layers. The depth of each of these layers is important when considering what different areas of land can be used for. Most agriculture production takes place on the top 12 inches or so of soil. Farmers and ranchers must work hard to maintain the health of the topsoil so their lands will continue to produce food for the world to eat! Let's learn more about the soil layers.

Humus layer: Top layer of decomposing matter, such as leaves. This layer can be thick in some soils, thin in others, or even not present at all.

Topsoil: This layer is made up of mineral particles (sand, silt, and clay) along with organic matter. This layer is extremely important for agriculture.

Subsoil: This layer is rich in minerals that have moved down from the layers above it, but it is much more compact than the topsoil.

Parent Material: This layer is made up of deposits at the surface of the Earth which the layers above it have been made from over time.

Bedrock: This is a layer of rock, such as granite, basalt, quartzite, limestone or sandstone



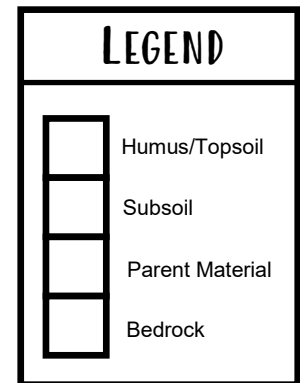
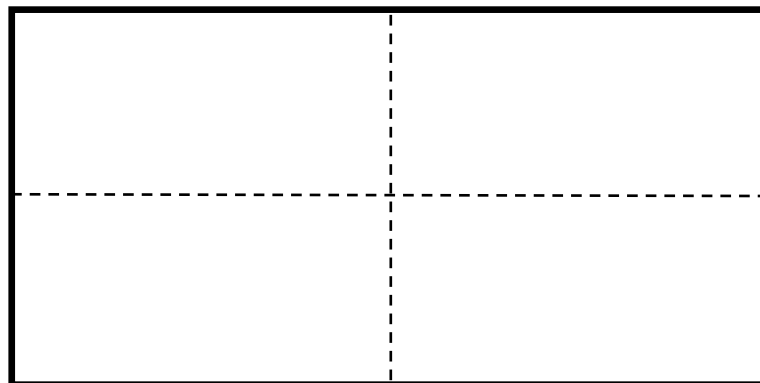
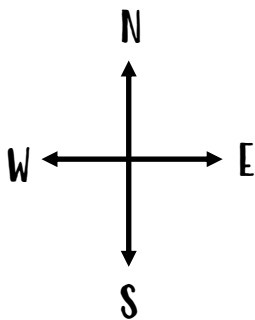
PLAY-DOH CORE SAMPLING

STUDENT WORKSHEET

Directions

1. Using your colored pencils, fill out the legend to show which colors represent the various soil layers.
2. Pick a location on your 'land' and push one straw straight down into the Play-Doh. Carefully pull the straw out.
3. On the map below, mark the location you collected your sample from.
4. Each time you collect a sample, color in the layers in the data boxes. Make sure to record the directional location for each sample by using the compass by the map.

MAP OF LAND



SAMPLE 1
<input type="checkbox"/> Location:

SAMPLE 2
<input type="checkbox"/> Location:

SAMPLE 3
<input type="checkbox"/> Location:

SAMPLE 4
<input type="checkbox"/> Location:

SAMPLE 5
<input type="checkbox"/> Location:

SAMPLE 6
<input type="checkbox"/> Location:

SAMPLE 7
<input type="checkbox"/> Location:

SAMPLE 8
<input type="checkbox"/> Location:



PLAY-DOH CORE SAMPLING

STUDENT WORKSHEET

Now that you have collected all of your data, it's time to analyze your samples and create your soil profile! Use your data to draw/color the soil on your property in the diagram below as best you can.



Use your data and soil profile to answer the following questions:

1. If you were to add a vegetable garden on your land/property, what location would be the best place for it and why?
2. What could be the cause for your land to have hills?
3. What could be the cause for your land to have different types of soil and depths of soil layers in different areas?
4. Why do you think it's important for farmers to know their soil? In what ways can farmers help care for the soil on their land?



Math



Literacy

AG-VENTURE WITH WATER

Use the IAITC Water Ag Mag to help you work through this worksheet!

Choose one of the four water quotes inside the Ag Mag and explain what you think it means. Then, provide evidence from the rest of the Ag Mag to support your explanation.

Convert these water statistics into fractions or percentages!

- 3% of the water on Earth is fresh water.
- 70% of Earth's surface is water.
- 40/100 of the nation's migratory birds are provided habitats from the Mississippi River.

Can you figure out the hidden message? Unscramble the words and fill them into the blank boxes below the scrambled word. Then use the number clues to fill in the hidden message!

PDHIAEWSSTR

20	18	1	6	10							

QYITUAL

3						13	

SALBTYTNIIUIAS

4				9											7	

HRESF

12	2				

CEYLC

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ETIALNSSE

11	16		17	15	5				19	

1	2

M			
3	4	5	

	O		K
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	O	G					
7	8	9	10	11	12		

	O
13	

	O					V	
14	15	16	17	6		18	

						!
1	19	20	8	6		

TEACHER RESOURCES

ANSWER KEY

Choose one of the four water quotes inside the Ag Mag and explain what you think it means. Then provide evidence from the rest of the Ag Mag to support your explanation.

Answers will vary but should focus on how every living thing relies on water for survival. In order for humans to continue growing food, we must practice conservation of fresh water, which is a limited resource. Students should add specific information from the Ag Mag to support their answer. Higher grades should cite where in the Ag Mag they found their supporting evidence.

Convert these water statistics into fractions and/or percentages!

1. 3% of the water on Earth is fresh water.

3/100

2. 70% of Earth's surface is water.

70/100 AND 7/10

3. 40/100 of the nation's migratory birds are provided habitats from the Mississippi River.

40% AND 4/10

Can you figure out the hidden message? Unscramble the words and fill them into the blank boxes below the scrambled word. Then use the number clues to fill in the hidden message!

PDHIAEWSSTR

S T E W A R D S H I P
20 18 1 6 10

QYITUAL

Q U A L I T Y
3 13

SALBTYTNIIUIAS

S U S T A I N A B I L I T Y
4 9 7

HRESF

F R E S H
12 2

CEYLC

C Y C L E
14 8

ETIALNSSE

E S S E N T I A L
11 16 17 15 5 19

W E
1 2

M U S T
3 4 5

W O R K
1 6

T O G E T H E R
7 8 9 10 11 12

T O
13

C O N S E R V E
14 15 16 17 6 18

W A T E R !
1 19 20 8 6



WATER CYCLE TOWER GAME

Grade Level

3-8

Length of Lesson

45 minutes

Objective

By the end of this lesson, students will have a better understanding of the steps and sequence of the water cycle.

Materials Needed

- Jenga or Tumbling Tower wooden block game sets
- Copies of Student Worksheet
- Copies of Student H₂O Path Sheet
- Copies of Score Sheet
- Copies of Student H₂O cycle templates

Standards

NGSS

Earth's Systems:
2-ESS2-3

Lesson Summary

This lesson is designed to give students a hands-on activity to practice and reinforce their understanding of the water cycle. A basic understanding of the water cycle prior to playing the game is ideal.

