



# Acres of Adventures

Cultivating Excitement for  
Science & Agriculture in  
Afterschool Programs

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



REVIEWED & RECOMMENDED  
National 4-H Curriculum





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**L**ooking 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 3<sup>rd</sup>–5<sup>th</sup> 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.



[www.4-H.org/curriculum/afterschoolag](http://www.4-H.org/curriculum/afterschoolag)

- Agricultural Literacy
- Theme-Based Learning



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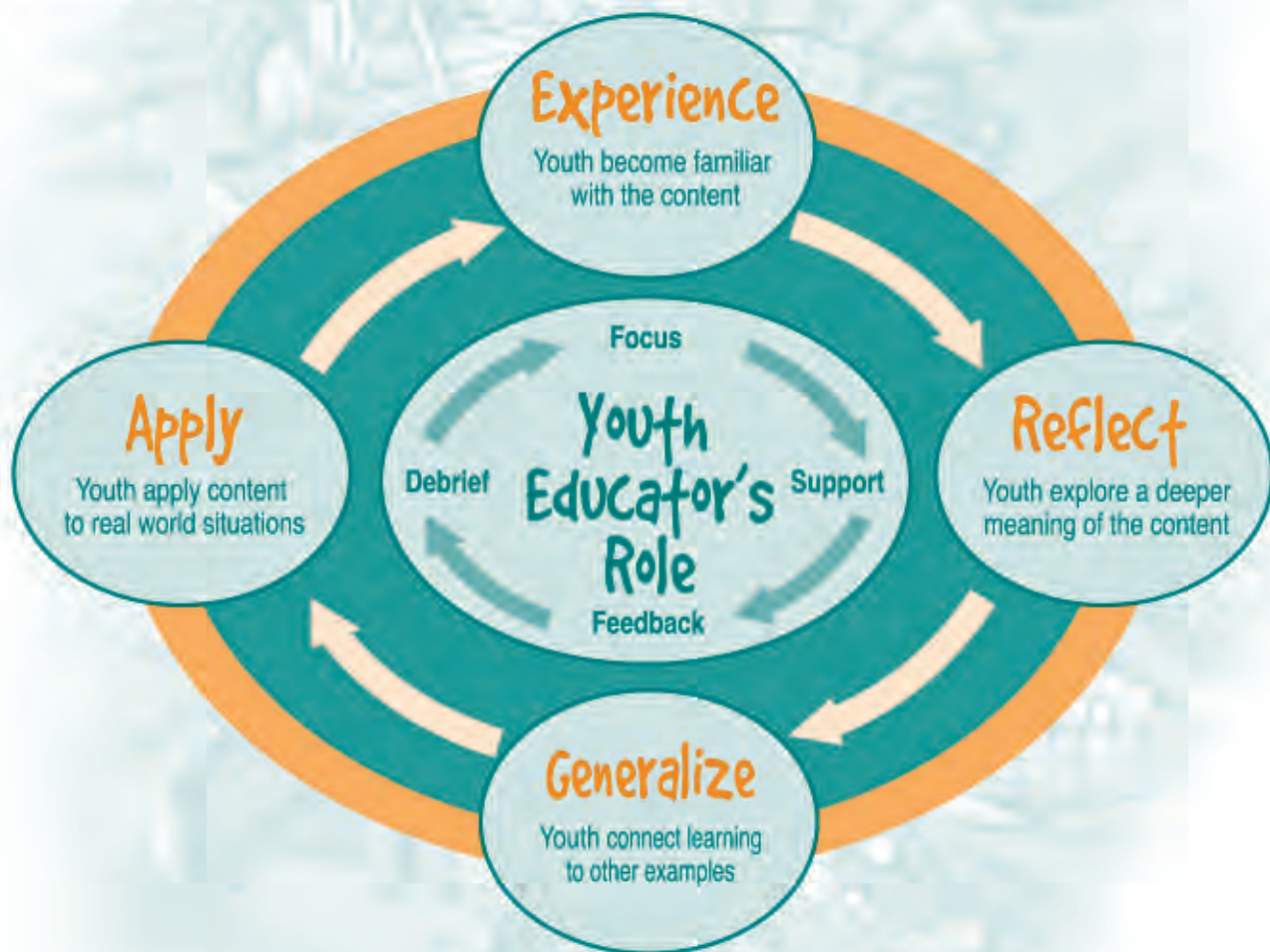
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## Using This Guide

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.

### Science Activities

## All About Agriculture

### Web of ideas

#### Thematic web



### 30 minute Activity

## Cotton to Blue Jeans

Guidelines for the activity are provided in the 30-minute activity guide. This guide includes a list of supplies, guidelines and step-by-step instructions for conducting the activity, processing questions, suggestions for extending the activity time, and references.

