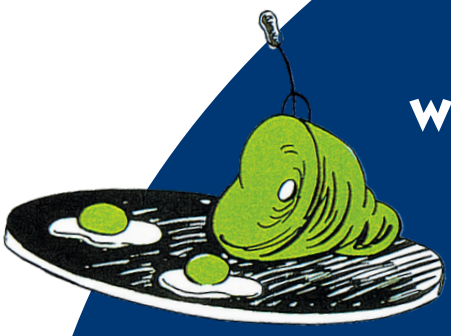
Illinois AGRICULTURE in the Classroom℠

Green Eggs & Agriculture



"Children want the same things we want. To laugh, to be challenged, to be entertained and delighted."

-Dr. Seuss

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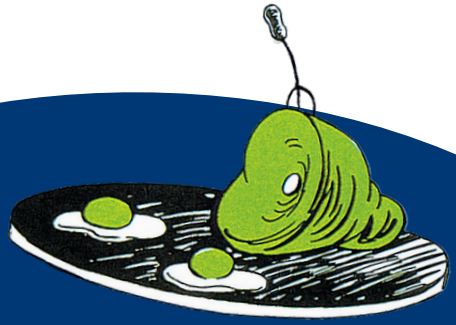
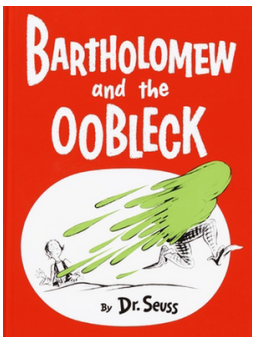
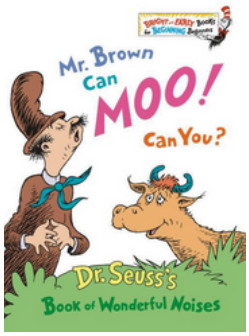
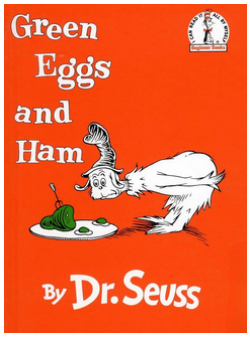
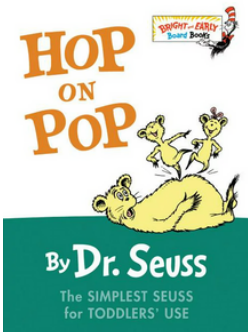


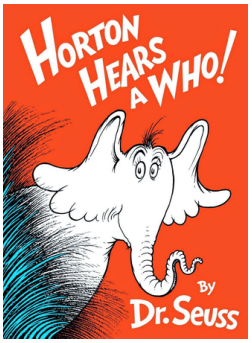
Dr. Seuss Originals

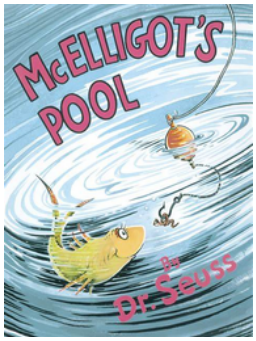


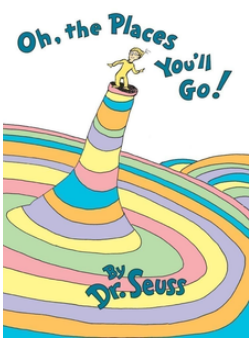


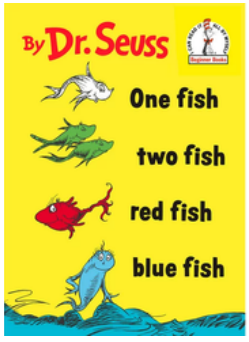


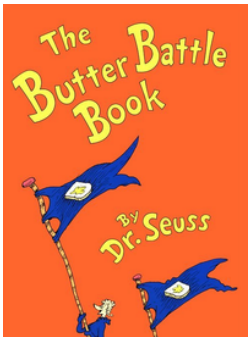


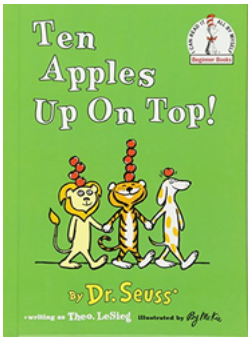


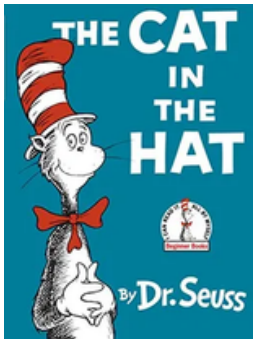




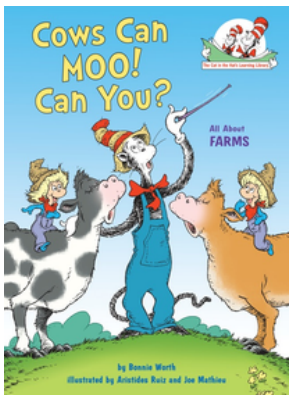


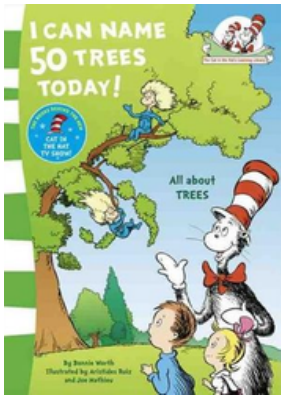


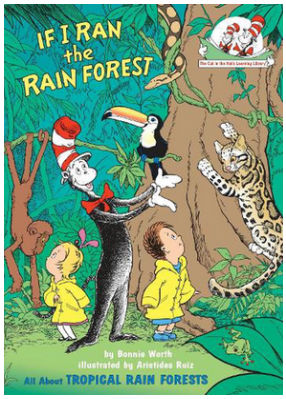


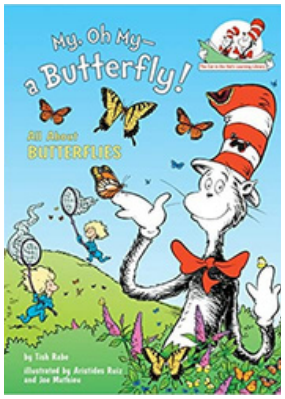


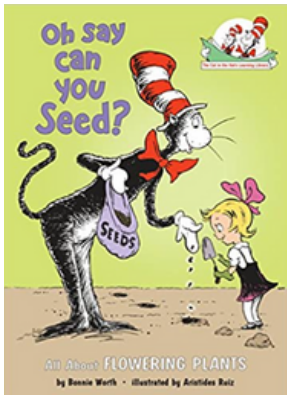
The Cat in the Hat's Learning Library

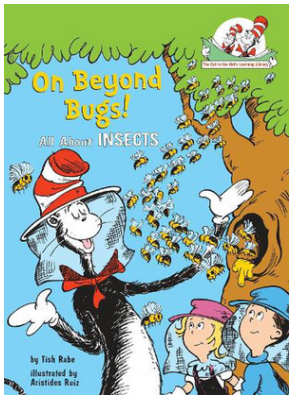


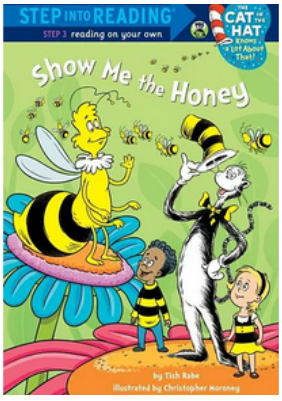


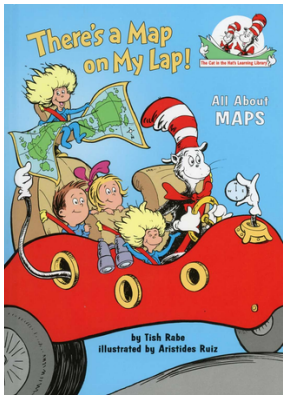












Dr. Seuss Trail Mix

Honey Teddy Grahams — Dr. Seuss's name was Theodor "Teddy" Seuss Geisel

- An apiarist is a beekeeper, they are responsible for ensuring the efficient production of honey by managing colonies of honey bees located within an apiary.
- Worker bees can visit up to 2,000 plants in one day.

