



National Agriculture in the Classroom

Relevancy and Engagement: agclassroom.org

Powerful Potato

Grade Level(s)

3 - 5

Estimated Time

1 - 2 hours, plus weekly observation time

Purpose

Students will explore life science concepts by observing a potato grow with and without soil. They will further learn about geography and world cultures by charting potato geography on a world map and holding a potato dress up contest.

Materials

Activity 1

- 2 large potatoes
 - Preferably an early-maturing variety like Yukon Gold
- *Potato Pattern*, 10 copies per student
- Paper plate
- Large pot
 - Any container that is at least 12" deep and 12" wide with drainage holes will work
- Potting soil to fill the pot
 - Choose a potting soil that contains nutrients to feed for at least two months
- Lamp or lights
 - Any lamp or light that can be positioned to shine closely and directly on the growing potato will work
- Watering can or pitcher

Activity 2

- *World Map*, 1 per student

Activity 3

- Potatoes, 1 per student
- Art materials (e.g., paint, fabric scraps, glue, pipe cleaners)
- Index cards, 1 per student

Essential Files (maps, charts, pictures, or documents)

- World Map
[<https://naitc-api.usu.edu/media/uploads/2016/11/11/worldmap.pdf>]
- Potato Pattern
[https://naitc-api.usu.edu/media/uploads/2016/09/28/potato_pattern.pdf]

Vocabulary

potato: an erect South American plant widely cultivated for its thick, starchy, edible underground tubers

seed potato: a potato tuber grown for its buds which are used to start new plants

staple food: a food that is eaten regularly and is a dominant part of the diet, supplying a major proportion of energy and nutrient needs

tuber: a short, fleshy, usually underground stem (as of a potato plant) having tiny scale like leaves each with a bud at its base that can produce a new plant

Interest Approach – Engagement

1. Hold up a potato for students to see. Ask if they can tell you what it is and what people use it for. (*It's a potato that's used for food.*)
2. Make a list on the board of all the different ways students can think of to eat potatoes. Ask how many recipes they think there are for cooking potatoes.
3. Do a live Google search for *potato recipe* and show students how many results there are (millions!).
4. Ask students if they can tell you where potatoes come from. Prompt them to discuss that potatoes grow from plants that are cultivated by farmers and gardeners. Explain that they will be learning more about potatoes and where they come from in the following lesson.

Did you know? (Ag Facts)

- A medium-sized potato has no fat, no cholesterol, and contains about 110 calories.¹
- Potatoes are a good source of vitamin C, potassium, fiber, complex carbohydrates, and antioxidants.¹
- The potato was domesticated in the Andes Mountains as early as 500 BC.¹

Background - Agricultural Connections

The **potato** is not a root but a storage area that is part of the plant's underground stem. Vigorous potato plants that have plenty of sunlight, water, and nutrients from the soil produce more energy than the growing plant can use at one time. The plant stores the excess energy in oval packages, called **tubers** (the potatoes). These tubers provide the plant energy to regrow in the spring. When the greenery starts to wither and turn brown, the potatoes are ready to harvest.

After they are harvested, potatoes can be stored for 2-3 months and will remain in a dormant state if kept in a cool, dark location. When moved to a warmer place, the potatoes will begin to sprout in one to three weeks. Sprouts grow from the "eyes" of the potato, which are actually nodes on this enlarged, underground stem. Each node is capable of developing into a branch that can grow up through the soil and emerge into a green, leafy shoot. As the branches grow, they use up the energy from the original **seed potato**, which will shrink and shrivel as its starch is consumed. Soon the branches of the plant will grow bushy and have many new leaves that all produce energy through photosynthesis. At this point, new potatoes will begin to form on the underground sections of the branches that grew upward from the seed potato.

Potatoes produce more pounds of protein per acre than corn, rice, wheat, or oats. They are packed with nutrients, low in fat, generous in bulk and efficiently packaged in their own skins. They can be prepared in many different ways and are delicious.

