National 4-H Curriculum
BU-08331 Revised 2009

Afterschool AGRICULTURE

Acres of Adventures

Cultivating Excitement for Science & Agriculture in Afterschool Programs

2

- Agriculture Gone Wild
- Farm Physics
- Frontier Living
- Insect Invasion

REVIEWED & RECOMMENDED
National 4-H Curriculum

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Revised 2009

Acres of Adventures Book 2

Looking for ways to introduce young people to the world of agriculture and life science? Interested in expanding your collection of fun-filled science activities that are keyed to national science education standards? Then this curriculum is for you. This uniquely focused activity guide was developed in cooperation with curriculum experts from the National Consortium of State Agriculture in the Classroom programs, Extension 4-H professionals, and specialists from the field of childcare education. Its intent is to promote agricultural literacy among young people during out-of-school time while developing their understanding, appreciation and application of science through a variety of hands-on agriculturally based activities.

Each book in this two volume series features 40 child-tested activities that can be administered in a 30-minute period with additional ideas for extending the activity time. Each activity is easily transferable across 3rd–5th grade audiences and requires minimal resources and preparation time, making them ideal for providers with limited experience and content knowledge. In addition, the activities are cross-referenced to important days and celebrations contained in an easy-to-use school-year calendar.

Theme-Based Learning

For those educators desiring to enrich the learning environment by tying their activity periods into a week-long celebration, each book has been organized around four agriculturally based themes that include the following:

Book 1

- All About Agriculture
- Fast Food Agriculture
- Mystery Agriculture
- Plant Detectives

Book 2

- Agriculture Gone Wild
- Farm Physics
- Frontier Living
- Insect Invasion

Each thematic unit includes 10 hands-on activities along with a web of ideas for its integration across the entire afterschool day. The web is organized around 9 core components for effective afterschool programs that include Arts and Crafts, Building and Transportation, Games, Science and Discovery, Dramatic Play, Gross Motor Play, Math and Literature, Snacks and Food, and Music. For additional information on theme-based learning in afterschool programs, follow the web link below to our National 4-H Afterschool Agriculture web page.

Program Partnerships and Support

Many county Farm Bureau and Extension offices are available to support the efforts of educators in the delivery of this Afterschool Agriculture curriculum. This may include:

- Training opportunities for conducting selected ag-related activities and themed events
- Teaching kits which include consumables and equipment for conducting activities
- Volunteers who are trained to lead or assist with selected activities
- Assistance with organizing, introducing and celebrating a particular themed event.

To learn more about organizing and providing these types of afterschool opportunities in your community, contact your local Farm Bureau, county Extension office, or follow the web link below to our National 4-H Afterschool Agriculture web page.