Dried Cranberries — Dr. Seuss's first book, *And to Think That I Saw It on Mulberry Street*

- The cranberry is native to North America.
- Only 5% of cranberries are sold fresh, the rest are dried, turned into sauce, or juice.
- Wisconsin has produced the largest crop of cranberries in the nation since 1995, producing about 60% of the crop.

Popcorn — *Hop on Pop*

- The average popcorn kernel will pop at 374 degrees Fahrenheit.
- Popcorn is Illinois' State Snack Food.

Soynuts — *Oh Say Can You Seed?*

- The average American consumes nearly half a cup of soybeans in some form each day.
- Illinois is consistently ranks #1 in the nation for soybean production.
- More soybeans are grown in the U.S. than anywhere else in the world.

Swedish Fish — *One Fish Two Fish Red Fish Blue Fish*
Goldfish — *McElligot's Pool*

- Aquaculture or fish farming is the raising of fish and shellfish on special farms.
- Aquaculture can take place in the open ocean, in bays, in ponds, in greenhouses, and even in buildings.

Green Apple Jelly Beans — *Ten Apples Up On Top*

- There are 2,500 apple varieties in the U.S., Illinois' State Fruit is the GoldRush Apple.
- Americans eat an average of 45 pounds of apples per year.
- Apples cannot be produced without pollination. One of every three bites of food we eat exists because of pollinators

Cheerios — *Oh, the Places You'll Go!*

- Oats can be used as a cover crop to provide ground cover in the winter. Cover crops help control soil erosion, add organic matter to the soil, suppress weeds and take up excess soil nutrients.

Peanut Butter Chips — *The Butter Battle Book*

- Each year, U.S. dairy farmers provide milk to make more than 2 billion pounds of butter.
- Illinois alone produces about 200 million gallons of milk.
- On average, one dairy cow produces about 8 gallons of milk per day.

Green M&Ms — *Green Eggs and Ham*

- Illinois ranks 4th in the nation for the number of pigs raised, with 5.25 million pigs.
- Illinois pig farmers produce nearly 2 billion pounds of pork each year. That's more than 6 billion pork chops!

Peanuts — *Horton Hears a Who*

- It takes about 540 peanuts to make a 12-ounce jar of peanut butter.
- George Washington Carver was known as the "grandfather of peanuts."

Circle of Earth Bracelet

Science Literacy

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.

Beanie Baby

Science

Grade Level
K-7

Length of Lesson
45 minutes

Objective
By the end of this lesson, students will have a better understanding of the process of seed germination.

Materials Needed
- Jewelry size resealable baggies (found in craft stores)
- Crystal Soil (order from Flinn Scientific at 800-452-1261)
- Hole Punch
- Water
- Measuring Spoons
- Soybeans
- Yarn
- Copies of student worksheet

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

Social Studies
SS.EC.1.4; SS.EC.2.4; SS.EC.FL.1.4; SS.G.2.4; SS.G.3.4

NGSS
5-PS1-4

Lesson Summary
This lesson is designed to give students a hands-on activity that shows how seeds germinate. Students will create a "beanie baby" which allows them to observe not only the process of seed germination, but also the environment a seed needs for growth.

Suggested Sequence of Events:
1. Set Up: Pre-cut yarn into pieces long enough to tie as a necklace. Hole punch baggies above the seal.
2. Read "Full of Beans: Henry Ford Grows a Car" by Peggy Thomas to capture student interest. Ask if they know what other things we use soybeans for/in.
3. Read through AITC Soybean Ag Mag to learn about soybeans. Interactive online versions can be found on our website.
4. Pre-Activity Discussion: Hand out the student worksheet and ask them what a seed needs to start growing. Have them work individually to fill out the "Think" column to answer that question. Then have students pair up and share their ideas. They can add new information in the "Share" column. Then, as a whole class, have students share their ideas from the "Think" column. Go through the list one at a time and discuss whether a seed actually needs that to begin growing. Cross off the ones that are not necessary. Once your class comes to a final consensus, have each student write the class list in the "Share" column.
5. Complete the activity following the procedures:
    - Give each student a hole-punched baggie.
    - Have each student put 1/4 teaspoon of Crystal Soil into their baggie.
    - Add 2-3 soybeans into the baggie with the Crystal Soil.
    - Then add 1-2 tablespoons of water into their baggie.
    - Have them seal their baggies firmly so that they won't leak.
    - Then have them insert one end of yarn through the hole of the baggie and tie the ends of the yarn in a knot to make a necklace.
    - Tell them to wear the beanie baby around their neck, tucked under their shirts (warm, dark place). Have them check their beanie babies several times a day to observe germination and growth!
6. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Extension Ideas:

- Read Dr. Seuss' "Oh Say Can You Seed" by Bonnie Worth and discuss the different parts of plants. Have students record unknown words as you read and go back to look up definitions.
- Have students create a comic strip showing the process of germination.
- Have students write a story from the soybeans perspective.
- Show a labeled diagram of a soybean plant.
- STEM: Have students build and label a model using recyclable materials.
- Introduce or teach about photosynthesis.
- Scientific Inquiry: Have students think more deeply about plant growth and create their own question, hypothesis, and experiment to test! Will soybeans grow faster in Mountain Dew, Coffee, or water? Does the amount of light affect the growth of the plant? Do different fertilizers, potting soils, temperature, etc. affect plant growth differently?
  - Have students use the "Student Inquiry Sheet" to test their variables.
- Watch a time lapse video of a soybean growing.
- Watch a video from a local farmer discussing soybean growth and harvest.
- Take a field trip to a farm.
- Invite a soybean farmer into the classroom.
- Watch the TEDx Talk "Sitting on Soybeans: Building the Bio-Based Automobile" presented by Debbie Mielewski. Discuss the idea of inventions and creativity. Discuss the broad possibilities of careers in Agriculture. Discuss how Debbie is a female in a stereotypically "male" career and how she is breaking that stigma.
- Research the "accidental" invention of the Crystal Soil used in the activity (which happened in Peoria, IL)
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

Science

Beanie Baby

Student Worksheet

Background Information

Soybeans are small, round seeds, each with a tiny hilum and made up of three basic parts. Each soybean has a seed coat, cotyledon, and the embryo. Each soybean plant generally reaches a height of 1 m (3.3 feet) and takes 80-120 days from sowing to harvesting. So how does a seed turn into a plant? Let's find out!

What does a seed need to start growing?

Think	Pair	Share

Materials

- 1 jewelry size resealable baggie
- Measuring spoons
- 1/4 teaspoon of Crystal Soil
- 1-2 tablespoons of water
- 2 soybeans
- 1 piece of yarn

Make a Prediction!

How long will it take for your seed to germinate?

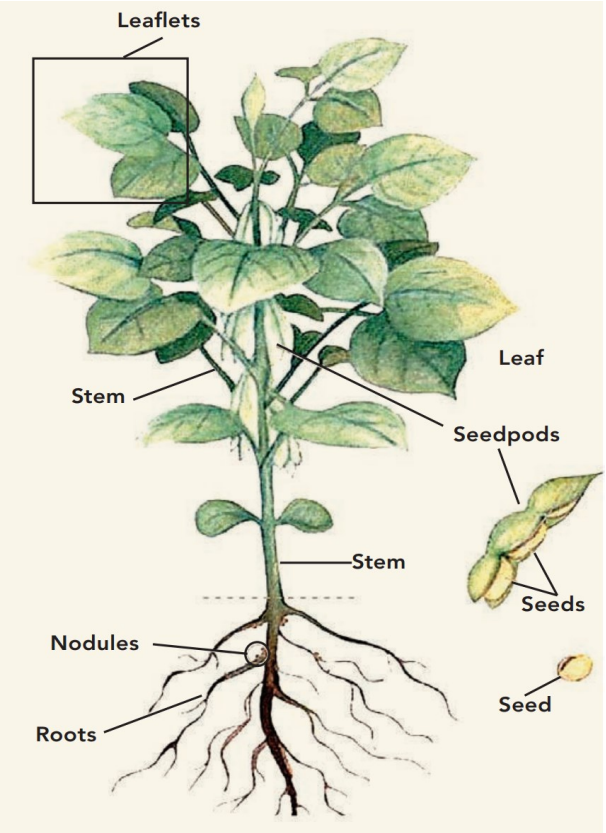
Procedures

1. Open your jewelry-sized baggie.
2. Measure 1/4 teaspoon of the Crystal Soil and carefully dump it into your baggie.
3. Gently push your 2 soybeans into the Crystal Soil.
4. Carefully measure 1-2 tablespoons of water and pour into your baggie.
5. Seal your baggie firmly and make sure there are no leaks!
6. Insert one end of your yarn piece through the hole in the baggie and tie the ends of the yarn in a knot.
7. Wear your beanie baby like a necklace and tuck it into your shirt (it's a little chilly at first!).
8. Check on your beanie baby several times a day to observe germination and record its growth!

