CULTIVATING HISTORY
Food, Crops, and Art

Activity Packet
Grades 4-12
Overview

About the activities

The following packet includes activities and lesson plans that correlate with the Virginia Standards of Learning, while also drawing back to the themes in the exhibit.

There are a total of 28 activities included in the activity packet, which can be adapted for any classroom, library, or resource center. The activities are broken up into two parts. **Part 1: Elementary and Middle School Activities**, includes 14 activities for grades 4-8. **Part 2: High School Activities** includes 14 activities for grades 9-12. The activities are multi-disciplinary, spanning across several academic subjects—history, English, science, math, and visual art.

How to use the activities

Each Activity includes the following components:

- **The name of the activity followed by the suggested grades and subject areas**
- **A short description of the activity**
- **Learning objectives & SOLs**
- **A background section explaining any relevant information that relates to the exhibit content or activity**
- **A discussion section with questions and prompts to ask students before and after they view the exhibit**
- **Step-by-step instructions**
- **Links and additional project ideas related to the content**
- **Sources**
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The Table of Contents for Part 1 and Part 2 were designed so a teacher or facilitator can easily choose the appropriate activities based on grade level and subject.

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CHARTING UNKNOWN TERRITORY
GRADES 4-6 • MATH, ART, HISTORY

DESCRIPTION
Students will embark on a journey to map out their school or playground using 18th century survey techniques to create an informative map.

OBJECTIVES
- Students will understand how maps have changed over time.
- Students will learn how maps were made in the colonial era.
- Students will practice cartography and understand how the field of mapmaking has evolved.

SOls
- Math 4.7, 5.4, 5.8, 6.10
- History VS.1, VS.4, USI.1, USI.2
- Art 5.2, 5.7, 6.1

BACKGROUND
Throughout the Scientific Revolution (between roughly 1550-1700), maps gradually became more accurate because of improvements in technology and humankind’s widespread wish to better understand the world. Mapmakers replaced daunting sea creatures and monsters with more factual information; maps began detailing physical features of the land, cities, towns, and bodies of water.

Colonial surveyors and mapmakers had the challenging task to map the New World. Because there were no previously-made maps to inform them, they had to start from scratch. In most situations, a surveyor would first measure and chart out the land using a compass attached to a stick and a Gunter Chain.

Gunter Chains consisted of four poles attached together by 66 feet of chain, looking somewhat like a large paperclip chain. One man would hold one end of the chain while the other walked forward until the chain was completely stretched out and he could not go any further. This would indicate that there was 66 feet of land between the two men. Next, the man in the back would walk forward again, passing his colleague, until the chain was stretched out completely. Again, this would mark that they have traveled another 66 feet. In colonial Virginia, surveyors carried half chains measuring only 32 feet—a full Gunter chain was difficult to carry through thick brush. Artists would either travel with these explorers and visually map out the land they were surveying or, they would wait to get the measurements from the surveyors and draw out the map afterwards. Most early surveyors and mapmakers had no formal training; they would learn skills on the job and were often negligent when measuring. This created inaccurate maps that had to be altered later on.

DISCUSSION
Before Viewing How are maps made? What type of technologies are used in this process?

After Viewing Without technology, how do you think Jefferson and Jefferys made the maps shown in the exhibit? Why were maps important to the establishment of new world colonies?

MATERIALS
- Several handfuls of paperclips
- Rulers
- Compass
- Clipboards
- Drawing paper
- Pencils and coloring utensils for each group
CREATE

1. Divide into groups of five. Each group chooses a location in their school to measure and map (such as the classroom, the hallways, or the playground).
2. Create a “Gunter Chain” by connecting either 32 or 66 paperclips. Measure its length by measuring one paperclip and multiplying that number by the number of paperclips in your chain (ex. Thirty 1.5” paperclips is equal to 45 inches, or 3.75 feet).
3. Use the chain and measure the length of the perimeter of your location. Two students should hold the chain. One student should hold the compass to determine direction. One student should record the measurements and compass directions. The last student should carry a clipboard, pencil, and paper to begin making the map of their location.
4. Once measurements are complete, work together to help the mapmaker finish adding the details to their map.