Suggested Sequence of Events:

1. Set Up: Prior to playing, teachers will need to color/paint the ends of some of the wood blocks to denote different steps in the water cycle. See the Teacher Resources page for details.
2. Pre-Activity: As you teach your water cycle unit, consider utilizing the IAITC Water Ag Mag, available on the IAITC website. *Water is Water* by Miranda Paul is an excellent water cycle book with some subtle ag connections.
3. Review the steps of the water cycle and important vocabulary terms: evaporate, condense, precipitate, flow, collect, uptake, and sublimate.
4. Complete the activity following the procedures:
 - Give each student a copy of the student worksheet and read through it together.
 - Divide students into groups and provide each group with a tumbling tower game. Have students work together to decide which way they would like to play the game (options 1-4 on the student worksheet).
 - Students can play the game in a variety of ways, based on the allotted time, student ability, and teacher preference. See the Teacher Resources page for full instructions of each option.
 - Groups who choose to play option 3 will need copies of the H₂O Path Sheet and the Score Sheet. For option 4, they will need copies of the Student H₂O Journey Sheet. These can be laminated for multiple uses.
 - No matter which way students decide to play the game, normal Jenga/tumbling tower rules apply; Once a block is successfully pulled, it is placed back on top of the tower. Students should record their points as they play.
 - Students take turns, marking their progress through the water cycle and verbally explaining what each color represents in the water cycle.
5. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Extension Ideas:

- Students can play the game in the following ways, based on time allotted, student ability, and teacher preference:
 - Option 1: Students play until the tower falls. Students earn points for each colored block they remove. The student who knocks the tower down earns a penalty. Points are added up at the end; the student with the most points wins. Students should explain the part of the water cycle that corresponds with the color they chose to remove.
 - Option 2: Pre-determine a number of points students should earn. If the tower falls, that student will earn a penalty, but then the group re-stacks the tower and continues play. The first student to earn the correct number of points wins. Students should explain the part of the water cycle that corresponds with the color they chose to remove.
 - Option 3: The first student to successfully make it through all three paths on the water cycle sheet by removing the corresponding colored wooden blocks wins. Students can check-off or X-out each step as they pass through the path. Once they start a path, they must completely work through that path before starting the next path. Use the attached point sheets for keeping score for this option.
 - Option 4: Students use the attached Water Cycle Map to create their own journey through the water cycle. Once they have correctly sequenced (drawn) each step of the water cycle on their maps, they must then follow that sequence as they play the game and remove the corresponding blocks. The first student to complete their water cycle wins. Use attached Student H₂O Journey Sheet for this option.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

The numbers in parentheses denote the number of blocks that need colored. Any leftover blocks do not need to be colored.

- Blue = Precipitation (6)
- Green = Uptake water (4)
- Pink = Sublimation (4)
- Red = Evaporation (4)
- Brown = Collects (4)
- Orange = Condensation (6)
- Yellow = Transpiration (4)
- Purple = Flows (4)





WATER CYCLE TOWER GAME

INSTRUCTIONS & RULES

All the water on Earth moves between oceans, rivers, lakes, the land, and the atmosphere in an ongoing cycle called the water cycle, which is powered by the sun. As the water flows through the cycle, it can change between the three states of matter: solid, liquid, and gas.

Set Up: Stack up the tumbling tower wooden pieces in a random order. Some of the pieces are colored and some are plain. Try to scatter the pieces throughout the tower as you stack it up. Then, get your game sheet and get ready to play!

Which Way to Play: There are 4 different ways to play the game. Read through all of them and then, as a group, decide which way you want to play!

- Option 1: Play until the tower falls. You can earn points for each colored block you remove. The person who knocks the tower down earns a penalty. Points are added up at the end; the person with the most points wins.

Rules: When you remove a colored block, explain that part of the water cycle to the rest of your group. Use scratch paper to keep score.

- Option 2: Pre-determine a number of total points to play to. If the tower falls, that person will earn a penalty, but then the group can re-stack the tower and continue playing. The first person to earn the correct number of total points wins.

Rules: When you remove a colored block, explain that part of the water cycle to the rest of your group. Use scratch paper to keep score.

- Option 3: The first person to successfully make it through all three given paths of the water cycle by removing the corresponding colored wooden blocks wins.

Rules: When it is your turn, choose Path 1, 2, or 3 to start. When you choose the path, start with the first step in that part of the water cycle and find a piece with the corresponding color. Remove that piece from its spot on the tower and then check off that step of the path. You must complete this entire path before you can move onto another path.

- Option 4: Use the attached Water Cycle Map to create your own path through the water cycle. Once you have correctly sequenced each step of the water cycle on your map, you must then follow that sequence as you play the game and remove the corresponding blocks in order. The first person to complete their water cycle wins.

No Skipping: If you can't pull the colored block you need, you have to pull a blank colored block. You cannot skip your turn OR pull a different colored block.

Point System: Colored blocks are 4 points each, blank blocks are 0 points.

Penalty: No matter which way you decide to play, if you knock over the tower, 10 points will be subtracted from your score at the end.

PATH 1



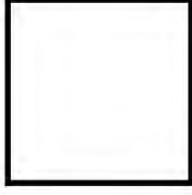
Liquid **evaporates** into water vapor.



Water vapor **condenses** to form clouds.



Water **precipitates** from clouds as rain or snow.



12 points if completed

PATH 2



Liquid water **flows** across land.



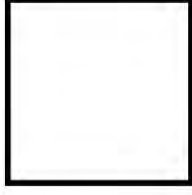
Water then **collects** in rivers, lakes, the soil, and other places.



Plants **uptake** the water from the soil.



Water then **transpires** from plants into the atmosphere.



16 points if completed

PATH 3



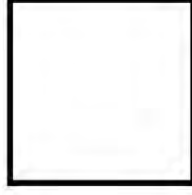
Ice can turn directly water vapor through **sublimation** into the atmosphere.



Water vapor **condenses** to form clouds.



Water **precipitates** from clouds as rain or snow.



12 points if completed

STUDENT SCORE SHEET: OPTION 3

<input type="text"/>	+	<input type="text"/>	+	<input type="text"/>	-	<input type="text"/>	=	<input type="text"/>
PATH 1 POINTS		PATH 2 POINTS		PATH 3 POINTS		KNOCK DOWN PENALTY		TOTAL SCORE

<input type="text"/>	+	<input type="text"/>	+	<input type="text"/>	-	<input type="text"/>	=	<input type="text"/>
PATH 1 POINTS		PATH 2 POINTS		PATH 3 POINTS		KNOCK DOWN PENALTY		TOTAL SCORE

<input type="text"/>	+	<input type="text"/>	+	<input type="text"/>	-	<input type="text"/>	=	<input type="text"/>
PATH 1 POINTS		PATH 2 POINTS		PATH 3 POINTS		KNOCK DOWN PENALTY		TOTAL SCORE





CLASSROOM VERMICOMPOSTING

Grade Level

K-8

Length of Lesson

Ongoing

Objective

By the end of this lesson, students will have a better understanding of vermicomposting and soil health.