Science

Beanie Baby

Student Worksheet



Vocabulary

Cotyledon: a seed leaf stored in a seed which are the first leaves the plant will have.

Embryo: part of a seed that develops into a new plant, including the stem, leaves, and roots.

Germination: the phase of plant growth when the seed begins to sprout.

Hilum: the scar on a seed marking the point of attachment to its seed vessel (the brown spot).

Radicle: the lower part of the axis of the embryo, the primary root.

Seed Coat: the outside cover that protects the seed.

Seed Pod: a structure that holds seeds. Each pod typically holds 3-4 beans.

Soybean Oil: a pale yellow oil derived from soybeans by solvent extraction. Used as a food and in the manufacture of soap, candles, inks, paints, varnishes, etc.

Stem: the main stalk of the plant.

Taproot: a main root descending downward from the radicle and giving off small lateral roots.

Observe, measure, record!

Use the table below to record your data.

Day	Measurement in cm	Observations

Science

Oobleck

Grade Level
4-8

Length of Lesson
45 minutes

Objective
By the end of this lesson, students will have a better understanding of the properties of solids and liquids.

Materials Needed
- Bowl
- Forks
- Water
- Cornstarch
- Measuring spoons
- Food Coloring (optional)

Standards
NGSS
K-PS3-2; 2-PS1-1; 3-LS2-1; 3-LS3-2; 3-LS4-1; 3-LS4-4; 4-PS3-4; 5-PS1-3; MS-PS1-3; MS-ESS2-4

Lesson Summary
This lesson is a fun, hands-on activity designed to engage students by using corn-based materials to make "Oobleck" and experiment with the properties of solids and liquids!

Suggested Sequence of Events:
1. Read through the IAITC Corn Ag Mag, IAITC Soybean Ag Mag, and the IAITC Water Ag Mag to learn more about products that come from corn and soybeans and the impact water has on agriculture! Interactive online versions can be found on our website.
2. Discussion Starters:
    - Is corn used for more than just food?
    - Corn, like soybeans, other crops, and animal products, can often be used to create secondary products we call "by-products."
    - Have students brainstorm the properties of solids and liquids and create a list as a class.
3. Complete the activity following the procedures:
    - Place 4 teaspoons of cornstarch in a bowl.
    - Add 2 teaspoons of water to the cornstarch.
    - Add a few drops of food coloring to the bowl (optional).
    - Blend the mixture with a fork. It should flow when the bowl is tipped but feel solid to the touch. If the substance is too thick, add a little more water. If the substance is too runny, add a little more cornstarch.
    - Play and have fun!
4. Whole class discussion and reflection of activity.
    - Is the Oobleck a solid or a liquid? Refer back to the list you made as a class and use your observations from the experiment to explain your answer.
    - What kind of crop is your Oobleck a by-product of?

TEACHER RESOURCES

Background Information:
Sir Isaac Newton is known for his properties in Physics. During his career, he described solids, liquids, and gasses as having a set of properties that are distinct to their state of matter. When focusing on liquids, he proposed that fluids should flow at a predictable, constant rate. These fluids are called “Newtonian” fluids.

Although Oobleck looks like a liquid, it does not always behave a liquid. Oobleck is a type of material belonging to the “non-Newtonian” class of fluids. Non-Newtonian fluids respond differently depending on how quickly you try to move it around. When a force is acted on Oobleck quickly, it will behave like a solid because the pressure forces all the particles of the corn starch together. When the force is slower, the particles of the corn starch have time to move around the object, just as a normal Newtonian liquid would.

Extension Ideas:

- Have students try using different measurements of the ingredients and observe how that affects the oobleck.
- Let the oobleck sit in a glass for a few hours and observe the separation of the solid and liquid. This is because oobleck is a suspension and not a mixture.
- Have students look into non-Newtonian products in the food industry. Can they think of any? Some examples include mayonnaise, jelly, ketchup, and cranberry sauce.
- Use the Corn and Soybean Ag Mags and read about by-products from those two crops. Do you have any of these items at home?
    - Use our “Indoor BINGO” activity to help students identify common household by-products of agricultural commodities!
- For older students, show them this video and then have them brainstorm how non-Newtonian liquids could be beneficial to engineers. Video can be found at https://www.youtube.com/watch?v=XrvzZewPUJA
- Introduce the scientific term “viscosity” and apply the understanding to this experiment.
- Invite a corn farmer into the classroom to talk about types of corn, their uses, and what it takes to be a corn farmer.
- Make your own biodegradable packing peanuts from cornstarch using our “Packing Peanuts” activity.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

Packing Peanuts

Science Literacy

Grade Level
3-6

Length of Lesson
45 minutes

Objective
By the end of this lesson, students will have a better understanding of renewable, non-renewable, and biodegradable resources.

Materials Needed
- Cornstarch packing peanuts (available from uline.com)
- Styrofoam packing peanuts
- Clear 8-12 oz. cups (2 per group)
- Water (2 cups per group)
- Copies of student worksheet
- Copies of QR codes sheet (optional)

Standards
Common Core
CCSS.ELA-Literacy.W.3.1; W.3.7

NGSS
K-2.ETS1-1; K-2-ETS1-2; 2-PS1-1; 2-PS1-3

Lesson Summary
This lesson is a hands-on activity that challenges students to strengthen inquiry skills as they use the scientific method to explore materials we use for every day objects. This also helps students critically think about renewable vs. non-renewable resources.

**For younger grades, students will need to have already learned concepts such as hypothesis (and/or the scientific method), biodegradable, renewable, and non-renewable resources.

Suggested Sequence of Events:
1. Set Up: Each group will need two clear cups, one half-way filled with corn packing peanuts, and the other half-way filled with Styrofoam packing peanuts. Have students label their cups “Packing Peanut A” and “Packing Peanut B.” Each group will also need at least two cups with equal amounts of water in them.
2. Read through the IAITC Corn Ag Mag to learn about corn. Interactive online versions can be found on our website.
3. Read “Corn” by Gail Gibbons to snag student interest.
4. Complete the activity following the procedures:
    - Pass out the student worksheets and talk about the words “renewable” and “non-renewable.” Have them brainstorm and list what resources are renewable/non-renewable. As they are working, pass out their lab materials.
    - As a class, have students share their lists and create one definition of each term to write on the board.
    - Have students work in small groups of two to three and follow the directions on their student sheets that will walk them through their scientific inquiry activity.
    - Once they are finished with their activity and have completed their worksheet, have students clean up their materials.
3. Whole class discussion and reflection of activity. Here are some discussion prompt ideas:
    - Did your understanding of renewable and non-renewable resources change or deepen after completing this activity? If so, how?
    - What do you think about using corn based products for something like packing peanuts? Is this better for the environment?

TEACHER RESOURCES

Additional Resources:
To help guide students through the experiment, we have added additional secondary sources that will help deepen and develop their understanding of the term "biodegradable," facts about corn, and what makes Styrofoam. The articles from the websites can be printed, used as links in Google Classroom (for example) for students to use, or to be used as QR codes if your technology allows.

Observation: Biodegradable available at https://wiki.kidzsearch.com/wiki/Biodegradation.
Hypothesis: Corn growth available at https://youtu.be/iFCdAgeMGOA.
Experiment: Corn based products available at https://youtu.be/5J_ZD_vTRhU.
Conclusion: Styrofoam available at https://easyscienceforkids.com/styrofoam-polymers/.