FURTHER EXPLORATION

- Make a Venn Diagram comparing and contrasting the differences between 14th century maps and 18th century maps.
- Read more about the tools used by colonial surveyors at http://www.colonialsense.com/Society-Lifestyle/Signs_of_the_Times/Gunter%27s_Chain.php

Sources
PLANTS AND POETRY
GRADES 4-6 • ENGLISH, ART

DESCRIPTION
Students will write a poem about one of the pieces of botanical art/illustration shown in the exhibit.

OBJECTIVES
- Students will be able to describe visual characteristics of the plants shown in the exhibit.
- Students will view and write about botanical art and illustration.

SOLs
- English 5.4, 5.5, 5.7, 6.4, 6.5, 6.7
- Art 4.13, 4.18, 5.18, 5.19, 6.17

BACKGROUND
Although the terms are often used interchangeably, there is a difference between botanical art and botanical illustration. Botanical illustrators focus on recording plants for scientific accuracy. Botanical art can be scientifically accurate, but the artist places emphasis on aesthetic value and artistic quality and focuses less on accuracy. Artists who label themselves “flower painters” do not care about accuracy; they want to create a beautiful image. Still life painters, abstract painters, and impressionist painters all fall under the “botanical art” category. Maria Sibylla Merian’s pineapple is an example of botanical art whereas John Abercrombie’s pineapple is an example of botanical illustration. To tell the difference, the viewer must pay attention to the artist’s intent: is it to inform, describe, persuade or entertain?

DISCUSSION
Before Viewing Read the poems “Sunflower” by Frank Steele and “Sunflowers” by Jose Antonio Rodriguez—found at https://www.poetryfoundation.org/—out loud. Although both poems are about sunflowers, they have a different purpose. Discuss the purpose and audience of each poem. Which is to describe and which to entertain? Can these purposes overlap?

After Viewing Like artists, poets must decide their intent before writing. Ask students to write down what they think each artist is attempting to say to the viewer with their artwork.

CREATE
1. Choose one piece of artwork or a crop from the exhibit to write about.
2. On a sheet of paper, describe the artwork or crop, listing its important features including its physical properties and potential uses as well as what stands out to you when you look at the plant.
3. Write a narrative or descriptive poem about the artwork or crop you selected.

FURTHER EXPLORATION
- Explore additional poetry collections, such as the “Poetry and the Environment” collection from the Poetry Foundation (https://www.poetryfoundation.org/collections/146462/poetry-and-the-environment).
- Create a venn diagram comparing and contrasting the jobs of an artist and poet. Which roles overlap and which are different?
- Submit a haiku (first line, 5 syllables; second line, 7 syllables; third line, 5 syllables.) for the environment: http://climate.miami.edu/your-haiku-to-the-environment

Sources
EXHIBIT TRIVIA “FORTUNE TELLER”

GRADES 4-6 • HISTORY, ENGLISH

DESCRIPTION
Students will create a “fortune teller” trivia game that tests each other's knowledge on the exhibit.

OBJECTIVES
- Students will engage with the information provided in the exhibit.

SOLs
- History VS.1, USI.1
- English 5.1, 6.1

CREATE
Preparation
1. Make copies of the template on page 15 so each of your students has at least one template.
2. Follow the folding directions on page 14 to make an example “fortune teller”.

Activity
1. While viewing the exhibit, take notes on the artwork and labels, writing down what you find interesting.
2. Use your notes to make eight different trivia questions about the exhibit.
3. Fill in the blank areas on the template. On the spaces with numbers, write a category for your question.
4. Fold the template. On the flap below each number/category space, write a trivia question about the exhibit (labeled Question on the template). The question should relate the category it is under. Write the answer above on the side of the flap labeled Answer.
5. Pick a partner and play!

Game Instructions
1. Fold the template and hold it in your hand. Place a finger under each flap. Squeeze fingers together so that the four flaps are touching.
2. Ask your partner to pick a word. Open and shut the fortune teller once for every letter in the word they picked (ex. “Peach” would be open and closed five times because it has five letters). Rotate opening up and down with side to side. Stop on the last letter of the word, leaving the number/category flaps open.
3. Ask your partner to choose a number. Open and close as you count out loud the number that they picked (ex. If the picked the number two, open and close two times).
4. Next, ask your partner to pick one of the four available categories. Lift the flap of the category they chose. Do not let them see what is underneath.
5. Read the question from the bottom half of the flap to your partner. See if their answer matches the answer you wrote above!
6. Reverse roles with your partner and keep playing!