Materials Needed

- (2) large, opaque plastic containers
- Replacement drain for cooler
- Drill & drill bits
- Newspaper
- Small amount of compost or soil
- 1/4 lb red wiggler worms
- Copy of the Weekly Log Sheet (optional)

Standards

NGSS

K-2-ETS1-1; K-LS1-1; 4-LS1-1-2; 4-ESS3-1; 5-LS2-1; MS-LS2-3

Lesson Summary

This lesson is a fun, hands-on activity designed to introduce students to the exciting world of vermicomposting—making compost with the help of worms! Students will help construct and maintain a classroom vermicomposter. As an alternative or supplemental lesson, students can make their own “desktop” composters as well.

Suggested Sequence of Events:

1. **Set Up:** Assemble all necessary materials. Teachers may want to mostly prepare the vermicomposting tubs beforehand and have students help with adding the worms.
2. Read through the IAITC Soil Ag Mag to learn more about soil health! Interactive online versions can be found on our website.
3. To prepare the composting bins, follow these steps (diagrams can be found on the Teacher Resources page):
 - Use the drill and a 1” drill bit to cut two holes near the top on each long side of one of the tubs. These holes will serve as ventilation for the worms.
 - Then, use the same 1” drill bit to drill a hole near the bottom on the short side of the other tub.
 - Attach the cooler drain through this hole. This will allow you to drain any liquid “worm tea” that collects in the bottom tub. Worm tea can be added to gardens and planting containers as fertilizer as well.
 - Return to the initial tub with the ventilation holes and flip the tub over. Switch to a 1/8” drill bit and drill a series of holes in the bottom of the tub. The holes should be large enough for liquid to drain, but not large enough to allow the worms to travel out of the tub.
 - Place this tub inside of the other tub to complete your vermicomposting bins!
4. To set-up your vermicomposting bins, follow these steps:
 - Have students tear the newspapers into small pieces.
 - Add the newspaper and compost/soil to the bin with the drain holes. Then, add a small amount of food waste. Avoid meat, dairy, and citrus products in your worm composter.
 - Finally, add the worms to your bin. Depending on how you received your worms, you may need to follow the directions included with them to “re-hydrate” the worms before adding them to your bin.
5. Your worm composter is now complete. Read the attached Teacher Resources page to learn more about maintaining your classroom composter.

TEACHER RESOURCES

- Watch our video about building our own vermicomposter on YouTube: <https://youtu.be/U7d7zek6IEM>

Maintenance:

- A vermicomposter takes little work to maintain in your classroom. Follow these tips to help your worms do their best work:
 - Add approximately the same weight in food as you have worms in your bin. For instance, if you start with 1/4 lb. of worms, add about 1/4 lb. of food scraps every week.
 - Food scraps that are in small pieces will be easier for the worms to digest quickly. Adding scraps of varying sizes may be a fun experiment to test how long it takes the worms to break down different materials.
 - Add shredded newspaper bedding as needed to keep the food scraps covered and help the pile retain moisture.
 - Burying the food scraps in the bin will help the worms digest the materials more quickly and will also eliminate the chance for bad smells.
 - The worm bin should have similar moisture to a damp sponge. Additional liquid should drain into the bottom bin, though this often isn't even necessary.
 - The worms will self-regulate their population. As the population grows, you will need to add more food each week. Eventually, the worm colony can be split to create an additional worm bin.

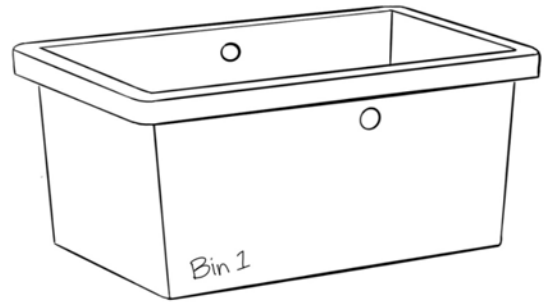
Extension Ideas:

- Students can perform various experiments and inquiry activities with the vermicomposter:
 - Use the attached weekly log for students to fill out with what they added to the worm bin, what they noticed inside the worm bin, what the worms are currently decomposing, etc. Assign different students to fill out the log each week.
 - Weigh the worms at various points in time to determine how quickly they are multiplying.
 - Experiment with adding different size food scraps to see how quickly the worms can decompose them.
 - Once the worms are creating compost, extract some and use it with garden or container plantings. See how plants grown with the vermicompost grow differently than plants grown with other types of soils.
 - Take a sample of your vermicompost and submit it for a soil sample to see what nutrients are present in the worm castings. Compare this with a soil test taken from soil around the school yard.
 - Have students research the benefits of vermicomposting and composting.
- Variation: Students can also create their own “desktop” vermicomposters using large plastic cups with lids. Worms prefer to work in the dark. Use construction paper to make a collar to block the light from the cup. Then, students can remove the collar to view the worms and their progress.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

TEACHER RESOURCES

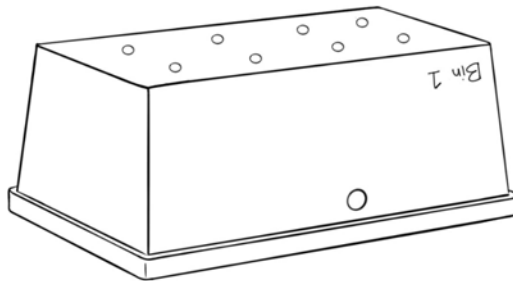
HOLES FOR VENTILATION

1" drilled holes
Top, 2 sides of the first bin



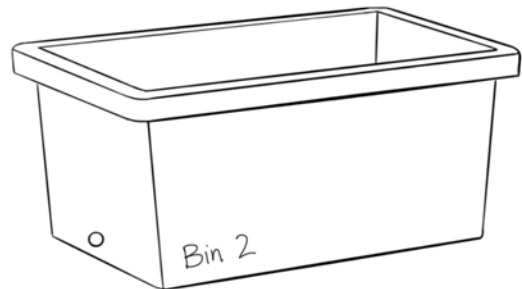
HOLES FOR DRAINAGE

1/8" drilled holes
Bottom of the first bin

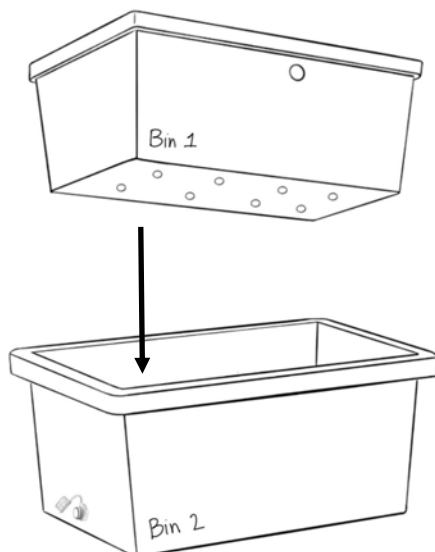


HOLE FOR COOLER DRAIN

1" drilled hole
Bottom edge, 1 side of the
second bin



(Cooler Drain)



ASSEMBLY

Secure the cooler drain in the hole drilled at the bottom of the second bin. Then, place the first bin into the second bin.