Potatoes were first grown by ancient tribes living in the Andes Mountains of Bolivia and Peru as early as 200 A.D. Archaeologists have found pictures of potato plants in designs on ancient pottery. The ancient people preserved the potatoes by trampling them and then drying them.

Even though potatoes were first grown in South America, people in North America did not start eating them until after they became a popular food in Europe. European explorers carried potatoes from South America to Europe in 1570. About 150 years later, the rulers of several European countries ordered their people to start growing potatoes. In Ireland, potatoes became a **staple food** for the people. In the 1840s disease wiped out the potato crop in Ireland for two years in a row. Many Irish people moved to America then, because they had no food to eat.

Today, China produces more potatoes than any other country in the world. In the mountainous regions of northern China, potatoes are both a staple food and an important source of income for rural households. In neighboring India, potatoes are less of a rural staple, but they are an important cash crop, providing significant income for farmers. Indian farmers grow potatoes during the winter season when days are shorter. India, Russia, and Ukraine follow China in production, and the United States is the fifth largest producer of potatoes globally.²

Potatoes are grown across the United States. The biggest potato-producing states are Idaho and Washington. Over half of the potatoes produced in the United States are sold to processors to make French fries, chips, and other products.² A large portion of the remainder goes to the fresh market. Before they go to market, potatoes are graded according to size and quality. The price of the potato depends on how it looks and how much it weighs.

There are thousands of varieties of potatoes. Potatoes come in different colors, including white, red, russet, yellow, and blue. Different varieties also mature at different times and can be broadly grouped as early-, mid-, and late-season potatoes. Yukon gold is a common early-season variety that matures in approximately 90 days, although new potatoes can be harvested as early as 60 days. Russet Burbank is one of the most common potato varieties, and it is a long-season variety, taking 120-140 days to mature. Potatoes are an excellent plant to grow in a school or home garden. The plants grow quickly, and it is exciting to unearth tender, new potatoes that can be turned into many familiar and tasty dishes.

Procedures

Activity 1: Potato Life Science

1. Provide each student with 10 copies of the *Potato Pattern*, and ask them to cut out each one. Explain that they will be using these cutouts to make a journal, and they should color the front and back covers. Ask them to write their names and the title "Potato Journal" on their front covers. Then staple the cutouts together on the top or left side.
2. Place one of the large baking potatoes on a paper plate in a location where students can easily make observations.
3. Ask students to examine the potato and describe it on the first page of their journals. They should make sure to note the date on which observations are made.
4. Ask students if they think the potato is living or nonliving. Discuss the characteristics of living and nonliving things.
5. Using the information provided in the *Background Agricultural Connections*, discuss how potatoes grow with students.
6. Explain to students that they will observe the potato to find the number of days that pass before the eyes begin to sprout. The potato contains enough nutrients, energy, and water for the plant to begin to grow without any soil.



7. Tell students that they will also observe a potato planted in soil and compare its growth to that of the potato with no soil. Show students the bag of potting soil and ask them if it is living or nonliving. Point out that the soil contains nonliving nutrients that the potato will use as it grows.
8. Plant and care for the potato as follows:
 - Fill the pot approximately one-quarter full of potting soil. Place the potato on top of the soil and cover with three to four inches of soil or until the pot is about half full.
 - Position light to shine on pot.
 - Water lightly. Do not over water or the potato may rot. After green sprouts appear, pay attention to the soil moisture and water when dry.
 - As shoots appear and get tall, cover them with more soil, and tie them to a stake.
 - When flowers start to appear, stop watering to prevent the potatoes from rotting.
 - As the potato grows, it may push up the dirt around the stem or even crack the container in which it's planted.
 - After six to eight weeks, when the potato plant has finished flowering or the top starts to die, harvest the potatoes by gently pulling the plant out of the pot.
 - Lay the plant on newspaper.
 - Have students sift through the dirt to find any potatoes left behind in the pot.
9. Instruct students to document their observations of the potatoes in their journals at regular intervals (e.g., once a week).
10. As the potatoes grow, or after harvesting the first new potatoes from the potted plant, discuss the differences that students observe between growing a potato with and without soil. Discuss the importance of soil to plants as an example of the interaction between living and nonliving things. Ask students if they can think of any other nonliving things that affect plants (e.g., light, water, temperature).