FURTHER EXPLORATION
- Brainstorm categories as a class, before selecting trivia questions.
- Turn the students’ questions into a Jeopardy trivia game.

Directions Fold one corner diagonally to the other corner, making a triangle. Open up the paper. Fold the other corners of the paper together. Open up the paper and the folds should make an X with a center point. Fold each of the corners to the center point, making a square. Turn the paper over so the folded sides are facing down. Once again, take each corner and fold it up to the center of the paper, making an even smaller square. Now reinforce the folds by folding the square in half both vertically and horizontally. Follow the instructions on the previous page and you are ready to play!
VIRGINIA NATIVE AMERICAN MAP: WHAT DID THEY GROW?
GRADES 4-5 • HISTORY

DESCRIPTION
Using the map provided, students will label where the different Virginia Native Americans lived as well as the food they grew.

OBJECTIVES
- Students will identify and label the three main Virginia Indian groups on a map.
- Students will identify the types of food Virginia Indians grew and consumed.

SOLs
History VS.1, VS.2, USI.1, USI.2

BACKGROUND
For centuries, Virginian Native Americans lived off of the land, producing their own food, culture, and traditions. Native Americans were rich in tradition, culture and agriculture. When European settlers arrived in Virginia, they learned from Native Americans how to grow food and use the wild around them. Thomas Jefferson and others, such as John Smith, kept detailed notes about local Native American tribes and the physical characteristics of Virginia. Thomas Jefferson’s map from Notes on Virginia visually describes the region. The rest of his book talks about the people and resources of Virginia; for example, Chapter (or “Query,” as Jefferson put it) 8 is “Population” and Query 6 is “Productions mineral, vegetable and animal.”

DISCUSSION
Before Viewing Show students a contemporary map of Virginia and have them locate where they live. When students enter the exhibit, show them Thomas Jefferson’s map and see if they can still locate where they are.

After Viewing What is different about the two maps? Explain to students that the purpose of Jefferson’s map was to show Europeans were different Indian tribes were located and tell them about the resources of the region.

CREATE
1. Introduce the activity by pulling up [http://www.virginiaplaces.org/nativeamerican/indlandclaims.html](http://www.virginiaplaces.org/nativeamerican/indlandclaims.html) which provides an overview of the Virginia Native American tribes and their trade routes.
2. Use the map on page 17 to label the three Virginia Native American groups: Algonquian, Siouan, and Iroquois.
3. Visit [https://www.warpaths2peacepipes.com/indian-tribes/indian-tribes-list.htm](https://www.warpaths2peacepipes.com/indian-tribes/indian-tribes-list.htm) to see a list of Native American tribes. Click on the Virginia tribes and read about them. For each group, list the plants they grew for food on your map.

FURTHER EXPLORATION
- Combine with “Colonial Dinner Menu” activity (p., having students create a menu for a Native American meal.
- Draw a picture of what you think a Native American garden would look like.

Sources
Map of Virginia
DESCRIPTION
In this activity, students learn the historical significance of hot houses and greenhouses and create their own classroom greenhouse.

OBJECTIVES
- Students will be able to explain the purpose of a hothouse and how it relates to greenhouses.
- Students will be able to explain how a greenhouse operates.

SOLs
Science 4.1, 4.4, 5.1, 6.1, LS.1, LS.6
History VS.1, USI.1

BACKGROUND
In 1767, John Giles published Ananas: or Treatise on the Pineapple, the first full-length book on pineapples. The work discussed how to grow, care for, and preserve pineapples. At the time, pineapples were rare in the Old World. The climates of northern areas, like Europe and the North American coast, were too severe to grow pineapples and other tropical fruits. As a result, Giles and other gardeners sought a way to grow the pineapple in colder areas. The result was the hothouse, predecessor to the modern-day greenhouse. Hothouses used artificial heat sources—such as fires or glass containers covered in manure—to transmit heat onto tropical plants that require warmth to grow. Thanks to Giles’ book, as well as the development of technology that made hothouses cheaper and easier to use, gardeners could grow pineapples in Europe by the late 18th century. Although the first hothouse was built in 1712, only one person is known to have successfully grown a pineapple in England prior to Ananas. Eventually, gardeners stopped using hothouses altogether. They opted to use the heat of the sun to grow their plants in what we know today as the greenhouse.

DISCUSSION
Before Viewing Discuss with students how greenhouses and hot-houses trap heat to warm plants. Potential discussion questions include: How do greenhouses help gardeners and farmers grow a wider range of crops? What types of plants would grow in a greenhouse in the winter versus the summer?