Your vermicomposter is ready for its materials and tenants!



Science

CLASSROOM VERMICOMPOSTING

WEEKLY LOG

DATE	FOOD SCRAPS BEING ADDED	OBSERVATIONS OF COMPOST



SOLAR OVEN

Grade Level

4-8

Length of Lesson

45 minutes

Objective

By the end of this lesson, students will better understand the power of the sun's energy and how humans can use that power.

Materials Needed

- Cardboard pizza box
- Aluminum foil
- Black construction paper
- Clear kitchen plastic wrap
- Scissors
- Glue
- Stick or pencil

Standards

NGSS

3-5-ETS1-2; 4-PS3-2; 4-PS3-4; 4-ESS3-1, 4-ESS3-2, 3-5-ETS1-2, MS-PS3-3; MS-PS1-4; MS-PS3-3-4

Lesson Summary

This lesson is designed to provide students an opportunity to build a solar oven in order to cook food using solely the sun's energy.

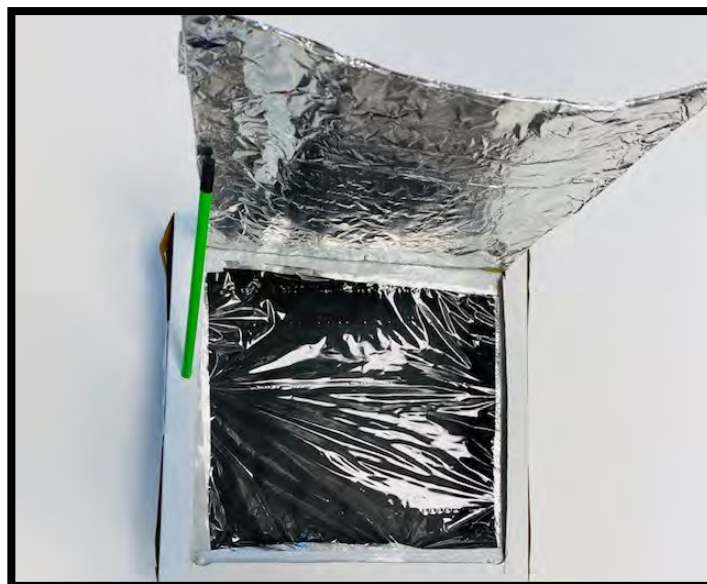
Suggested Sequence of Events:

1. Read *Time to Shine* by Catherine Daly to learn more about how solar ovens can be built and used to cook food.
2. Complete the activity following the procedures:
 - Give each group the necessary materials to build their own solar ovens.
 - On the lid of the pizza box, use scissors or a box knife (with help from an adult!) to cut through the cardboard on three sides, leaving about an inch between the sides of the flap and the edges of the lid. Fold this flap out on the uncut side so that it stands when the box lid is closed.
 - Cut aluminum foil to fit on the inside of this flap. Use glue to attach.
 - Cut clear plastic wrap to fit the hole from the flap in the lid of the box. Attach from the underside of the lid with tape or glue.
 - Next, line the inside of the box with foil adhered with glue.
 - Then, cut black construction paper to the size of the bottom of the box and glue to the foil.
 - Use a pencil or stick to prop open the flap of the solar oven. Place food, such as a piece of pizza or a s'more, into the oven and position to maximize the reflection of the sun's rays into the oven chamber beneath the clear plastic.
 - Allow students to experiment by changing the types of food, the angle of the flap, and attempting to cook with different outside temperatures and cloud cover.
4. Whole class discussion and reflection of activity. In what types of situations might this solar oven be useful? What are ways this design could be perfected to cook food more efficiently? What is the purpose of the plastic wrap in the solar oven?

TEACHER RESOURCES

Extension Ideas:

- Learn more about the types of thermal transfer: radiation, conduction, and convection. This activity uses radiation—the transfer of heat without direct contact between the two objects.
- Discuss how the solar oven traps the sun's heat (thermal energy) inside to raise the temperatures.
 - Keep in mind that extreme physical changes in the food may not occur but that the temperatures of the food will increase. Recording the temperature of the food before and after would show the trapping of the heat of the sun.
- Learn more about how temperature affects the properties of materials and sometimes those changes cannot be undone.
 - For example, heating chocolate will cause melting, but a decrease in the temperature will cause the chocolate to become a solid again. But a marshmallow heated over a fire will brown and the change in properties cannot be undone.
- Learn more about renewable energies and the concept of greenhouse gases.
- Learn about how the sun's energy is important for many different reasons. Can they trace the flow of the sun's energy through the food chain? Can they explain how the sun's energy drives the water cycle?
- Discuss the pros and cons of using the solar oven for cooking their food.
- Incorporate the IAITC Pizza and Nutrition Ag Mags into this lesson to provide background information on how some of our favorite foods are grown and transported to our tables.
- Use thermometers inside the solar ovens to test how hot they can get on days with different environmental conditions.
- Provide students with materials to make their own versions and see which design is most effective in heating up food.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!





Art



Science

BUILD-A-BEE HOTEL

Grade Level

2-5

Length of Lesson

30-60 minutes

Objective

By the end of this lesson, students will have a better understanding of native bees, their habitat, and how we can help them prosper.

Materials Needed

- Empty, clean aluminum food cans with lids removed
- Cardboard and bamboo bee tubes (available online)
- Pinecones, bark, small twigs, and other organic materials
- Wire and wire snips
- Paint supplies

Standards

NGSS

2-LS4-1; 3-LS2-1; 3-LS4-4; 5-ESS3-1

Illinois Visual Arts

VA: Cr2.1.2-5; VA:Cr2.2.2-5

Lesson Summary

This lesson is a fun, hands-on activity designed to introduce students to different types of pollinators, help them understand the importance of pollinators, and provide them a chance to design and build their very own “bee hotel” to add to their school or home garden.

Suggested Sequence of Events:

1. Set Up: Have students bring in empty aluminum cans from home and collect them. Drill a small hole near the edge of the round side of each can before giving to each student. Plan for a “foraging day” in which students can gather pinecones, bark, and small twigs from around the school.
2. Read through the IAITC Pollinator Ag Mag to learn more about pollinators and the process of pollination! Interactive online versions can be found on our website.
3. Students should have a basic understanding of the diversity of pollinators in our environment, and how different pollinators need different types of habitat and are attracted to different types of flowers. See the Teacher Resources page for a list of suggested books.
4. Complete the activity following the procedures:
 - Give each student an aluminum can to decorate. Students can decorate them to look like a bee or other pollinator if they choose. Wire can be used to make and attach wings, and bottle caps and googly eyes can be used as the insect eyes as well.
 - Once the paint dries, it is time to fill each can with the bee tubes and some of the materials collected from outside. Different bee species need different sized openings for their nests, so having a variety is a good thing. It may be necessary to cut the bee tubes to the length of the can.
 - Wires can be strung through the hole in the bottom of the can and through the open top in order to hang the bee hotels in the garden.
 - See the Teacher Resources page for additional ideas and variations.
4. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Background information on native Illinois bees:

Honeybees get a lot of the attention when we discuss pollinators. While they are important to our food supply, native pollinators are just as important, and need our help in establishing and maintaining habitat for them to reproduce.