Project Online
Afterschool AGRICULTURE

www.4-H.org/curriculum/afterschoolag

- Agricultural Literacy
- Theme-Based Learning

Acres of Adventures Book 2

Table of Contents

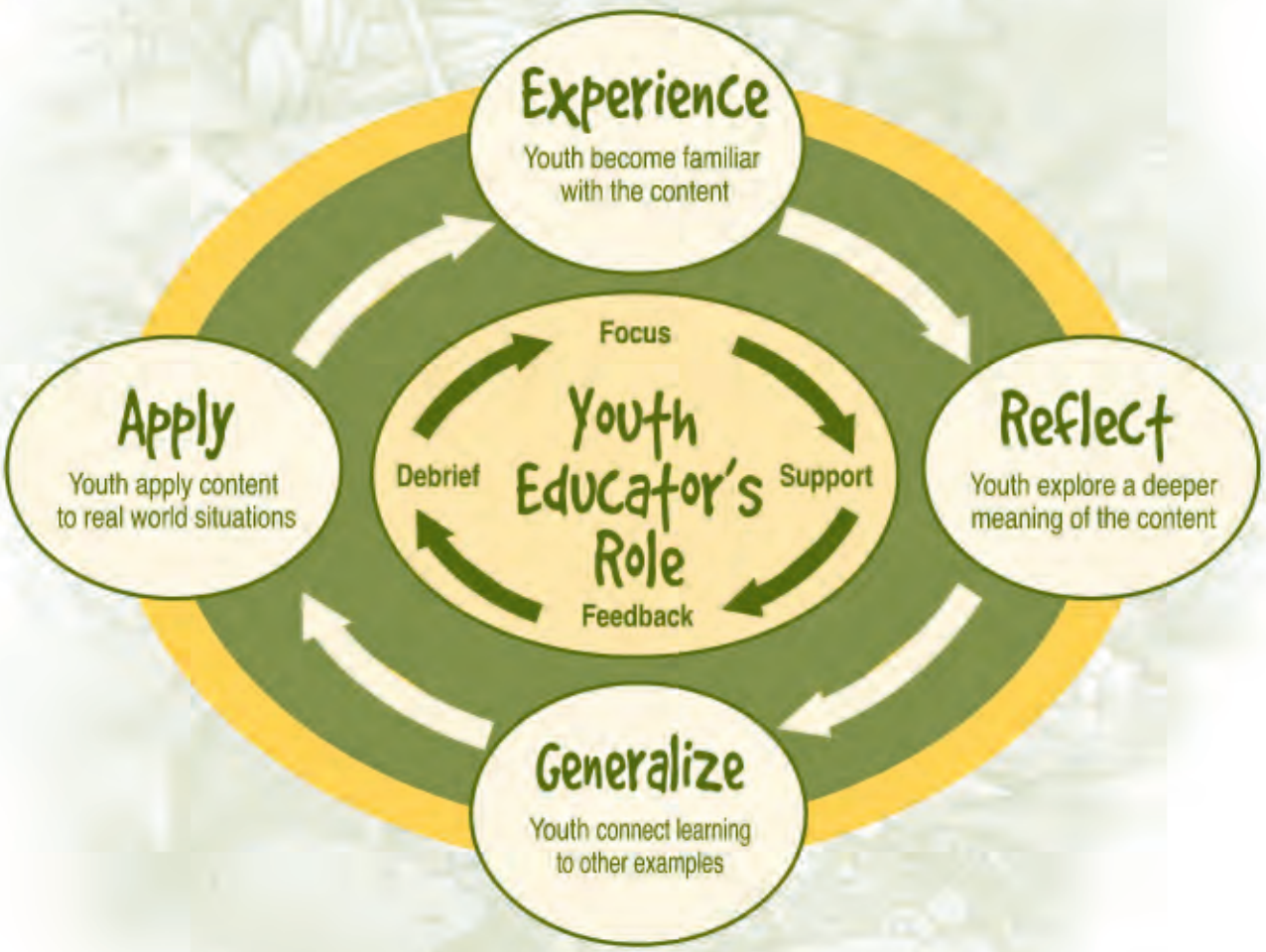
Frontier Living

Insect Invasion

Using This Guide

Each of this guide's 40 hands-on activities has been organized in a unique experiential fashion. (See figure). After **Experiencing** an activity, youth **Reflect**, **Generalize** and **Apply** what they learned in meaningful ways. At the core of this Experiential process is the youth educator. The duties of this individual include helping the youth **Focus** on the tasks at hand, providing **Support** and **Feedback** for the learning taking place, and **Debriefing** the youth to determine what was done well, what could have been done differently, and where to go from here. In this way, youth educators can nurture and cultivate interest in a topic by guiding the learners to complete an activity along with recognizing them for a job well done.

After completing an activity, time is allowed for processing. Process questions are provided to help the group integrate what they observed and experienced. The purpose of the processing questions is not to focus on answers being right or wrong, but to consider all answers as possible solutions then explore why a particular answer might be more appropriate than others. Process questions increase the depth of understanding and meaning young people get from activities. They can also serve as benchmarks for the adult to assess his/her own performance as a learning facilitator.