After Viewing Ask students the same questions as before. Have their answers changed now that they saw the exhibit and learned more about hot-houses and greenhouses? What fruits shown in the exhibit needed to be grown in hothouses in Europe?

MATERIALS
Large transparent plastic bin with clamp-on lid
Electric drill
Seeds, soil, and a pot

CREATE
1. Prepare the plastic bin by drilling several small holes on the lid with the electric drill.
2. Continue to drill at least ten holes on each side of the bin, including the bottom, for ventilation. Spread the holes out so they are not clumped together (this may need to be done at home rather than in the classroom).
3. Flip the bin over so that the lid is on the ground. Detach the lid from the bin. Place the plants on the lid and reattach the bin.
4. Place outside and watch your classroom garden grow!

FURTHER EXPLORATION
- Watch this tutorial before starting your greenhouse: https://www.youtube.com/watch?v=Y35PVCHVQcM
- Encourage students to create their own gardens at home. https://www.smartgardener.com has a digital layout plan students can access at home, with tips on what vegetables to plant in different conditions.

Sources
DESCRIPTION
Students will learn about and create traditional Native American corn husk toys.

OBJECTIVES
- Students will learn about corn husk dolls and how they contributed to the development of relationships between Natives and the colonists.

SOLs
- History VS.4, USI.3, USI.4, USI.5
- Art 4.11, 4.12, 5.11, 6.8, 6.10, 7.11, 8.1

BACKGROUND
Corn husk dolls, made from leftover husks, were popular in Algonquin tribes. Adults also used the dolls in religious ceremonies. As with other components of Native American life, the dolls were sustainable; as children grew older and stopped playing with their doll, the corn husks would disintegrate and not create waste. Additionally, the dolls make use of the corn husk—a typically unusable part of the plant. Native American children would teach colonial children how to make these dolls, sharing their culture with European settlers. Despite a language barrier, the dolls served as a point of connection and mutual understanding between Natives and the European foreigners.

DISCUSSION
Before Viewing Facilitate a discussion—what do you think Native American children played with? How may this have changed when the colonists arrived in Virginia?

After Viewing Aside from maize, which of the crops shown in the exhibit could be transformed into a children’s toy?

MATERIALS
Corn (maize) husks
Thin string or twine
Scissors

CREATE
Teacher Prep
1. Collect corn husks. They can be purchased at a craft store, or by contacting your local grocery stores produce department. Ask if they can save discarded husks for you.
2. Lay the husks out in the sun to dry. Once dry, they will keep for years.
3. Before using, soak the husks in water until they are pliable and let dry until damp.

Building the dolls
1. Place four husks as shown.
2. Using a small piece of string, tie the husks together about an inch or two inches down from the top.
3. Trim the edges of the husks above the string so that they are rounded.
4. Flip the husks upside down. Pull each of the four husks down over the trimmed edges.

5. Tie another piece of string about an inch and a half down from the top, as shown. This will be the head of the doll.

6. Take another husk, flatten it, and roll into a tight cylinder. Tie both ends with string. This will be the arms.

7. Place the arms through the long husks, directly below the head.

8. Tie the area below the arms with string, creating the torso and waist.

9. Take four or five flattened husks and form around the body. Tie the top with a string, forming the skirt.

10. If desired, twist the skirt into two sections and tie every few inches down. This will create legs.

11. Use small scraps of husk and tie over the areas with string to hide it. The doll can be dressed with scraps of fabric, if desired.

**FURTHER EXPLORATION**

- Split students into small groups and have them brainstorm how to make the other crops in the exhibit into children’s toys.

*Lesson adapted from [https://www.teachersfirst.com](https://www.teachersfirst.com)*

**Sources**

Corn Husk Doll Instructions

1. Place four corn husks as shown.

2. Using a small piece of string, tie the husks together about an inch to two inches down from the top.

3. Trim the edges of the husks above the string so that they are rounded.

4. Flip the husks upside down. Pull each of the four husks down over the trimmed edges.

5. Tie another piece of string about an inch and a half down from the top, as shown. This will be the head of the doll.

6. Take another husk, flatten it, and roll into a tight cylinder. Tie both ends with string. This will be the arms.

7. Place the arms through the long husks, directly below the head.

8. Tie the area below the arms with string, creating the torso and waist.

9. Take four or five flattened husks and form around the body. Tie the top with a string, forming the skirt.

10. If desired, twist the skirt into two sections and tie every few inches down. This will create legs.

11. Use small scraps of husk and tie over the areas with string to hide it. The doll can be dressed with scraps of fabric, if desired.
DRAWING FROM OBSERVATION:
BOTANICAL ILLUSTRATION COLLABORATION
GRADERS 4-8 • ART, SCIENCE, ENGLISH

DESCRIPTION
Students will collaborate to create a botanical illustration of a plant of their choice.