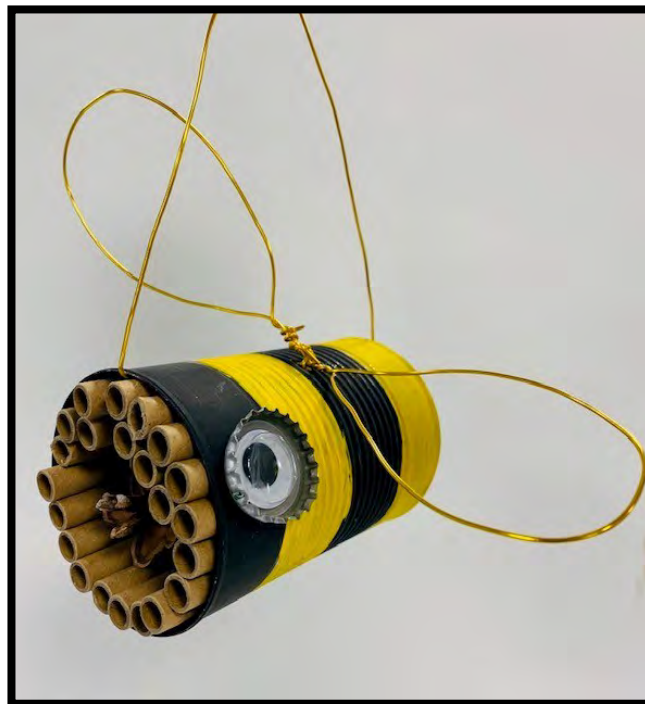
There are 400 to 500 species of native bees in Illinois. These include bumble bees, carpenter bees, cuckoo bees, mason bees, sweat bees, mining bees, and many more. These native bees live in wetland, woodland, grassland, and urban habitats across the state. All bees need a place to lay their eggs so that their larvae and pupae can safely develop into the next generation of bees. Native Illinois bees have a wide variety of nesting styles which allow them to raise their young. Some live solitary lives away from other bees. Some create communal and semi-social hives. The cuckoo bee is considered a “nest parasite” because it invades the hive of another species of bumblebees and tricks them into raising their young for them!

Additional Ideas and Variations:

- A variety of materials can be used to create bee hotels. Alternatives include empty bottles, wooden boxes, PVC pipe, and more. The containers should block the rain and should be closed on one end—many bees will not nest in tubes that are open on both ends. The containers should also be opaque to block the light to better attract pollinators.
- Spraying the painted hotels with clear lacquer before placing outside may protect the paint finish for longer.
- Instead of hanging the bee hotels, they can also be attached with screws or plastic zip ties to a post or other structure and then filled with nesting materials.
- Students could also fill milk cartons with a sand/clay/water mixture and then press holes into the wet clay with a small stick or dowel rod. Once dry, these can be placed in the garden, protected from rain, to attract bees.

Resources:

- Some excellent pollinator books to pair with this activity include: *Give Bees a Chance* by Bethany Barton, *Honeybee* by Candace Fleming, *Buzzing with Questions* by Janice Harrington, and *Flowers are Calling* by Rita Gray.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!





Science



Literacy

OUTDOOR ADVENTURE FLIP BOOK

Grade Level

3-6

Length of Lesson

1-2 Hours

Objective

By the end of this lesson, students will have a better understanding of various aspects of the environment and have increased observation skills.

Materials Needed

- Hand trowels
- Small bins*
- Magnifying glasses
- Copies of the student flipbook**

Standards

Common Core

CCSS.ELA-Literacy.RI.4.3; RI.4.4; RI.4.5; RF.4.3a

NGSS

3-LS4-2-4; 4-LS1-1; 5-LS2-1; MS-LS2-2; MS-LS4-2

Lesson Summary

This lesson is a fun, outdoor activity designed to help students recognize various aspects of the environment like tree leaf identification, native flowers and identifying parts of a flower, soil health, and more!

You will want to have a pre-determined area outside, on or off campus. It is best to have a place with some trees and flowers and somewhere that you have permission to dig a few small holes for students to observe soil.

*Any container will work. The size will depend on how big of a hole you have your students dig.

**Printer settings for the flipbook should be set as double-sided, flip on the short edge.

Suggested Sequence of Events:

1. Set Up: Print enough copies of the flip book so that each student can have their own. For younger students, or to reduce time in class, put them together and staple ahead of time.
2. Read through the IAITC Soil and Pollinator Ag Mags to learn more about soil health and the importance of pollination! Interactive online versions can be found on our website.
3. Complete the activity following the procedures:
 - Give each student the papers to create their flipbook to fold and walk through the folding directions with your students. (Folding directions on Teacher Resources page)
 - Make sure students have something to write with and head outside.
 - Use the flipbook however it works best for your students, depending on their age, needs, and understanding of the content.
4. Whole class discussion and reflection of activity.




TEACHER RESOURCES

Folding Directions:

- Page 1: “My Outdoor Adventure Flip Book”
 - Fold forward on the line above the title so that the title is at the top and facing you. You will notice that the “Treasure Pocket” is facing toward you, at the bottom and upside down.
- Page 2: “Environment”
 - Fold forward on the line above the “I Hear, I Smell, I Feel” boxes so that those are at the top and facing you. Once folded, you will see the “Soil” flap underneath and facing you, right-side up.
 - Slide this page inside the first page so that the “Environment” title is directly under the “My Outdoor Adventure Flip Book” title.
- Page 3: “Trees”
 - Fold forward on the line about the labeled leaf diagram so that the diagram is at the top and facing you. After folding, you will see the title “Flowers” directly under the “Trees” title.
 - Slide this last page inside the “Environment” page. You should now have the pages lined up to read in this order: My Outdoor Adventure Flip Book, Environment, Trees, Flowers, Soil, (Picture of stick)
- Next, add 2-3 staples at the very top to secure the pages together. The closer to the top, the better students will be able to work in their books.
- Turn the flip book over and fold that page up toward you so that you can see the “Treasure Pocket”. Lift that page up and add a few staples on both sides to secure the pocket. Make sure not to staple this page to the other pages.