Background Information:
Unlike Styrofoam packing peanuts, cornstarch packing peanuts are biodegradable and decompose in water, leaving no toxic waste. The polymers, long-chain molecules, that make up corn packing peanuts are polymers that occur naturally in nature as opposed to Styrofoam peanuts being made up of synthetic, or man-made, polymers. Corn, being a plant, is a renewable resource that we could use to reduce the amount of non-renewable and non-biodegradable products!

Extension Ideas:
- Define and discuss the words "biodegradable," "decompose," and "toxic waste." Dig deeper and look at the by-products and wastes from making various materials.
- Brainstorm as a class and make a T-Chart on the board and list renewable and non-renewable resources.
- For older students, have them research what products can be made renewable, but are still primarily made with non-renewable resources. (Ethanol, corn packing peanuts, plastics, etc.)
- Because the peanuts begin to break down in water, the peanuts can be used to construct sculptures and art. Simply "lick and stick." Have student build structures out of the corn packing peanuts. A little spit goes a long way!
    - Have students think of the word "agriculture." What is the first thing that comes to mind? Have them build that with their packing peanuts.
    - Give students the title of an upcoming reading assignment or book. What does each student think of when they hear that title? What will the book be about? Have each student construct their idea using the peanuts.
    - For younger students learning the alphabet or numbers, give them a piece of paper with a number or letter on it. Have them "trace" the number or letter with the corn packing peanuts by having them lick and stick them together.
- Learn more about other common corn-based products.
- Invite a corn farmer into the classroom to talk about types of corn, their uses, and what it takes to be a corn farmer.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

Packing Peanuts

Student Worksheet

Take a few minutes to think about resources that we use daily. Which of those are renewable? Which are non-renewable? Make your list of each type in the boxes below!

Renewable	Non-renewable

Now that you've shared your ideas as a class, write what it means for a resource to be renewable and non-renewable.

Observation

Before any scientist begins the experimentation stage of their inquiry, they must make observations of the objects they are using in their experiment! This way, they can use that data to help determine how to complete their experiment and what materials to use. Observe your two types of packing peanuts and record your observations in the table below!

Sound Color Shape Texture Smell Softness

Packing Peanut A	Packing Peanut B

Packing Peanuts

Student Worksheet

Hypothesis

We want to figure out which one of these packing peanuts is made from biodegradable materials. Based on your observations and your understanding of the term 'biodegradable,' write your hypothesis in the space below.

Experiment

You should have two cups of water, with the same amount of water in each cup. Slowly pour one cup of water into the "Packing Peanuts A" cup and the other cup of water into the "Packing Peanuts B" cup. Record your observations in the table below.

Packing Peanut A	Packing Peanut B

Conclusion

Now that you've finished your experiment, can you accept or reject your hypothesis? (Circle one)

Accept Reject

What materials are the packing peanuts made from?

Packing Peanut A:

Packing Peanut B:

Which of these materials is renewable? Explain.

Packing Peanuts

Student Worksheet

Observation

Hypothesis

Experiment

Conclusion

Science

Dancing Popcorn

Grade Level
2-6

Length of Lesson
30 minutes

Objective
By the end of this lesson, students will have a better understanding of a variety of scientific concepts.

Materials
- Copies of student worksheets
- Clear glass jars
- Baking soda
- Vinegar
- Water
- Popcorn kernels
- Spoons
- Measuring cups/spoons
- Paper towels

Standards
NGSS
2-PSI; 3-PSI-2; 5-PSI-1-2,4; MS-PSI-2

Lesson Summary
This lesson is designed to help students strengthen their understanding of a variety of scientific concepts like chemical reactions, the scientific method, density, and buoyancy.

Suggested Sequence of Events:
1. Set Up: Print enough copies of the student worksheet so that every student has one. Students can work individually or in small groups of 2-3. Each student or small group will need the following measurements of the materials:
    - Clear glass jar that will hold at least 3 cups of liquid
    - 2 Cups of water
    - 2 Tablespoons of baking soda
    - 1 cup of vinegar
    - Popcorn kernels (a couple tablespoons worth)
    - 1 spoon
    - Paper towels
    - *Optional: Funnel*
2. Read *11 Experiments That Failed* by Jenny Offill to capture student interest and talk about how to complete experiments.
3. Read through the IAITC Corn Ag Mag to learn more about different types of corn and corn products. Interactive online versions can be found on our website.
4. Complete the activity following the procedures:
    - Give each student a copy of the student worksheet. Read through the introduction together.
    - Hand out materials and have students work through the procedures.
        - *Point out that they'll need to make their predication after step 5 of the procedures.*
    - When they are finished with the experiment, have them write their conclusion to answer the question. Was their prediction correct?
5. Whole class discussion and reflection of activity.

TEACHER RESOURCES

Background Information

- When the vinegar (acid) mixes with the baking soda (base) it causes a chemical reaction. This chemical reaction creates Carbon Dioxide, which gets trapped in bubbles. The bubbles attach themselves to the popcorn kernels and lift the kernels to the top of the water. The bubbles pop when they reach the surface of the water and the kernels sink back down to the bottom. This happens over and over again until the chemical reaction is done.
- The bubbles are less dense than the water, causing them to rise to the surface. The popcorn kernels are more dense than water which is why they start at the bottom of the jar until the vinegar is mixed in and then kernels sink after the bubbles pop at the surface.

Tips

- If students pour the vinegar too quickly, the chemical reaction will cause the bubbles to overflow.
- When the reaction starts to slow down, have students stir the solution again and observe what happens.

Extension Ideas

- Use other materials as variables to compare results. Do cranberries or raisins behave the same way as popcorn kernels in this experiment? Would changing the type of vinegar change the chemical reaction? How does seltzer water/soda compare to the reaction caused when mixing the baking soda and vinegar?
- Learn more about other chemical reactions. What happens with the molecules of substances when they undergo a chemical reaction? How is this different than a physical change like water going through the various states of matter?
- Talk through the process of the scientific method. Why do scientists all follow the same steps when completing experiments?
- Compare the density and buoyancy of other objects in water.
- Learn about the history of popcorn. How is popcorn different than sweet corn and field (dent) corn? Why does popcorn even pop?
- Check out IAITC's Popcorn Reader, available at agintheclassroom.org.
- Go to agintheclassroom.org to contact your County Ag Literacy Coordinator for free classroom sets of our Ag Mags!

Science

Dancing Popcorn

Student Worksheet

Introduction: Scientists are always observing, asking questions, and doing experiments and tests to find the answers to their questions. It's your turn to be a scientist! Use this worksheet to help guide you through this experiment to answer the question.

Question

What happens when you add vinegar to a jar of baking soda, water, and popcorn kernels?

Materials

- ☐ Water
- ☐ Baking soda
- ☐ Popcorn kernels
- ☐ Vinegar
- ☐ Clear jar
- ☐ 1 cup
- ☐ 1 tablespoon
- ☐ Spoon

Procedures

1. Use the checklist to the right to make sure you have all your materials.
2. Add 2 cups of water to the clear jar.
3. Add 2 tablespoons of baking soda to the water.
4. Use the spoon to stir the water and baking soda together. Stir until all the baking soda is dissolved.
5. Carefully drop the popcorn kernels into the clear jar.

Prediction

What do you think will happen when you add the vinegar to the jar?

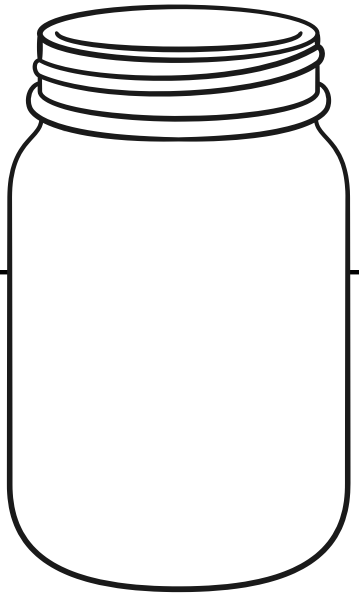
_____

_____

6. Measure 1 cup of vinegar.
7. **Slowly** pour the vinegar into the jar. It will overflow if you pour too fast!
8. Watch what happens. Use the diagram to the right to draw what you are observing.