#### The Activity

1. Students will learn about the history of cotton and how it is used to make blue jeans. They will also learn about the different parts of a cotton plant and how it grows.

- Students will learn about the history of cotton and how it is used to make blue jeans.
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2. Students will learn about the history of cotton and how it is used to make blue jeans. They will also learn about the different parts of a cotton plant and how it grows.

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.

### Photo-ready Materials

## Name That Bread

It's a challenge to name the breads that are made in your area. This activity is a fun way to learn about the different breads that are made in your area.

### Calendar

Project Online



Afterschool AGRICULTURE

[www.4-H.org/curriculum/afterschoolag](http://www.4-H.org/curriculum/afterschoolag)

- Positive Youth Development
- National Science Standards



# All About Agriculture

This section explores the world of agriculture around us. It's designed to introduce youth to the various ways in which agriculture interacts with their daily lives. Contained in this section are 10 hands-on activities designed to engage youth in the topic of agriculture.

- **Cold Air and Fuzzy Mittens**  
*Recognizing which natural fibers make the best insulators*
- **Ice Cream in a Bag**  
*Discovering the agricultural products used in the production of ice cream*
- **Homegrown Play Dough**  
*Exploring the versatile properties of wheat grain*
- **Cotton to Blue Jeans**  
*Exploring the role of cotton fiber in the production of clothing and fabrics*
- **Cycling Back to Nature**  
*Recognizing the interdependence of agriculture and recycling*
- **Paper Making**  
*Discovering the role of tree fiber in the production of paper*
- **Making Mozzarella**  
*Exploring the science of cheese protein*
- **Tie Dye Agriculture**  
*Creating and using natural dyes from cultivated crops*
- **Pizza Farm**  
*Understanding that farmers produce all the ingredients needed to make pizza*
- **Bread in a Bag**  
*Exploring the science and history of bread making*

When conducting these activities as a week-long celebration, think of ways to enhance the learning environment with references to the theme, All About Agriculture. 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

- Brochures on local farming
- Prepare a poster on "Today's Agriculture"

Project Online



Afterschool  
AGRICULTURE

[www.4-H.org/curriculum/afterschoolag](http://www.4-H.org/curriculum/afterschoolag)

Activity Instructions



# Cold Air and Fuzzy mittens

When it is cold outside, how do you keep your hands warm? Different products from the farm can help you stay warm. Do a scientific investigation using "bag-mittens" to determine which insulators will keep your hands the warmest when it is cold outside.

## The Activity

- 1 Organize six groups of students.
- 2 Ask each group to prepare one of the six bag-mittens.
  - a. Turn one quart-sized zipper-type plastic bag inside out and insert it inside a second bag that is still right side out. (See illustration)
  - b. Fill each bag-mitten with a different insulation material: wool, Styrofoam, foil, feathers, cotton cloth or cotton balls, and air. For the bag insulated with air, blow air between the inner and outer bags.
  - c. Zip the bags together. Label each bag with the insulation it contains.



Turn one zipper-type bag inside out and insert it into a second bag that is right-side-out and zip together.

- 3 Prepare two cold packs for each group by filling two zipper-type plastic bags with ice water.
- 4 Test and collect data. Each student should take a turn at the following:
  - Hold a bag of ice water. Do your hands stay warm, or do they get cold? Why?
  - Slide a hand inside the bag-mitten and hold a bag of ice water. Time how long it takes to feel the coldness of the cold pack through the bag mitten. Record the results.
  - Switch mittens until everyone has experimented with all six mittens.

**Ag Skill:** Recognizing which natural fibers make the best insulators

**Life Skill:** Making Decisions—Applies various strategies to make decisions

**Education Standard:** NS.K-4.1 Science as Inquiry

**Success Indicator:** Discovers and describes different insulating properties of materials used to make bag-mittens

**Time Involved:** 30 minutes

**Suggested Group Size:** Six groups of up to 6 students each

### Materials Needed

- ☐ Several mittens made of different materials for display
- ☐ 16 quart-sized zipper-type plastic bags
- ☐ Masking tape and pens for labels
- ☐ Stopwatch or timing device with a second hand
- ☐ Ice water
- ☐ Enough of each of the following materials to fill a bag-mitten (a sixth bag-mitten will be filled with air)
- ☐ Wool
- ☐ Small Styrofoam pieces (for example, packing peanuts or torn-up Styrofoam cups)
- ☐ Aluminum foil
- ☐ Cotton cloth or cotton balls
- ☐ Feathers (down if possible—can be taken from a down pillow)





## Talk it over

### Share

- Which natural fiber/material is the best insulator and how did you discover this fact?