Extension Ideas:

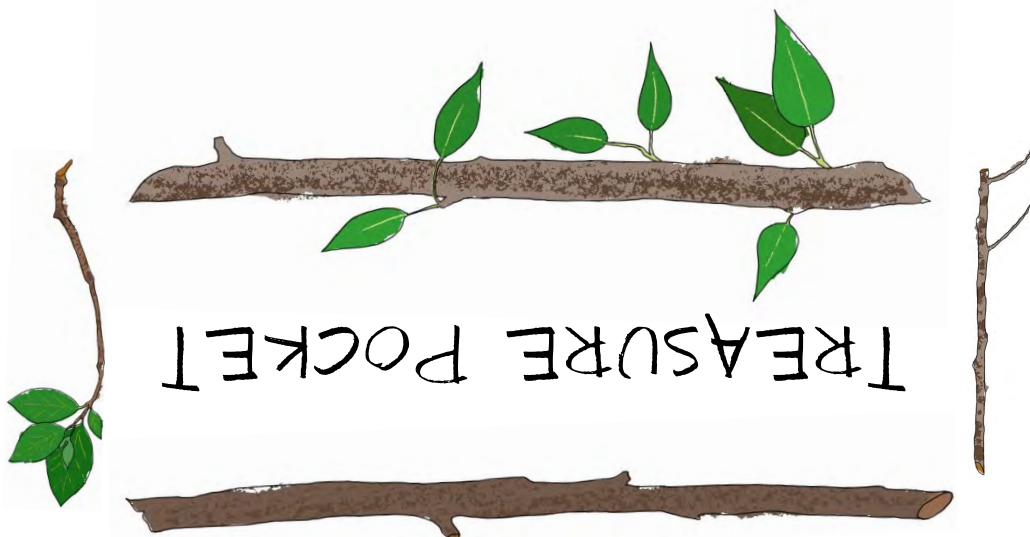
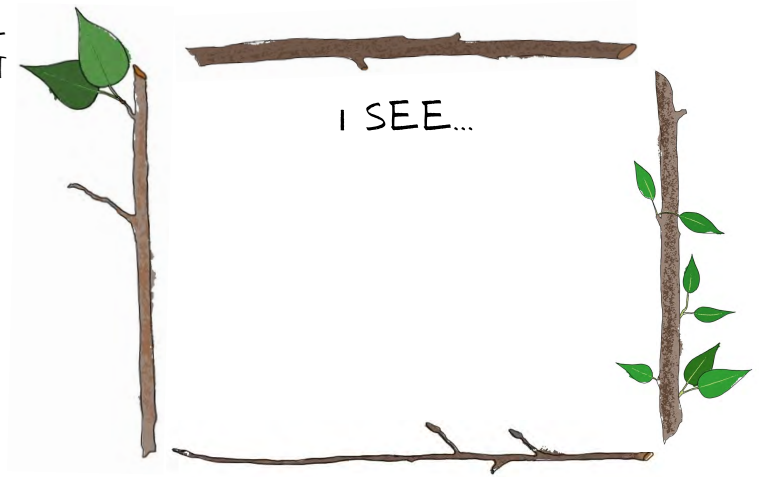
- Read books about nature to introduce or become more familiar with aspects of the environment.
- Have students put their flower and leaf in their “treasure” pocket and then dissect those items when you get back to the classroom. Use magnifying glasses and/or microscopes to take a closer look.
- Complete IAITC’s Throw and Grow lesson and learn more about native flowers.
- Learn more about flower and tree life cycles.
- Have students draw a comic strip showing the process of pollination.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

MY OUTDOOR ADVENTURE 
  FLIP BOOK 

NAME: _____

WE ARE SURROUNDED BY NATURE! OFTEN TIMES WE TAKE OUR ENVIRONMENT FOR GRANTED BUT AS HUMAN BEINGS, IT IS OUR JOB TO TAKE CARE OF OUR PLANET! TO DO THAT, WE NEED TO BE AWARE OF OUR SURROUNDINGS AND APPRECIATE THE BEAUTY AND COMPLEXITY OF OUR ECOSYSTEM.

DIRECTIONS: USE YOUR SENSES TO DESCRIBE THE ENVIRONMENT AROUND YOU. MAKE A SHORT LIST OF WHAT YOU SEE, FEEL, SMELL, AND HEAR IN EACH OF THE CORRECT BOXES.



ENCOURAGE POLLINATION OF THOSE CROPS!

POLLINATOR HABITATS AROUND THEIR FARMS TO HELP PROMOTE POLLINATOR POPULATIONS AND PEOPLE EAT AROUND THE WORLD. FARMERS WHO GROW THOSE PLANTS ARE PLACING



POLLINATION: POLLINATORS ARE RESPONSIBLE FOR POLLINATING OVER 1,200 CROPS THAT

RIGHT TIME, AND RIGHT PLACE) WHEN APPLYING FERTILIZERS.

ROTATION TO REPLACE IMPORTANT USED NUTRIENTS, AND THE 4R'S (RIGHT SOURCE, RIGHT RATE, MINERALS IN THE SOIL. MANY FARMERS PRACTICE NO-TILL FARMING TO REDUCE EROSION, CROP



FOR HUMAN AND ANIMAL CONSUMPTION! PLANTS CAN'T GROW WITHOUT THE NUTRIENTS AND SOIL: FARMERS RELY ON KEEPING THEIR SOIL HEALTHY TO GROW THE MOST NUTRITIOUS CROP

PRACTICING SUSTAINABILITY AND REDUCING THEIR IMPACT ON THE ENVIRONMENT.

WORKING WITH THOSE IN THE SCIENCE FIELD TO CONTINUE GROWING FOOD FOR THE WORLD WHILE JUST LIKE SCIENTISTS, CROP AND LIVESTOCK FARMERS UNDERSTAND THIS. TODAY, FARMERS ARE

LIVING AND NONLIVING THINGS WORK TOGETHER TO CREATE A HEALTHY AND THRIVING ECOSYSTEM.

OF BEING ABLE TO TAKE CARE OF OUR ENVIRONMENT IS TO LEARN AND UNDERSTAND HOW

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IS EXTREMELY IMPORTANT. A PART



AGRICULTURE AND THE ENVIRONMENT



I HEAR...

I SMELL...

I FEEL...

ENVIRONMENT

HERE ARE SOME COMMON, NATIVE ILLINOIS TREE LEAVES AND SEEDS:



LOCUST

RED OAK



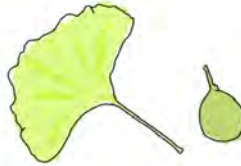
TULIP



ASH



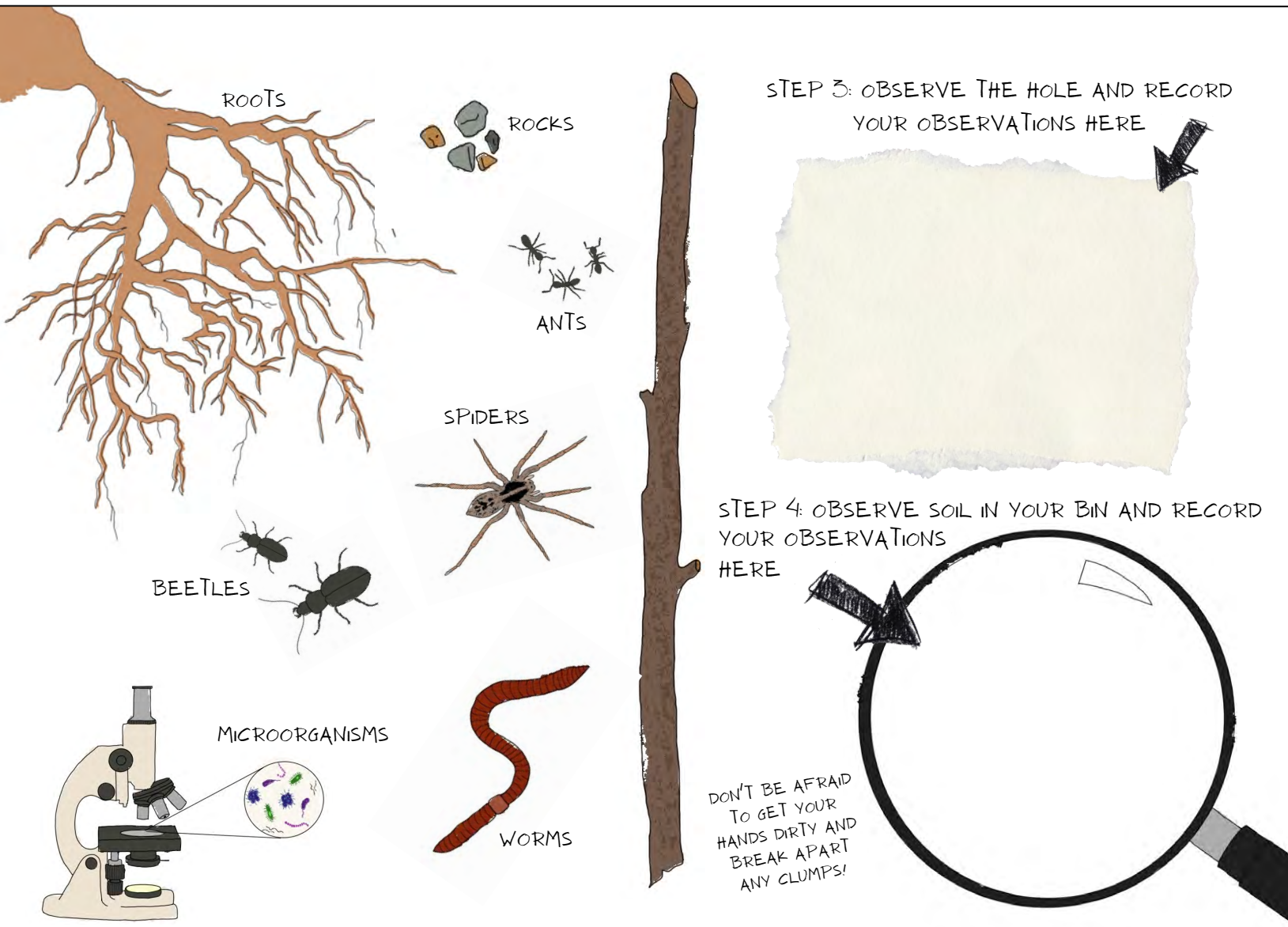
WHITE OAK



GINKGO



SILVER MAPLE



ROOTS

ROCKS

ANTS

SPIDERS

BEELES

WORMS

MICROORGANISMS

STEP 3: OBSERVE THE HOLE AND RECORD YOUR OBSERVATIONS HERE

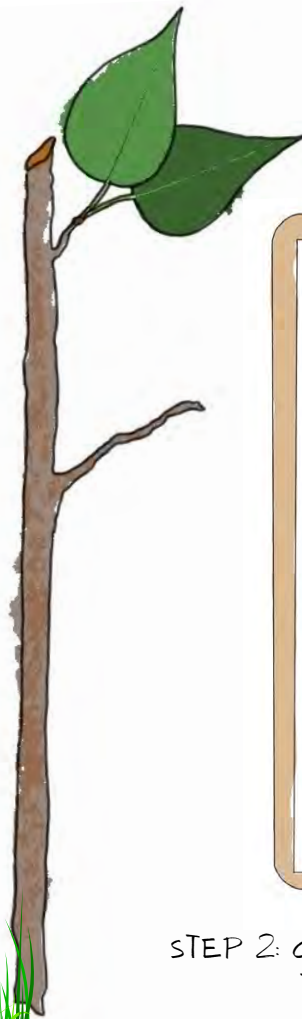
STEP 4: OBSERVE SOIL IN YOUR BIN AND RECORD YOUR OBSERVATIONS HERE

DON'T BE AFRAID TO GET YOUR HANDS DIRTY AND BREAK APART ANY CLUMPS!

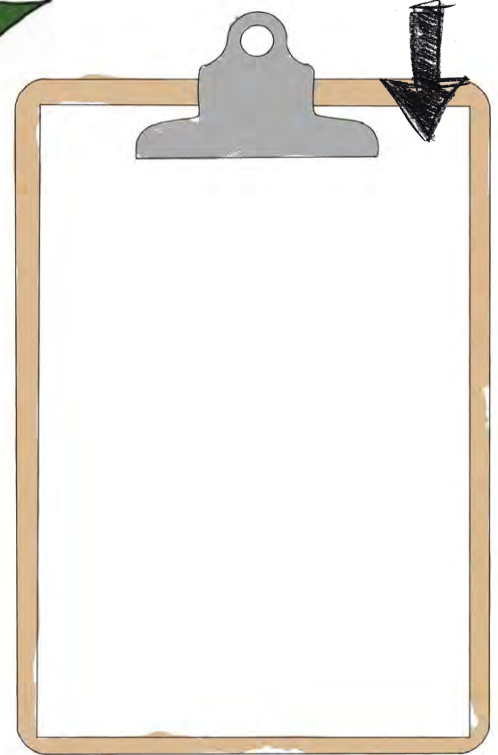
SOIL

SOIL IS MADE UP OF ORGANIC MATTER (ONCE LIVING PLANT AND ANIMAL MATTER), MINERAL PARTICLES (SAND, SILT, AND CLAY), AND PORE SPACES (OPEN AREAS POTENTIALLY FILLED WITH AIR, WATER, AND LIVING ORGANISMS).

THE SOIL BENEATH OUR FEET IS AS IMPORTANT AS THE AIR WE BREATHE AND THE WATER WE DRINK! THIS IS BECAUSE IT IS THE PRIMARY SOURCE OF FOOD, FEED, FUEL, FORAGE, AND FIBER.