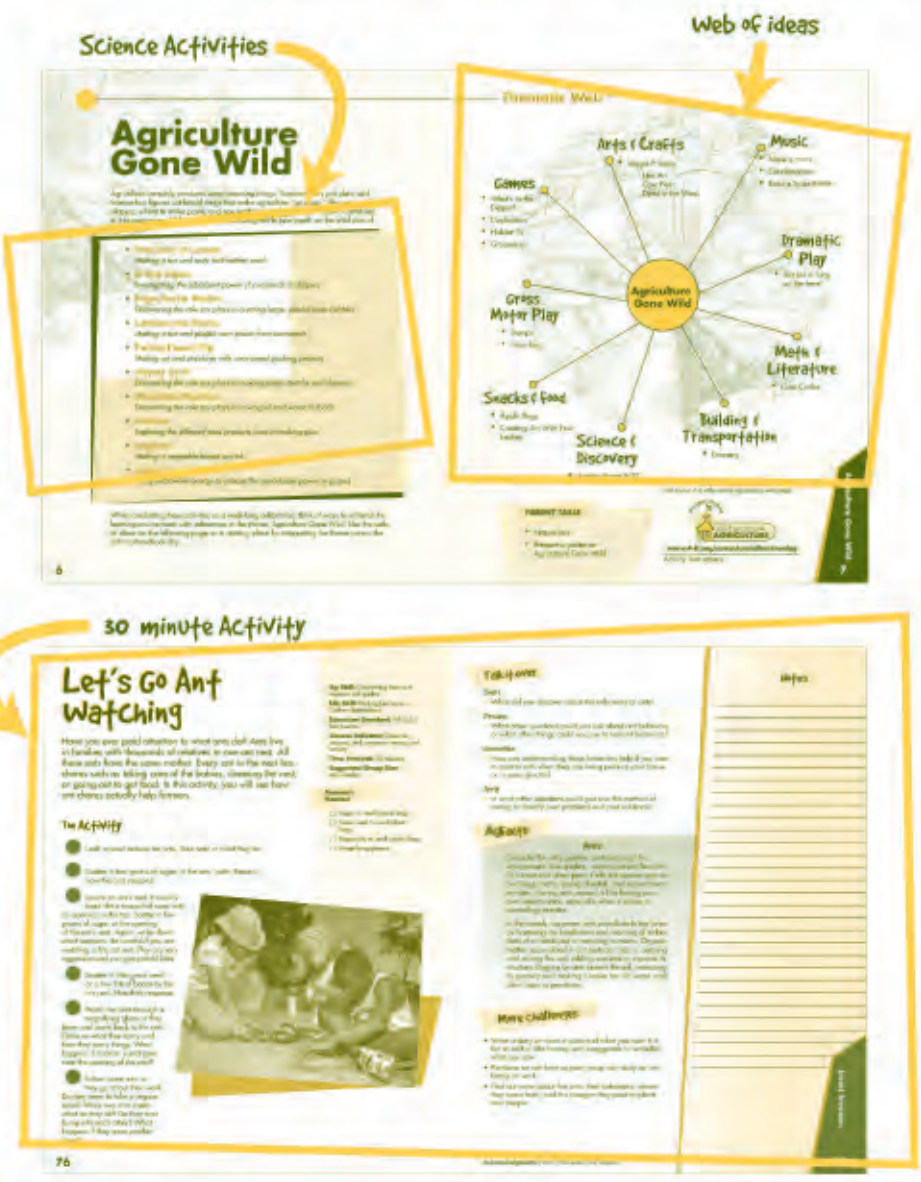


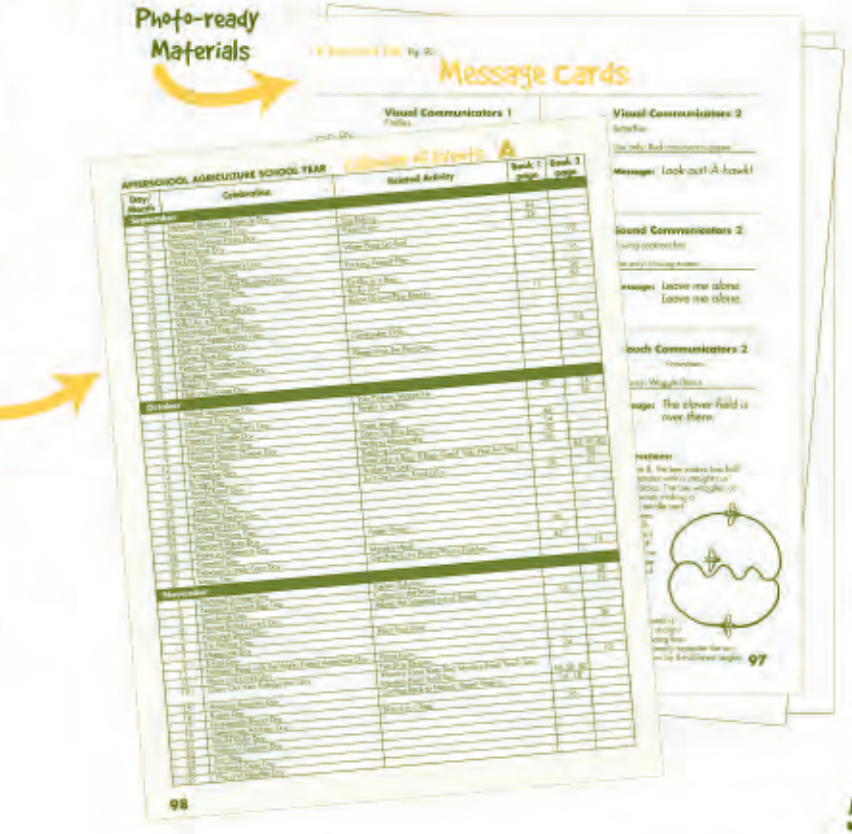
Horton and Hutchinson, *Designing Experientially Based 4-H Curriculum*, OSUE 4-H 897, 1999

How it's organized

Each section begins with an overview of the theme along with the agricultural outcomes for each of the section's 10 science activities. These activities represent the theme's core learning. This is followed by a web of ideas for integrating the theme throughout the afterschool day. This thematic web of ideas is organized around 9 core components for effective afterschool programs. Research shows that learning increases when activities can be linked through association to a particular theme! Specific instructions for conducting selected thematic tie-in activities are provided at our 4-H Afterschool Agriculture web page (see link below). Following this are step-by-step instructions for conducting the unit's 10 core activities. Each two-page, 30 minute activity guide identifies specific success indicators, connections to various National Science Education Standards, facts and background information, a detailed list of supplies, guidelines and step-by-step instructions for conducting the activity, processing questions, suggestions for extending the activity time, and references.

In the back of this book is a section containing essential photo-ready materials that support selected hands-on activities. This is followed by a cross-reference of hands-on activities to notable days and national celebrations in an easy-to-use school-year calendar. Use this calendar as your guide for deciding when to offer a particular activity or themed event especially if it complements the learning taking place at their home school.