Observation

Draw what you see.



Conclusion

What happened in the jar when you added the vinegar?

_____

_____

_____

_____

Science

Bag Butterfly

Grade Level
K-2

Length of Lesson
30 minutes

Objective
By the end of this lesson, students will have a better understanding of the basic parts of a butterfly.

Materials Needed
- Snack size baggies
- Pipe cleaners
- Colored construction paper, confetti, or tissue paper

Standards
Common Core
CCSS.ELA-Literacy.W.K.1; SL.1.5

NGSS
K-LS1-1

Lesson Summary
This lesson is a fun, hands-on activity designed to introduce students to the basic parts of a butterfly! Use black and orange paper pieces and learn more about monarch butterflies!

Suggested Sequence of Events:
1. Set Up: Cut colored construction paper or tissue paper into small pieces.
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. Complete the activity following the procedures:
    - Give each student a snack-sized baggie, small paper pieces, and a pipe cleaner.
    - Have them place the small pieces of construction paper, tissue paper, or confetti into the baggies. Leave about an inch at the top unfilled, then seal the baggies.
    - Pinch the middle of the baggie and wrap the pipe cleaner around the center, twisting the piper cleaner to secure around the baggie.
    - Shape the loose ends of the pipe cleaner to look like antennae!
4. Whole class discussion and reflection of activity. Have students pair up and name the parts of their butterflies.

Extension Ideas:

- Turn this into a glyph activity and have students use different colors of paper pieces that represent different things. For example, the colors could represent favorite foods or number of siblings, or type of pet. Have them compare with each other to see what they have in common with and learn more about their classmates!
- Dig deeper into butterfly anatomy and have students add a second baggie (see image below).
- Pair this activity with IAITC's Butterfly Life Cycle lesson.
- Show a labeled diagram of a butterfly.
- The Monarch is the Illinois State Insect. Watch this video on YouTube to learn more about these beautiful butterflies. Monarch Butterfly | Amazing Animals. Available at https://youtu.be/1b87rwtXGzA
- Read "Monarch Butterfly" by Gail Gibbons.
- Show a time-lapse of a caterpillar transforming into a butterfly.
- Learn about different species of butterflies. What butterflies are native to Illinois?
- Compare butterflies to moths.
- Take a closer look at butterflies and other pollinators. What is pollination? Why is it important for plants? Why is it important for agriculture?
- Read "Honeybee: The Busy Life of *Apis Mellifera*" by Candace Fleming.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

Science Literacy

Butterfly Life Cycle

Grade Level
1-5

Length of Lesson
45 minutes

Objective
By completing this activity, students will have a better understanding of the life cycle of a butterfly.

Materials
- Small paper plates
- Markers
- Scissors
- Glue
- Couscous pasta
- Rotini pasta
- Shell pasta
- Bowtie pasta
- Green construction paper (optional)

Standards
Common Core
CCSS.ELA-Literacy.RL.K.9; RL.K.10; RI.K.9; RI.K.10 ; RF.K.1; RF.K.2; RF.K.3; W.K.3; W.K.8; SL.K.5

NGSS
K-LS1-1; K-ESS3-1; K-ESS2-2

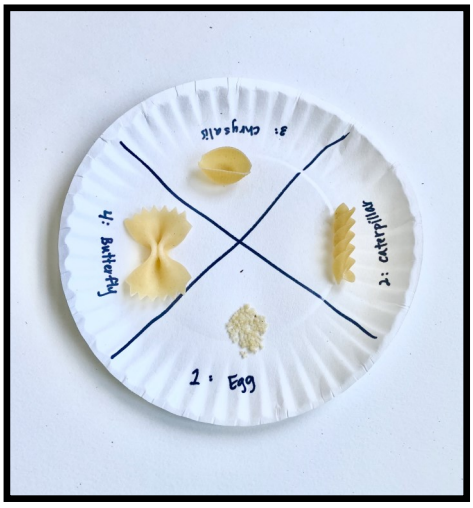
Lesson Summary
This lesson uses pasta to create a fun way for students to strengthen their sequencing skills while learning about the stages of a butterfly's life. This is the perfect lesson to also teach about the importance of pollinators!

Suggested Sequence of Events:
1. Set Up: (Optional) Cut out leaf shapes from the green construction paper, four for each student. This will get glued down first and then the pasta glued on top.
2. Read: "The Very Hungry Caterpillar" by Eric Carle to capture student interest.
3. Read through the AITC Pollination Ag Mag to learn more about pollinators. Interactive versions can be found on our website.
4. Complete the activity following the procedures:
    - Give each student a small paper plate.
    - Using a marker, have them write out the names of the four stages on their paper plate. "Egg" at the top left, "Larva" at the top right, "Pupae" at the bottom right, and "Butterfly" at the bottom left.
        - For younger students, students with IEP's, or to reduce time of lesson, use the attached student worksheet instead of the paper plate. Put the glue dots right on the black dots and then add the correct pasta to each stage.
    - Draw arrows clockwise from "Egg" to "Larva," "Larva" to "Pupae" and so forth.
    - Put a dot of glue under "Egg" and drop a pinch of couscous on it.
    - Put a dot of glue under "Larva" and place a rotini pasta on it.
    - Put a dot of glue above "Pupae" and place a shell pasta on it.
    - Put a dot of glue above "Butterfly" and place a bow-tie pasta on it.
5. Whole class discussion and reflection of activity. Pair students together and have them use their pasta models to tell the butterfly life cycle to their partner!

TEACHER RESOURCES

Extension Ideas:

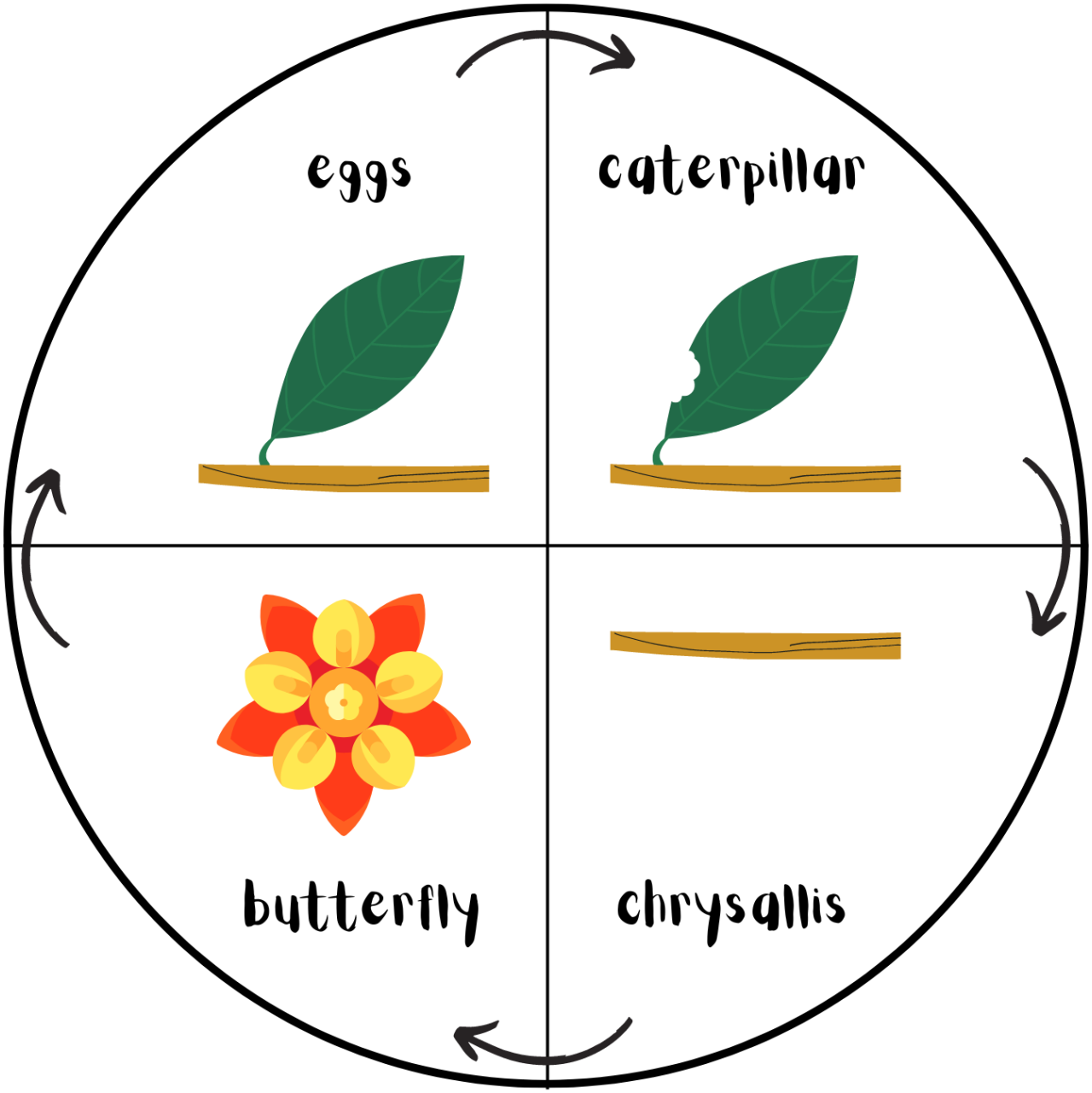
- Have students make a flip book of the life cycle of a butterfly and write about what happens at each stage and how long each stage takes.
- Read "Egg to Butterfly" by Shannon Zemlicka. Look at the pictures and have students compare the images with their pasta life cycles.
- Complete AITC "Bag Butterfly" activity to create butterflies out of a Ziploc Bag!
    - Place colored construction paper, cellophane, or confetti into the Ziploc® bag. Leave about an inch of the Ziploc® unfilled.
    - Seal the Ziploc® and fold the unfilled portion of the bag to the back of your butterfly.
    - Wrap a black pipe cleaner around the middle of your Ziploc® bag and twist it at the top. Shape the pipe cleaner to make it look like antennae.
- Have students create a comic strip showing the butterfly life cycle.
- Have students tell a story from a caterpillar's perspective.
- Show a labeled diagram of butterfly.
- The Monarch is the Illinois state butterfly. Watch this video on YouTube to learn more about these beautiful butterflies. Monarch Butterfly | Amazing Animals
- Read "Monarch Butterfly" by Gail Gibbons.
- Show a time-lapse of a caterpillar transforming into a butterfly.
- Learn about different species of butterflies. What butterflies are native to Illinois?
- Compare butterflies to moths.
- Take a closer look at butterflies and other pollinators. What is pollination? Why is it important for plants? Why is it important for agriculture?
    - Read "Honeybee: The Busy Life of *Apis Mellifera*" by Candace Fleming.
- Go to www.agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!



Science Literacy

Butterfly Life Cycle

Student Worksheet



Milk Emulsion

Science

Grade Level
4-6

Length of Lesson
30 minutes

Objective
By the end of this lesson, students will have a better understanding of how sensitive the fats and proteins of milk are to new substances.

Materials Needed
- Milk (whole or 2%)
- Small bowls
- Cotton swabs
- Food coloring (4 colors)
- Dish-washing soap

Standards
Common Core
CCSS.ELA-Literacy.RI.4.3; RI.5.3

NGSS
5-PS1; MS-PS1

Lesson Summary
This lesson is a fun, hands-on activity designed to help students understand how fats and proteins are sensitive to the changes in the surrounding solution (the milk).

Suggested Sequence of Events:
1. Read through the IAITC Dairy Ag Mag to learn more about milk and other dairy products! Interactive online versions can be found on our website.
2. Complete the activity following the procedures:
    - Pour enough milk in the bowl to completely cover the bottom. Allow the milk to settle. There should be no ripples in the milk before starting this activity.
    - Add one drop of each of the four colors of food coloring - red, yellow, blue, and green - to the milk. Keep the drops close together in the center of the plate of milk.
    - Find a clean cotton swab for the next part of the experiment. Predict what will happen when you touch the tip of the cotton swab to the center of the milk. It's important not to stir the mix. Just touch it with the tip of the cotton swab.
    - Now place a drop of liquid dish soap on the other end of the cotton swab. Place the soapy end of the cotton swab back in the middle of the milk and hold it there for 10 to 15 seconds.
    - Add another drop of soap to the tip of the cotton swab and try it again. Experiment with placing the cotton swab at different places in the milk.
4. Whole class discussion and reflection of activity. Here are some prompting questions:
    - Describe how the milk reacted when you first added the food coloring drops (step number 2).
    - Explain what happened when the soapy cotton swab was held on the surface of the milk.
    - What happened when you placed the soapy cotton swab in different locations of the plate? Would this work with the plain cotton swab, why or why not?
    - Read the background information on the teacher resources page.
        - What makes the food coloring in the milk move?
        - Explain why this activity would or would not work with regular tap water.

TEACHER RESOURCES

Background Information:
When you add soap to milk, the weak chemical bonds that hold the proteins in the solution are altered. It becomes a free-for-all! The molecules of protein and fat bend, roll, twist and contort in all directions. The food coloring molecules are bumped and shoved everywhere, providing an easy way to observe all the invisible activity.

At the same time, soap molecules combine to form a *micelle*, or cluster of soap molecules. These micelles distribute the fat in the milk. This rapidly mixing fat and soap causes swirling and churning where a micelle meets a fat droplet.

Milk is mostly water and has surface tension like water. The drops of food coloring floating on the surface tend to stay put. Liquid soap wrecks the surface tension by breaking the cohesive bonds between water molecules and allowing the colors to zing throughout the milk. What a party!

Extension Ideas:
- Read "Clarabelle: Making Milk and So Much More" by Cris Peterson. Look at the pictures and have students analyze the images.
    - Have students write a short story or create a comic strip from Clarabelle's perspective.
- Take a closer look at emulsion. What are other types of emulsions?
    - Try out IAITC "The Chemistry of Butter" activity and make your own butter while deepening their understanding of emulsion.
- Take the experiment to the next level and have students test different types of milk-different fat contents and even different brands!
- Take a field trip to a dairy farm and learn about dairy farming.
- Invite a dairy farmer into the classroom.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

Literacy Art

Paper Bag Pig Puppet

Grade Level
K-2

Length of Lesson
45 minutes

Objective
By the end of this lesson, students will be able to demonstrate their knowledge of pig parts and how pigs differ from humans.

Materials Needed
- Pink construction paper
- Paper lunch bag
- Markers or crayons
- Scissors
- Glue or tape
- Copies of pig template (attached)

Standards
Common Core
CCSS.ELA-Literacy: RI.K.4; SL.K.1a; SL.K.2; SK.K.6

Illinois Visual Arts
VA:Cr2.2.PK; Cr2.3.PK; Cr2.1.1; Re7.2.1

Lesson Summary
This lesson is designed to help students learn more about the body parts of pigs by making a fun hand puppet! Use the puppets to compare and contrast pigs and humans.