Activity 2: Potato Geography

1. Discuss with students the *Background Agricultural Connections* information regarding the origin and history of potatoes.
2. As you are discussing the origin and history of potatoes, provide each student with a [World Map](#) and instruct them to:
 - Locate and label Bolivia, Peru, and the Andes Mountains in South America. This is where the potato was first domesticated. A great variety of potatoes is still grown in this region.
 - Draw a line connecting South America to Europe. Early explorers brought potatoes to Europe, but it took some time for Europeans to develop a taste for potatoes.
 - Draw a line connecting Europe to the United States. After Europeans began growing and eating potatoes, the crop then began to catch on with settlers in North America.
 - Locate and label Ireland. From 1845 to 1852 there was mass starvation, disease, and emigration from Ireland due to the failure of potato crops.
 - Locate and label China, India, Russia, and the Ukraine. China is now the world's top potato producer, followed by India, Russia, and Ukraine. The United States is the fifth largest producer of potatoes in the world.
 - In the United States, label the approximate location of the states Idaho and Washington. This is the greatest potato-producing region in the United States.
3. Potatoes grow best in cool climates with fertile soils. Have students compare the geography of different potato-growing regions of the world.
 - Using a relief map, look at the terrain of Bolivia, Peru, and Idaho to see what they have in common. Look at the terrain of China, India, Russia, and Ukraine.

- Compare and contrast these places to find what features they have that would make potatoes an important crop there (e.g., cool climate, mountains). You may wish to use the [National Geographic Mapmaker](#) which includes layers for climate and weather.
- Discuss cultural, economic, and social factors that might affect potato production in the different countries. For example, India does not have a cool climate, but there is demand for potatoes, which means farmers can make money by growing them. They grow potatoes in the winter months and plant varieties that are suited to their climate.

Activity 3: Potato Dress Up Contest

1. Hold a Great Potato Dress Up Contest! Give each student a potato, access to arts materials, and the following directions:
 - Choose a country/time period discussed in the previous activity, such as Ireland in the 1800s, ancient Peru, or modern India.
 - Research how people traditionally dressed (or commonly dress) in your chosen area and time period.
 - Dress up your potato (without cutting it) in the traditional or common dress of your chosen area and time period. You may dress it in a costume, paint it, add different things to it, etc.
 - Think of a name for your potato
2. After students have finished dressing up their potatoes, give each student an index card, and ask them to write the following things on it:
 - Potato's name
 - Where and when is your potato from?
 - Short description (1-3 sentences) of what your potato is wearing
3. Place all of the potatoes in an area where students can see them and have students vote on their favorites.

Concept Elaboration and Evaluation

After conducting these activities, review and summarize the following key concepts:

- Potatoes are living things that depend on nonliving things, like sunlight and soil nutrients, to grow.
- Potatoes are an important food, grown and eaten by many different cultures around the world.
- Agriculture is one way that people use the physical environment.
- Geography affects what crops can be grown in an area; potatoes grow best in cool climates.
- Potatoes were first domesticated in South America, and they greatly affected European history years after being brought there by the first explorers.



We welcome your [feedback](#)! Please take a minute to tell us how to make this lesson better or to give us a few gold stars!

Enriching Activities

- **Make potato stamps:**
 - Cut potatoes in half.
 - Have students create simple designs to carve into the meat of the potato (e.g., star, heart, circle).
 - Help students carve the designs in the potatoes using plastic knives.
 - Mix water-based paints in aluminum pie pans or other shallow dishes.
 - Instruct students to dip the potato surface into the paint, press to the surface of paper, and carefully lift the potato, leaving the print on the paper.