Project Online
Afterschool AGRICULTURE

www.4-H.org/curriculum/afterschoolag

- Positive Youth Development
- National Science Standards

Agriculture Gone Wild

Agriculture certainly produces some amazing things. Sometimes it's just plain wild. Science has figured out lots of things that make agriculture "go crazy " like corn inside diapers, wheat to make paste, and soy lecithin to make Nesquik™ quick. Contained in this section are 10 hands-on activities designed to take youth on the wild side of agriculture:

- **From Fruit to Leather**
  Making a fun and tasty fruit leather snack
- **No-Drip Diapers**
  Investigating the adsorbent power of cornstarch in diapers
- **Bigger, Better Bubbles**
  Discovering the role soy plays in creating large, playful soap bubbles
- **Carefree Corn Plastic**
  Making a fun and pliable corn plastic from cornstarch
- **Packing Peanut Play**
  Making art and structures with corn-based packing peanuts
- **Slippery Stuff**
  Discovering the role soy plays in making water stretchy and slippery
- **Mysterious Mixtures**
  Discovering the role soy plays in mixing oil and water in foods
- **Food Glue**
  Exploring the different food products used in making glue
- **Veggie Ink**
  Making a vegetable-based soy ink
- **Grape Lightning**
  Using microwave energy to release the remarkable power in grapes

When conducting these activities as a week-long celebration, think of ways to enhance the learning environment with references to the theme, Agriculture Gone Wild. Use the web of ideas on the following page as a starting place for integrating the theme across the entire afterschool day.

Thematic Web*

* *For additional ideas and instructions, follow this web link to our 4-H Afterschool Agriculture web page.*

PARENT TABLE

- Nature Box
- Prepare a poster on Agriculture Gone Wild

Project Online Afterschool AGRICULTURE

www.4-H.org/curriculum/afterschoolag

Activity Instructions

From Fruit to Leather

Which fruits make the best leather? Fruit leather is a "wild" way to eat an agriculture product. By removing the water from fruit, the fruit flavor, sugars, fiber, and vitamins become concentrated. The result is a fruit leather high in sugar, but high in other nutrients, too!

Ag Skill: Making a fun and tasty fruit leather snack

Life Skill: Making Decisions—Analyzes situation/information

Education Standard: NS.K-4.2 Physical Science

Success Indicator: Decide which fruits would make tasty leather

Time Involved: 30 minutes to make, 6–8 hours in the oven

Suggested Group Size: Any size

Materials Needed

- ☐ Blender
- ☐ Oven
- ☐ Plastic wrap
- ☐ Cookie sheet

Per group of 2–3 students:

- ☐ Fruit (ripe, washed, stems and skins removed) to make 2 cups puree (Peeled apples, berries, bananas, oranges, grapes, and peaches, combinations are good)

The Activity

1. Line a cookie sheet with plastic wrap and tape it to the edges. (Do not use wax paper or aluminum foil.)
2. Pairs of students can choose the combination of fruit to make leather. Consider favorite flavors, ease of preparation, color, and amount of water.
3. Place small pieces of fruit in blender. Puree until smooth and thin enough to pour. (Some fruits like apples and grapes make a smoother puree if they are cooked with a little water first.)
4. If desired, add spices or honey.
5. Pour onto the prepared cookie sheet. Tilt pan to spread evenly until it is ⅛ to ¼ inch thick. Leave at least 1 inch around the edges so the plastic wrap can be removed. Make smaller pieces of fruit leather by pouring puree into small "pancakes."
6. Dry the fruit leather in a warm oven (140 degrees). Leave the door open 2 to 6 inches. Fruit will dry in 4 to 6 hours. If the oven is too hot, it will begin to cook the fruit. If it is too cool, it may not dry fast enough.
7. Dry it until it is still rubbery. The center should not be sticky. Remove the leather from the tray while it is still warm. Peel away the plastic wrap and roll up the leather.
8. Wrap the leather in plastic or put it in an airtight bag or container.

Talk it over

Share

- What are some other ways the fruit could be dehydrated?

Process

- List three different kinds of fruit you could use. Decide which one would be the easiest to use and tell why.

Generalize

- What are the pros and cons of drying the fruit using solar power?

Apply

- What ideas could improve the recipe? Consider ingredients and method of drying.