### Process

- What was the most difficult part of this activity?
- What did you learn by observation that you didn't know before?

### Generalize

- How will learning about insulators help you?

### Apply

- What other things could you test in this way?

## AgFacts

### Wool—The Insulator

To stay warm in cold weather, we wear warm clothes. These clothes, such as mittens, trap heat inside providing a barrier to the transfer of heat energy. Effective insulators have many air pockets. Air is a poor conductor of heat and the air pockets trap heat energy.

Wool is an example of a good insulator. As a result of wearing a wool sweater, heat is not lost quickly, and a person stays warm. Wearing a hat also works as an insulator. A hat serves as insulation by trapping a layer of air near the skin. It slows the movement of heat away from a person's head.

## More Challenges

- Choose different materials to be insulators for the mittens and do the tests again. Which other materials make good insulators?
- Examine materials found in different types of boots, coats, scarves and sweaters. How are the materials similar to the materials you have tested? Identify the source of these materials. Which ones come from agriculture?
- Design a test to find if color of clothing makes a difference in insulation.

## Notes



# Ice Cream in a Bag

If you understand the freezing point of water, you can use your muscles to produce the mechanical action to shake and toss your ingredients to become delicious homemade ice cream.

## The Activity

- 1 Pair students and direct them with the following instructions.

### Ice Cream Recipe

1. Pour the cream, vanilla extract, and sugar into the small zipper bag. Squeeze as much air out as possible, mix well and seal the bag carefully.
2. Place the small zipper-type bag into the large bag. Cover with ice and salt. Seal the large bag tightly.
3. Shake, toss and flip the "ice cream machine" for 5 to 10 minutes. If the bag gets too cold to handle, wrap it with a towel or pass it from person to person. If the mixture hasn't frozen after 10 minutes, add more salt and ice.
4. Open the larger bag and remove the smaller bag. Wipe the smaller bag thoroughly before opening it so the salty water does not contaminate the ice cream. The ice cream should be the consistency of soft serve ice cream. Eat right out of the bag or serve in small cups.



**Ag Skill:** Discovering the agricultural products used in the production of ice cream

**Life Skill:** Performing as a Team Member—Completes tasks

**Education Standard:** NS.K-4.2 Physical Science

**Success Indicator:** Works together to make ice cream

**Time Involved:** 30 minutes

**Suggested Group Size:** Any size

### Materials Needed

For youth working in teams of two:

- ☐ 1 gallon zipper-style bag (heavy duty freezer bag)
- ☐ 1 quart zipper-style bag
- ☐ 4 cups ice
- ☐ 1 cup ice cream salt or table salt
- ☐ 1/2 tablespoon sugar
- ☐ 1/2 cup light whipping cream
- ☐ 1 teaspoon vanilla extract
- ☐ Cups and spoons



## Talk it over

### Share

- What happened during this activity?

### Process

- Why was working together helpful in completing these tasks?

### Generalize

- What other food products do you combine using some "mechanical action" to get a new product?

### Apply

- How has technology made the production easier than this process?

## AgFacts

### Making Ice Cream

Most of the ice cream eaten is made by adding sugar and vanilla or other flavorings to cream from cows' milk. The United States produces about 900 million gallons of ice cream a year. Salt is used in the production process to lower the freezing point of the water. This super-cold water and ice mixture causes the liquid milk mixture to freeze and become solid.

## More Challenges

- Try making different flavors of ice cream.
- Make ice cream using milk with different amounts of fat—2%, whole milk or half-and-half. Compare flavor and texture.
- Design a mechanical method of shaking to replace the work you and your teammate did to freeze the ice cream.

## Notes



# Home Grown Play Dough

Wheat is the main ingredient in many more things than bread. One "wild" idea that turned into fun was to use wheat as the main ingredient in Play-Doh®. In this activity, you will use wheat flour to make Home Grown Play Dough and then experiment with the properties to create a better product.

## The Activity

- 1 Divide the group into teams of three. Each team can prepare a small amount of Homegrown Play Dough to use.  
Post the recipe for all to follow:

### Home Grown Play Dough

1 cup flour	1 cup cool water
1/2 cup salt	1 tablespoon oil
2 teaspoons cream of tartar	Food coloring

Mix the dry ingredients in a cooking pot. Mix the liquids together and pour them over the dry ingredients. Cook over medium heat, stirring constantly. Remove from heat when dough pulls away from the sides of the pot. After the mixture has cooled, take it out of the cooking pot and knead it until it is smooth. Store in an airtight container.

- 2 Play with it and become familiar with the properties of the substance—texture, color, stretch, thickness, etc. Answer these questions:
  - How could I change this recipe?
  - I wonder what would happen if ... ?
  - How could I get it to ... ?
- 3 Try another batch to improve one of the properties.