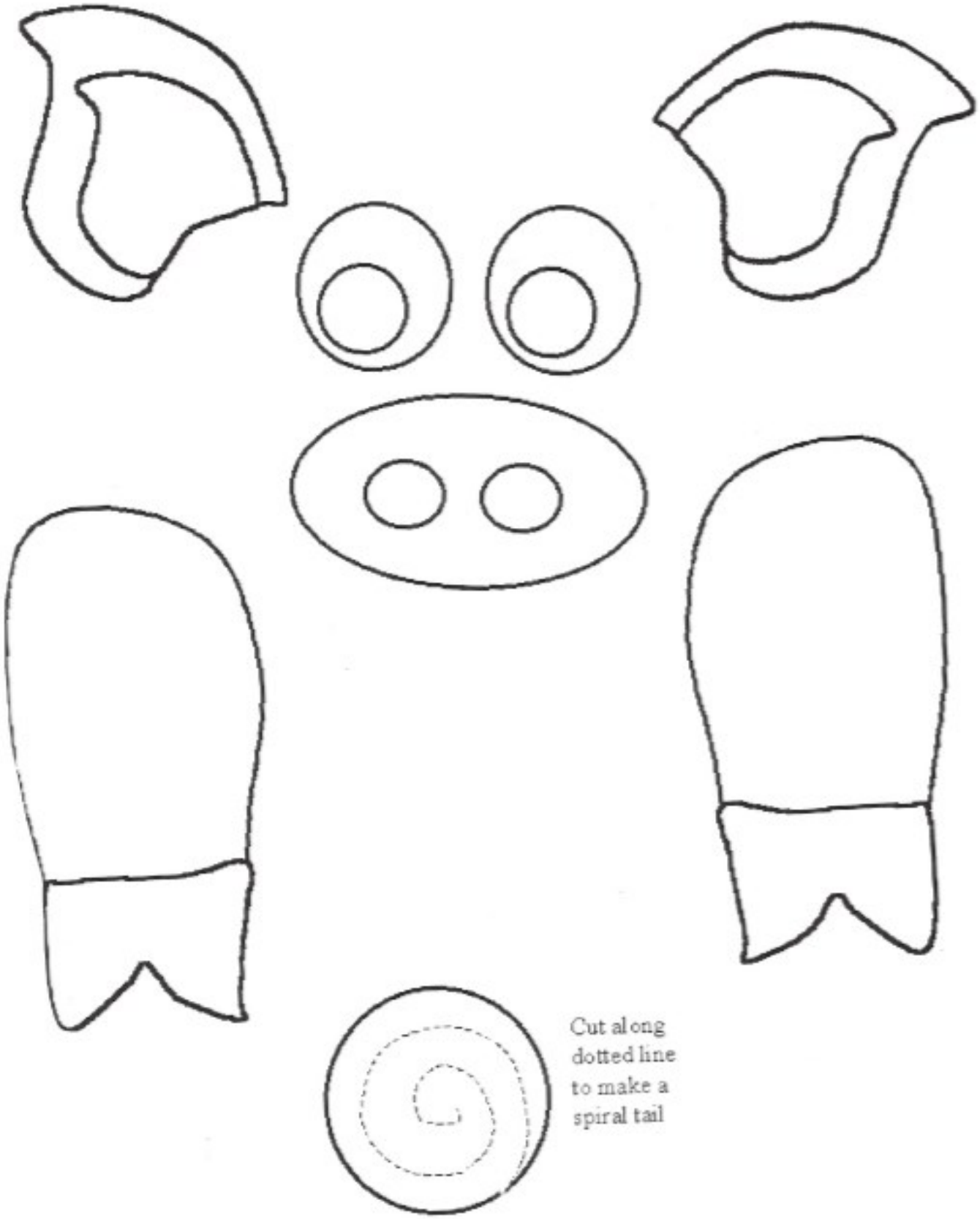
Suggested Sequence of Events:
1. Set Up: Print enough copies of the pig template on pink construction paper for the entire class. Templates can be printed on white copy paper and then colored in if preferred.
2. Read "Pigs" by Gail Gibbons to capture student interest.
3. Read through the AITC Pork Ag Mag to learn about pigs and pork. Interactive online versions can be found on our website.
4. Complete the activity following the procedures:
    - Give each student a brown paper bag and get familiar with the bags! Go through the parts of the bag. (Instructions are on the Teacher Resources page.)
    - Give each student a piece of plain, pink construction paper.
    - Cut a piece of the pink construction paper to the size of the body and glue it on the bag.
    - Cut another piece the size of the head and glue it on the bag.
    - Pass out the pig template to your students and have them cut out all of the shapes. Make sure to follow the dotted lines for the piggy spiral tail.
    - Now, have them glue on the eyes, snout, and ears to the head of the bag.
    - Glue the arms to each side of body part of the bag.
    - Finally, flip over the bag and glue on the spiral tail.
    - Clean up materials and play!
5. Whole class discussion and reflection of activity. Pair students together and have them share their pig puppets with each other!

TEACHER RESOURCES

Get Familiar With Your Bags:
Get familiar with your pig. Lay your bag flat, and closed, as if it were new. The smooth side will be the BACK of your puppet. (It's important to distinguish front and back!) The other side has a flippy tab (This is the bottom of the bag when carrying your lunch). This flippy tab will be the HEAD. The remaining part below the tab will be the BODY. OK, now that we're comfy with our bags, let's craft!

Extension Ideas:

- Read "Awesome Agriculture: Pigs an A-to-Z" and "Awesome Agriculture: Pigs & Pork in the Story of Agriculture" by Susan Anderson & JoAnne Buggey. Look at the pictures and have students analyze the images. Compare the images in the books to your pig puppets!
- Have students tell a story using their puppets. Challenge them to use facts about pigs in their story.
- Watch a video that talks about what pigs eats. What do pigs need to be healthy?
- Take a field trip to a pig farm and take a tour of the pig barn. What kind of shelter do pigs need to stay safe?
- Compare and contrast pigs to other farm animals.
- Invite a pig farmer into your classroom to talk about pig farming.
- Introduce the word 'livestock' to your students and talk about why farmer raise animals. What do we use pigs for?
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!


Cut along dotted line to make a spiral tail

Science Math

Slice of Soil

Grade Level
2-7

Length of Lesson
45 minutes

Objective
By the end of this lesson, students will have a better understanding of our natural resources and their connection to agriculture.

Materials Needed
- 1 Apple (keep sticker on, if possible)
- Paring Knife
- Cutting Board

Standards
Common Core
CCSS.ELA-Literacy.RI.4.7; RF.4.4; W.4.1; W.4.9

CCSS.Math.Content.4.NF.3

NGSS
3-LS4-1; 3-LS4-4; 3-LS2-1; 3-LS3-2; 4-PS3-4; ETS1.A

Lesson Summary
This lesson uses an apple as a small scale model of earth to give students a different perspective on the amount of land available for agriculture. Students will follow along the demonstration, using fractions to divide the earth into decreasing segments. Students should be familiar with the term *natural resource*.

*This activity should be completed as a teacher demonstration.

Suggested Sequence of Events:
1. Read "A Handful of Dirt" by Raymond Bial to capture student interest.
2. Read through AITC Soil Ag Mag to learn about soil. Interactive online versions can be found on our website.
3. Pre-Activity Discussion: Tell students that soil is one of our most important natural resources on earth's surface. Many living things, including people, depend on it for food. Not all soil is good enough for plants to grow. Let them know that this activity is going to show them how much soil we have on earth to grow our food.
4. Complete the activity following the procedures on page two.

Science Math

Slice of Soil

Grade Level
2-7

Length of Lesson
45 minutes

Objective
By the end of this lesson, students will have a better understanding of our natural resources and their connection to agriculture.

Materials Needed
- 1 Apple (keep sticker on, if possible)
- Paring Knife
- Cutting Board

Standards
Common Core
CCSS.ELA-Literacy.RI.4.7; RF.4.4; W.4.1; W.4.9

CCSS.Math.Content.4.NF.3

NGSS
3-LS4-1; 3-LS4-4; 3-LS2-1; 3-LS3-2; 4-PS3-4; ETS1.A

Suggested Sequence of Events:

4. Complete the activity following these procedures:
    - Explain to your students that the apple is going to represent a smaller model of the earth.
    - Cut an apple into four equal parts. Three parts represent the oceans of the world. Set these three aside. The fourth part represents the land area.
    - Cut the land section into three equal wedges. Each of these represents 1/12th of the earth.
        - One of these wedges represents inhospitable land (including deserts, mountains, and polar regions) where it is not suitable for life or plant growth.
        - The second of these wedges represents habitable land that has been protected (like nature preserves or public lands) or developed for roads, schools, houses, businesses, etc.
        - Set these two aside. One 1/12th wedge remains for us to grow food on.
    - Slice this 1/12th section crosswise into four equal parts. Each of these represents 1/48th of the earth.
        - Three of these pieces represent land that is used for grazing or for growing feed crops for livestock. Set these aside.
    - One 1/48th piece of the earth remains. This final piece is what is left for us to grow food crops for humans to eat, such as beans, fruits, vegetables, and grains.
    - Slice the peel off of the flesh of the apple. The peel on this small piece represents the amount of soil on which we have to grow food. This amount of soil will never get any bigger, but will only get smaller as the population grows and more land is developed for roads, schools, houses, business, etc.