AgFacts

Fruit Leather

There are many ways to remove water from fruit by drying: solar, heat, and a dehydrator. The fruit must be completely dry or it will mold during storage. To make sure the fruit leather is completely dried, try to pull the leather from the plastic wrap. If it peels from the plastic and holds its shape, it is dry. If the fruit leather becomes too dry it will crack and won't roll, but it is still good to eat.

This treat can be a healthy alternative to starchy, salty snacks. Fruit leather is also lightweight and easy to carry in lunches, backpacks, and sports bags.

More Challenges

- Create nutrition information to accompany the fruit leather recipe that includes calories, sugar content and vitamins.
- Dry the fruit using another method: solar, dehumidifier or dehydrator.

Acknowledgments: Horton, Warkentien, and Gogolski

Notes

No-Drip Diapers

What keeps the baby's diaper from leaking? Secret ingredients! Explore the science of super absorbent diapers and the connection with an agriculture product—corn. Do some market testing using a science experiment.

Ag Skill: Investigating the absorbent power of cornstarch in diapers

Life Skill: Reasoning—Extracts information and data

Education Standard: NS.K-4.5 Science and Technology

Success Indicator: Collects data about the properties and use of super absorbent corn polymers in diapers

Time Involved: 30 minutes

Suggested Group Size: Any size

The Activity

1. Pair students into investigative teams.
2. Give each pair activity supplies (two diapers, scissors, gallon-size plastic bag, a measuring cup and water).
3. Instruct students to cut into one diaper and remove the cotton-like material in the diaper lining. Place the material into a gallon size plastic bag.
   - **a.** Shake the cotton to loosen the polymer from the lining; it is a powdery substance.
   - **b.** Add 4 ounces of water and watch what happens. Powder should gel; this is what happens in the diaper.
4. Pour 1 cup of water slowly into the second diaper. Hold over a plastic plate/bowl to catch any extra water that "leaks." Keep pouring in water slowly, 1 cup at a time. Keep track of all water absorbed. When the diaper will not hold anymore, it is time to change the baby! (Some diapers will collect up to 6 cups of water!) Alternative: Weigh diaper before the water is added and after the water is added. *Note: 8 cups of water is ½ gallon and weighs 4 pounds.*
5. Measure the amount of water that leaks from the diaper. Collect this information from each pair of students. Which diaper performs the best?
6. Get a sample of Hydrosorb. (Not all Hydrosorb products are made from corn; a version can be obtained in most garden stores.)
   - **a.** Fill a cup about ¾ full of water.
   - **b.** Sprinkle in 3 tablespoons of Hydrosorb.
   - **c.** Stir for a minute. The mixture will gel.
   - **d.** Turn the cup upside down to test absorbency.

Materials Needed

Per pair of students:

- ☐ 2 diapers (have several different kinds)
- ☐ Scissors
- ☐ Gallon-size plastic bag
- ☐ Measuring cup (in units of ounces)
- ☐ Water, plastic plate or bowl
- ☐ Optional: Hydrosorb potting soil and cup, stirring stick

Talk it over

Share
- Which diaper is the best? Why?

Process
- Why is it important to carefully measure the amount of water you pour into each diaper?

Generalize
- What other uses can you create for Hydrosorb?

Apply
- What other products could be studied through data collection and market testing?

AgFacts

Uses for Corn

The first alternate use discovered for corn was cornstarch. Developers learned how to turn cornstarch into fructose sugar, the most popular beverage sweetener in North America. Today corn has over 3,500 uses—from food sweeteners and absorbents in diapers to biodegradable packing peanuts and biodegradable plastics. Corn is also found in tires, the ethanol used in our cars, cosmetic and skin care products, drugs, batteries, crayons, soaps, food supplements, and much more.

Hydrosorb is a super absorbent cornstarch, a corn-based polymer which was discovered in a USDA lab. It can absorb up to 300 times its weight in water. This handy discovery changed the way we diaper babies. A polymer is a long molecule made up of repeating units; these molecules grab onto water molecules. This practical application makes it valuable for use in fuel filters as well as baby diapers.