**Ag Skill:** Exploring the versatile properties of wheat grain

**Life Skill:** Teaching Others—Models proper attitudes

**Education Standard:** NS.K-4.1 Science as Inquiry

**Success Indicator:** Makes homegrown play dough and plays with others

**Time Involved:** 30 minutes

**Suggested Group Size:** Any size

### Materials Needed

- ☐ Flour
- ☐ Salt
- ☐ Cream of tartar
- ☐ Water
- ☐ Vegetable oil
- ☐ Food coloring





## Talk it over

### Share

- What did you do to create the Home Grown Play Dough?

### Process

- What are the characteristics of the substance that make it useful for Home Grown Play Dough?

### Generalize

- What other things have you used that have similar properties?

### Apply

- What would you change to make it useful in other ways?

## AgFacts

### History of Play-Doh®

Play-Doh® was invented in 1956 by Noah and Joseph McVicker. They were looking for a way to make wallpaper cleaner but created Play-Doh® by accident. The exact Play-Doh® recipe is a secret, but it is made from ingredients similar to those in this recipe. Manufacturers have added components to keep it smooth, dry and free from mold or hardening. Play-Doh® comes in different colors, is non-toxic and non-staining, and is soluble in soapy water. Today the Play-Doh® compound is sold in more than 6,000 stores in the United States and in more than 75 countries worldwide.

## More Challenges

- Make Home Grown Play Dough for a local preschool. Vary the supply of colors.
- Use Home Grown Play Dough to play with a younger child, teaching math or reading, forming letters, creating shapes or counting.
- Look for other Play Dough recipes that use salt, cornstarch, baking soda and compare the properties.

## Notes



# Cotton to Blue Jeans

Cotton is the world's most important non-food crop. Many steps are required from the cotton field to the bluejeans you buy at a store. Use the remnant fabric from making a pair of "cut-offs" to create a blue jean bag.

## The Activity

- 1 Generate a list of useful things that could be made from the bottom of the leg of a pair of bluejeans. Ideas should include things of interest to girls and boys, young and old. Some ideas may include: storage bag, book bag, laundry bag, tote bag, or money bag.



- 2 Cut off the bottom half of each leg of a pair of jeans to make a pair of cut-offs. Ask permission and try on the pants to mark the right length before you cut. Denim is available on a bolt or roll if students choose not to cut off jeans.
- 3 Use a needle and thread to sew up the bottom and side to create a bag. Other fabric, ribbon or cording can be used to attach handles. Be creative.

### Sewing tips:

- Turn fabric inside out when stitching to hide the stitches on the finished product.
- Use a sturdy needle and thread to support the weight of the denim.

**Ag Skill:** Exploring the role of cotton fiber in the production of clothing and fabrics

**Life Skill:** Thinking Creatively—Applies creative thinking skills to generate new ideas

**Education Standard:** NA-VA, K-4.1 Understanding and Applying Media, Techniques, and Processes

**Success Indicator:** Creates a bluejeans bag (storage bag, book bag, laundry bag, tote bag or money bag)

**Time Involved:** 45–60 minutes

**Suggested Group Size:** Any size

### Materials Needed

- ☐ Old bluejeans that can be cut-off to make shorts
- ☐ Denim fabric in varied colors
- ☐ Needles
- ☐ Thread
- ☐ Thimbles
- ☐ Scissors
- ☐ Additional fabric, ribbon, cording for decoration



## Talk it over

### Share

- How did you decide what to make? What skills do you need to have or learn for this activity?

### Process

- What did you learn about yourself by doing this activity?

### Generalize

- What other ways can you generate new ideas for using old things?

### Apply

- What examples can you find of new things created from old stuff? (Think recycled items.)

## AgFacts

### From Farm to Consumer

Denim is a major product made from cotton. Like many agricultural products, cotton has limited use in the form it is found on the farm. It is similar to raw or unprocessed wheat, soybeans or sugar beets. The product must have value to consumers and be in a form that can be used, before anyone will purchase it.

Every process between the farm and the consumer makes the product more valuable to the consumer and adds to the price the consumer pays. Over 152,000 workers are employed in the U.S. cotton and finishing mills. Each worker involved in the process of bringing a product to us gets a wage for his or her work with the product. That explains why bluejeans seem to cost a lot.

## More Challenges

- Design other useful items such as pillows.
- Cut strips and share with a friend who has another color of denim to weave placemats or pillow tops, etc.
- Make several items, price them and sell to raise funds for a party for your group.
- Make several useful items such as totes and book bags and donate to a senior center for wheel-chair and walker totes.
- Use fabric glue, decorate with buttons, ribbon or cording; use a sewing machine.

## Notes