- **Use one or more of the following activities to integrate math with this potato lesson:**
 1. Have students conduct a survey of students in their school to find the most popular way to eat potatoes—as French fries, potato chips, mashed potatoes, etc. —and graph their results.
 2. Review your school menu as a class to see how many times a week potatoes are served and the different ways they are cooked.
 - Have students use tally marks to record findings.
 - Then, have students use the data they have collected to make bar graphs comparing the different ways the potatoes are cooked with the total number of times they are served.
 3. Have students tear potato shapes from brown construction paper and then:
 - Measure the length and width of the potato shapes in inches and centimeters, and find the perimeter of the shapes.
 - Use non-standard units of measure (beans, seeds, etc.) to measure the area of the potato shapes by first estimating how many units it will take to fill the potato shapes and then filling in the shapes and recording the data.
 4. Have students weigh different sizes of potatoes using scales and compare the weights to various classroom materials: bottle of glue, linking cubes, etc. Then instruct students to write sentences to show their results (e.g., my potato is lighter than ____, but it is heavier than ____).
- **Use one or more of the following activities to integrate English language arts with this potato lesson:**
 1. Guide students to create a classroom story to explain why a potato needs so many eyes. Use multimedia to present the story.
 2. Read a book about potatoes. (See *Suggested Companion Resources*)
 - Give each student two *Potato Cutouts*—one printed on brown paper and one on white paper.
 - The brown potato will be the cover. Instruct students to write the title and author of the book you read on the cover.
 - Next, have students divide the cover potato into three equal sections and cut it to make flaps that will lift to reveal the white potato beneath.
 - On the white potato have students write “beginning,” “middle,” and “end” under the correct flap.
 - Ask students to write one sentence to retell the main idea for each part of the story and draw a picture to illustrate each of the sentences.
 3. Following the potato dress up contest, ask students to select one of the following ideas to write about, and submit their writing with their potato:
 - How-To: Write detailed directions to explain how you made your potato’s clothes. Use transition words.
 - Persuasive: Write a detailed letter from your potato to the judge. Convince the judge to pick your potato as the winner.
 - Narrative: Write a detailed story from your potato’s perspective describing a day in its life.
 - Friendly Letter: Write a letter from your potato to another potato describing what your potato likes to do.
- Read Issue 4 of [Ag Today](#) titled *Agriculture in Society*. This reader can be printed or accessed digitally. Students will learn how agriculture plays a significant role in different geographic areas such as small towns, large cities, and local, state, and federal government. It also places a focus on where food comes from and why different foods are grown in different states.

Suggested Companion Resources



- Midday Meals Around the World (Book)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=724]
- The Hungry Planet (Book)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=72]
- Step into the Inca World (Book)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=467]
- Nory Ryan's Song (Book)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=456]
- Tomatoes, Potatoes, Corn & Beans (Book)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=74]
- Clothing and Jewelry (Book)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=307]
- Eat Happy Project video series (Multimedia)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=822]
- Ag Today (Booklets & Readers)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=829]
- Hungry Planet Family Food Portraits (Website)
[https://www.agclassroom.org/teacher/matrix/resources.cfm?rid=703]

Sources/Credits

1. <http://www.nationalpotatocouncil.org/potato-facts/>
2. <http://www.agmrc.org/commodities-products/vegetables/potato-profile/>

Activity 3 was inspired by Christi Fultz's [Annual Great Potato Disguise Contest](#).

This lesson was adapted with permission by Utah Agriculture in the Classroom. The original *Powerful Potato* lesson by Pat Thompson of Oklahoma Agriculture in the Classroom can be found at <http://aitc.okstate.edu/lessons/primary/potato.pdf>.

Author(s)

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Organization Affiliation

Oklahoma Agriculture in the Classroom and Utah Agriculture in the Classroom