More Challenges

- Test the absorbency of Hydrosorb with other liquids such as cooking oil, milk, pop, and vinegar. Compare the results.
- Test the absorbency of Hydrosorb with other absorbent materials such as paper towels, cotton balls, and toilet paper. Compare the results.
- Find out about polymers. What other uses do they have? Design a science lesson for other youth.

Acknowledgments: Horton, Warkentien, and Gogolski

Notes

Bigger, Better Bubbles

Playing with soap bubbles is fun. It can also be scientific! A bubble is a very thin layer of soapy water that has air inside. But the problem is that they don't last very long! How can soap bubble science help you make bigger and longer-lasting soap bubbles? In this activity, you will work with an agriculture product to help you create the biggest and wildest bubbles ever.

Ag Skill: Discovering the role soy plays in creating soap bubbles

Life Skill: Solving Problems—Analyzes possible causes/reasons

Education Standard: NS.K-4.1 Science as Inquiry

Success Indicator: Tests glycerin recipes to analyze how to create the best bubbles

Time Involved: 45 minutes

Suggested Group Size: Any size

Materials Needed

Per team of student:

- ☐ Timer
- ☐ Supplies to make bubble wands (pipe cleaners, thin wire hangers, plastic six-pack holder, two straws, and a piece of string 3 to 4 feet long)
- ☐ 4 ounces dishwashing detergent (Joy® or Dawn® by Proctor and Gamble is best)
- ☐ 1 liter (or quart) water
- ☐ 45 milliliters (3 tablespoons) of glycerin (can be found in the drugstore skin-care aisle—also called glycerol)
- ☐ Wide-mouthed bowl
- ☐ 2-quart bottle with tight lid

The Activity

1. Explain the goal—Each team should create the best bubble brew to produce the largest and longest-lasting bubbles.
2. Stir 1 liter water and 4 ounces dishwashing detergent. Do NOT shake! Do NOT add glycerin.
3. Create bubble wands using the supplies.
4. Make bubbles. Estimate size of bubbles and use the timer to measure how long the bubbles last. Which wand works the best?
5. Explain that glycerin is a soy oil product that reduces the evaporation of water and makes the bubbles last longer. Add 1–3 tablespoons of glycerin to the soap mixture and repeat bubble making (step 4). Test different amounts of glycerin.
   - Which amount makes the best bubbles?
   - Which wands work the best?
6. Post results on classroom board or list.
7. Hold a Bubble Celebration where teams demonstrate their best bubbles.

Talk it over

Share

- What is the best bubble recipe? Which bubble wand produced the best bubbles?

Process

- What tests were performed to decide on the best recipe and the best wands?

Generalize

- Analyze the effect that weather might have on the tests you performed. Does air humidity affect the bubbles? Does wind speed affect the bubbles?

Apply

- What other uses can you create for glycerin?

AgFacts

Bubbles

Bubbles break when the water evaporates and the molecules "separate." One way to slow the evaporation is to change the chemistry of the water by adding glycerin, a soy-oil product. Certain weather conditions also slow the evaporation of water. High humidity provides the best conditions for bubbles. Other conditions that bubbles "prefer" include cool, shady areas that are sheltered from breezes.

Bubbles love the cold and can last longer inside a refrigerator. Protect bubbles from dust and drafts by inverting a glass bowl over them. The oldest bubbles in the world have lasted up to two years.

More Challenges

- Design bubble tricks such as making a small bubble and enclosing it inside a larger one. Take photos.
- Use straws or other materials to create square bubbles.
- Research other interesting soy products such as ink, plastic, glue, and countertops.

Acknowledgments: Horton, Warkentien, and Gogalski

Notes

Carefree Corn Plastic

Corn is an important renewable resource. There are thousands of uses for this valuable crop, not only as food for humans and livestock, but for many other products such as camera film, candles, shoestrings, crayons, detergents, wood products, adhesives, and medicines. Make corn plastic and imagine the possibilities! How could it solve some environmental problems? What can you do with this wild and wacky stuff?