5. Whole class discussion and reflection of activity. Ask your students to explain why soil is so important.

TEACHER RESOURCES

Extension Ideas:

- Give students a photo of an apple cut open. Have them label the layers of the earth. Have them explain what layer of the earth the soil is a part of.
- Have students draw or fill in a pie chart that shows the fractions from the activity. Color the sections to identify the types of areas described.
- Look at pictures of places around the world that have the types of land described in the demonstration.
- Introduce or review photosynthesis.
- Introduce or review sustainability.
- Invite a farmer into the classroom to talk about soil health.
- Have students research other types of natural resources. Students could present their research using a slide show or poster.
- Have students explain how weather and climate affect different regions in the world.
- STEM: Have students think more deeply into accessibility of natural resources. Can they design a way to be able to grow crops on the other parts of the land where there isn't good soil? Have students use the "STEM: Student Worksheet" to record their research and experiment.
- Go to agintheclassroom.org to contact your County Literacy Coordinator for free classroom sets of our Ag Mags!

Media Resources:

Use this short video to introduce, review, or demonstrate this activity: http://iaitc.co/Slice

Science

Pinecone Adaptation Experiment

Grade Level
2-6

Length of Lesson
50 minutes

Objective
By the end of this lesson, students will have a better understanding of why adaptation is important for survival.

Materials Needed
- Pinecones (2 per group)
- Clear cup or jar (1 per group)
- Water
- Copies of student worksheet

Standards
NGSS
K-2-ETS1-1; 3-LS3-2; 3-LS4-2; 4-LS1-1; 4-EES2-2; MS-PS3-4; MS-LS2-4; MS-LS2-2

Lesson Summary
This lesson is a fun, hands-on activity designed to help students understand how pine tree seeds, pinecones, have adapted to their environments.

Suggested Sequence of Events:
1. Set Up: Collect enough pinecones for each group to have at least one pinecone. Two pinecones would be best so that students can use one of the pinecones as their control and the other as the tester. Leave the pinecones in a dry place for a couple of days so that the pinecones are dried and all the scales are 'opened.'
2. Read "The Pinecone Walk" by Barbara Springfield to snag student interest.
3. Read through the AITC Tree Ag Mag to learn more about trees! Interactive online versions can be found on our website.
4. Complete the activity following the procedures:
    - Hold up a pinecone and ask students why pine trees have pinecones.
    - Put students into small groups of two to three and give them each a student worksheet.
    - Give each group two pinecones and have them discuss and record their observations on their worksheet. Explain that one pinecone will be the control and the other pinecone is the tester.
    - Next, hand out the rest of the materials.
        - Use the student worksheet and have students hypothesize what the reaction of the pinecone will be when it is placed in the water.
        - Share your hypotheses as a class and have them explain *why* they made that hypothesis.
    - Have them add their pinecones to the water and observe.
    - After 20 minutes, have students record their observations and complete the rest of the student worksheet.
4. Whole class discussion and reflection of activity. Have students share what happened to the pinecones and why they think that happened. How does this adaptation increase chances of the pine trees' survival?

TEACHER RESOURCES

Background Information:
An organism's existence is based on survival for itself and its offspring. Adaptations occur when characteristics have evolved over time to increase the chances of survival! The opening and closing of the pinecones is an adaptation to protect the seeds and provide the best time for release.

Pinecones react to moisture as a way to protect the seeds under the scales of the cone. When the weather is wet, the woodier part at the base of the scales absorbs the moisture in the air and causes swelling. The swelling causes the scales to curve inward and close! When the weather is dry, the scales dry out and begin to bend back outward, causing them to open back up. When the seeds are dry, they are lighter and can be carried further distances by the wind.

Extension Ideas:
- Have students measure the circumference and weight of their tester pinecones before and after they soak in the water.
- Have students lay out their tester pinecones on a paper towel overnight. Make observations the next day.
- Have students draw diagrams of their observations to help strengthen observation skills.
- Have students dissect a pinecone and find the seed. What does the seed actually look like? Why is the seed shaped like this? Why is there a tough scale around the seed?
- Read "From Cone to Pine Tree" by Emma Carlson-Berne to learn more about how pinecones turn into pine trees!
- Compare and contrast pinecones to other plant seeds. What about the plant's environments may have caused them to adapt that way? What environmental factors help trees spread their seeds around?
- Compare and contrast pine trees to other coniferous trees. Dig deeper and compare and contrast coniferous trees to deciduous trees. In what geographical locations do these trees grow?
- Turn this into an inquiry experiment: Is it temperature or moisture that causes the cones to open and close? Make hypotheses and use a control pinecone to test. Get inquiry ideas from students' incorrect hypotheses.
- Did you know pinecones stay on trees for up to 10 years before falling off? Research pinecones and have students write three new facts they learned during their research.
- Invite a tree farmer or nursery owner into your classroom to talk about what it takes to grow trees and what they're grown for.
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Science

Pinecone Adaptation Experiment

Student Worksheet

Observations are a very important step when doing experiments! Observe your pinecones and **record** your observations in the space below. Hint: Use some of your senses to guide your observations. Make sure you're specific!

What will happen when you put the pinecone in the water? Write your **hypothesis** in this box!

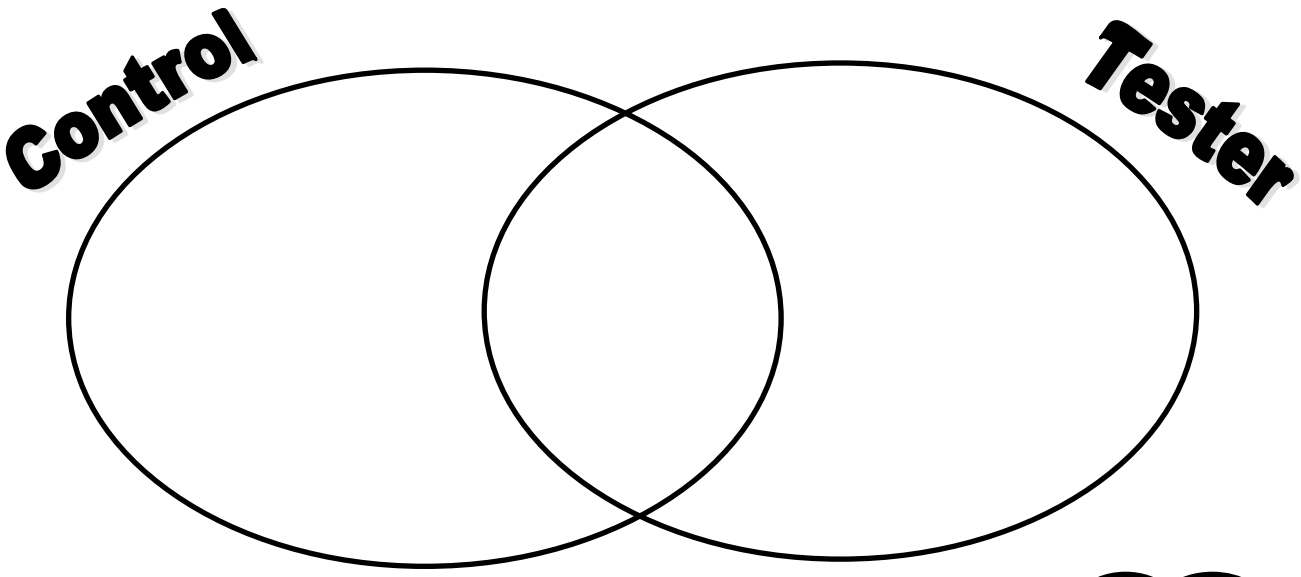
Your 20 minutes is up! Now, observe the pinecone in the water and record your observations in the space below.

Science

The Pinecone Experiment

Student Worksheet

Use the Venn Diagram below to compare and contrast the control pinecone to the tester pinecone.



Was your hypothesis correct? Yes No

If no, how could we change the experiment to be able to test your original hypothesis? Are there other variables we could test?

Explain what happened to the tester pinecone.

Why do you think the pinecone reacted like this? How would this be beneficial for the seed's survival?