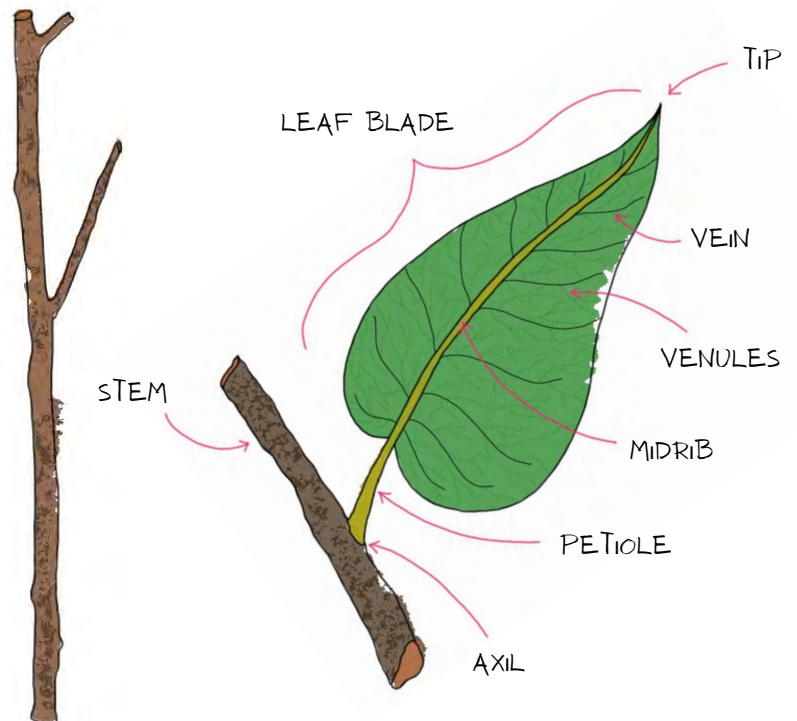
STEP 1: CHOOSE YOUR DIGGING SPOT AND DESCRIBE SURROUNDINGS HERE



STEP 2: CAREFULLY DIG YOUR HOLE AND PUT THE LOOSE SOIL INTO A BIN



FIND A LEAF AND DRAW IT HERE!



TREES

HERE ARE SOME COMMON NATIVE ILLINOIS FLOWERS:



BEEBALM

BLACK-EYED SUSAN



BUTTERFLY WEED



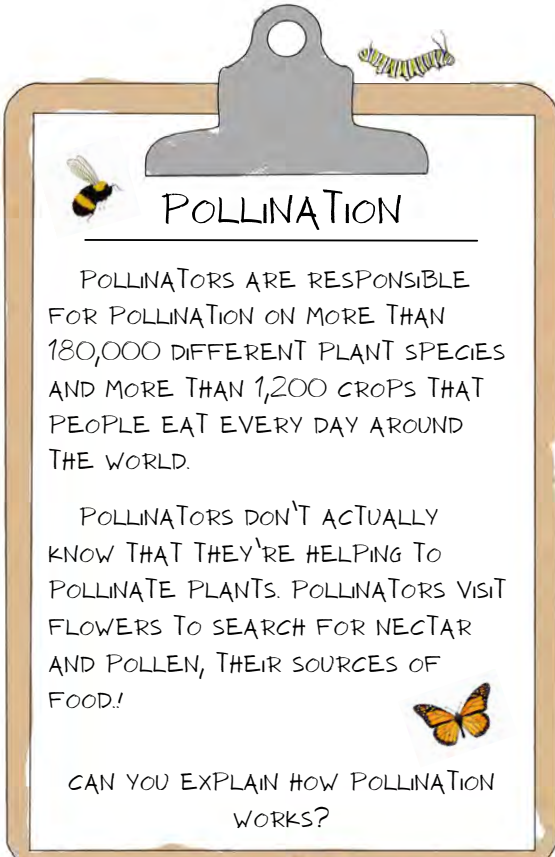
GOLDENROD



IRIS




CONE FLOWER



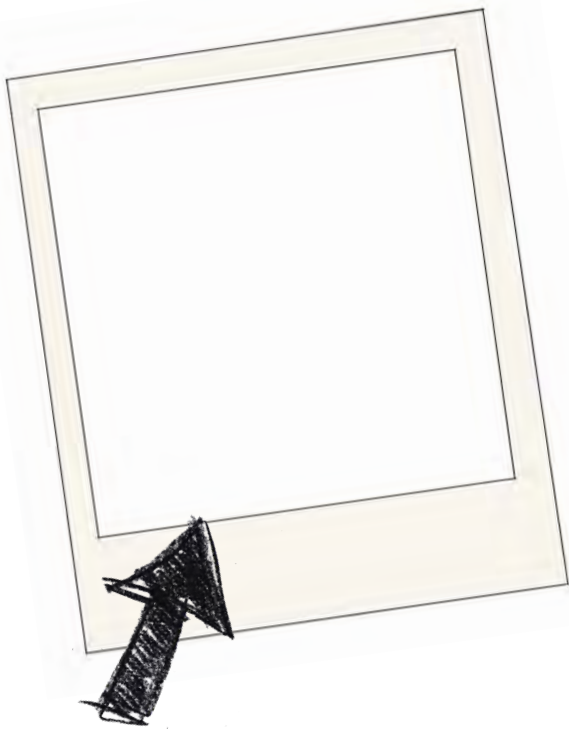
POLLINATION

POLLINATORS ARE RESPONSIBLE FOR POLLINATION ON MORE THAN 180,000 DIFFERENT PLANT SPECIES AND MORE THAN 1,200 CROPS THAT PEOPLE EAT EVERY DAY AROUND THE WORLD.

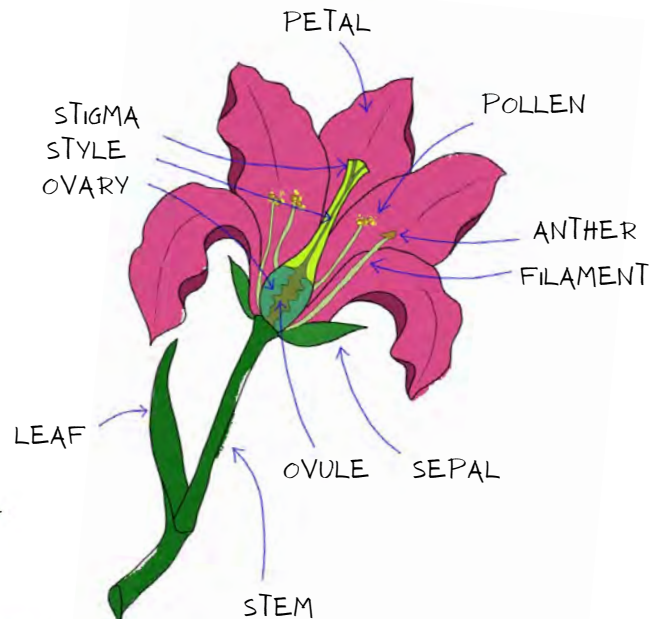
POLLINATORS DON'T ACTUALLY KNOW THAT THEY'RE HELPING TO POLLINATE PLANTS. POLLINATORS VISIT FLOWERS TO SEARCH FOR NECTAR AND POLLEN, THEIR SOURCES OF FOOD!



CAN YOU EXPLAIN HOW POLLINATION WORKS?



FIND A FLOWER AND DRAW IT HERE!



CAN YOU IDENTIFY ANY OF THESE PARTS ON THE FLOWER YOU FOUND AND DREW?