Ag Skill: Making a fun and pliable corn plastic from cornstarch

Life Skill: Solving Problems—Generates/evaluates solutions

Education Standard: NS.5-8.6 Science in Personal and Social Perspectives

Success Indicator: Makes corn plastic and generates new uses that might solve environmental problems

Time Involved: 20–30 minutes

Suggested Group Size: Any size

Materials Needed

- ☐ Cornstarch
- ☐ Measuring spoons
- ☐ Corn oil
- ☐ Water
- ☐ Pipette/dropper
- ☐ Food coloring
- ☐ Sandwich-size resealable plastic bag
- ☐ Microwave
- ☐ Poster board to list corn plastic ideas

The Activity

1. Provide the materials to start the experiment.
   - **a.** Place a tablespoon of cornstarch in a resealable plastic bag.
   - **b.** Add 2 drops of corn oil to the cornstarch.
   - **c.** Add 1 ½ tablespoons of water to the oil and cornstarch.
   - **d.** Stir the mixture.
   - **e.** Add 2 drops of food coloring to the mixture and stir well.
   - **f.** Microwave the bag for 30–45 seconds.

   Caution! *Open the bag slightly before starting the microwave. The plastic bag will get very hot. Be careful when removing the plastic. When the substance has cooled a bit, try shaping it into a ball.*

2. Create a new idea about how corn plastic could be used to solve environmental problems. Add it to a list of ideas created by others.

Talk it over

Share

- What happens to the liquid corn mixture after it is microwaved?

Process

- What could you make with this plastic?

Generalize

- How could edible corn plastic help to solve the space problem in many landfills?

Apply

- What future uses or products can you imagine for plastic that could be made out of edible corn?

Notes

AgFacts

Plastic from Corn

Has a checkout clerk at a store ever asked you if you prefer paper or plastic? If you chose plastic, you may have received a biodegradable shopping bag made from corn products. The Brookfield Zoo near Chicago uses plastic knives, spoons, and forks made from corn. These places aren't the only ones using biodegradable corn products. During the 2000 Summer Olympic Games in Sydney, Australia, more than 35 million pieces of tableware, straws, and drink cup lids were made from biodegradable corn plastic.

Other creative ideas are being considered for using corn plastic. For example, a ski slope is considering changing the lift tickets to biodegradable plastic so when the snow melts there will be less litter. Another company is using this new plastic to make casings for fireworks. When the firework explodes, the casing falls to the earth and decomposes.

More Challenges

Plastic Flubber

Compare Corn Plastic to a glob of Plastic Flubber. See which one they like best. Remind them that the Carefree Corn Plastic will bio-degrade while the Plastic Flubber will not.

- Have each student take a Ziploc plastic sandwich bag and add 1/4 cup of Elmer's White glue (the non-school type which contains polyvinyl acetate), 1/4 cup of water and a pinch of grape Koolaid to the bag and seal it shut. Have the students mix the contents together.
- In another Ziploc plastic sandwich bag, mix 1/4 cup of water with 1 tablespoon of Borax laundry powder.
- Once mixed, pour the Borax solution into the bag with the glue mixture. Seal the bag and have the students mix the ingredients. After 1 minute, remove the coagulated mass from the bag. Be sure the colored glob is well drained before placing it on a piece of waxed paper.
- Using a paper towel, gently dab the glob to absorb the remaining moisture. Be careful, the glob may stick to the paper towel.
- After about 1 minute of drying time, the students may pick up their glob and begin to roll it in their hands to shape it. For safe storage, place the glob in a clean Ziploc plastic sandwich bag and seal it shut. The glob will eventually dry out if not sealed properly. Keep the glob away from clothing as it will stick to and stain fabric.

Acknowledgments: Horton, Warkentien, and Gogalski