OBJECTIVES
- Students will understand the difference between botanical art and botanical illustration
- Students will explore how artists and scientists collaborate.
- Students will learn about local plant species.

SOLs
- Art 4.5, 4.9, 4.13, 4.15, 5.5, 5.7, 5.13, 5.15, 6.5, 6.7, 6.11, 6.12, 7.8, 8.10
- Science 4.4, L.4
- English 4.1, 4.7, 4.9, 5.1, 5.7, 6.1

BACKGROUND
Although the terms are often used interchangeably, there is a difference between botanical art and botanical illustration. Botanical illustrators focus on recording plants for scientific accuracy. Botanical art can be scientifically accurate, but the botanical artist places emphasis on aesthetic value and artistic quality and focuses less on accuracy. Artists who label themselves “flower painters” do not care about accuracy; they want to create a beautiful image. Still life painters, abstract painters, and impressionist painters all fall under the “botanical artist” category. In the exhibit, Maria Sibylla Merian’s pineapple is an example of botanical art whereas John Abercrombie’s pineapple is an example of botanical illustration. To tell the difference, the viewer must pay attention to the artist’s intent: is it to inform, describe, persuade or entertain?

In the early days of books and manuscripts, creating an illustrated book was a collaborative process. Artists would be employed to create the original drawings, engravers would turn the drawing into a reproducible print, another artist would go back in and color the print, and a scientist would often write about the plant. Artists—especially female artists—were often not given credit for their role in the printing process. For example, Hugh Ronalds’ apples in the exhibit were all illustrated by his daughter, Betsy, although she is not credited for her contribution.

DISCUSSION

Before Viewing Explain the differences between botanical art and botanical illustration. Discuss how both of these types of artists might have contributed to their societies.

After Viewing Have students recall the various types of artwork in the exhibit. Which were examples of botanical art and which were botanical illustration? Is it possible to tell the difference without knowing the work’s context?

CREATE
1. Divide into groups of three. In each group, select an “artist,” a “scientist,” and a “writer”. The artist is in charge of illustrating the plant. The scientist is in charge of identifying and researching the plant. The writer is in charge of taking notes and writing the description of the plant.
2. As a group, go outside and select a plant from your school garden or other plant-rich area. The scientist should take notes of its color, shape, size, texture, etc. and photograph the plant, if possible.
3. The artist will draw the plant as accurately as possible. The artist should include various viewpoints of the plant—above, front, back, etc. Make sure to include the plant’s common name underneath your finished drawings.

4. The scientist and writer will research the plant and find both its common name and scientific name, as well as its classification.

5. The writer will communicate both the scientific and artistic information on a description sheet separate from the artwork.

FURTHER EXPLORATION

- Select plants and crops from the exhibit and create a still life for students to practice observational drawing and botanical art.
- Create two drawings and writings: one from a photograph, and one in the field. Compare and contrast the differences between the two.
- Research the selected contemporary botanical artists on [www.botanicalartandartists.com](http://www.botanicalartandartists.com). Discuss how modern technology has changed the way artists look at and use plants in their work.

Sources

DESCRIPTION
Students will create a bar and circle graph illustrating historical data on food crops from seventeenth century Jamestown.

OBJECTIVES
- Students will use graphing skills to learn how food was distributed throughout the Jamestown colony.

SOLs
- Math 4.4, 5.4, 5.16, 6.14, 8.13
- History VS.1, VS.4, USI.1, USI.2, USI.5, CE.11

BACKGROUND
For food, the Jamestown colonists relied mainly on imports from England. Although they supplemented their diets with native Virginia plants, seeds, and meats, they did not typically use family gardens as a source of food. Farmers, instead, focused their attention on cultivating tobacco. Having a variety of healthy food to eat was the least of their worries—they just wanted to get rich off of tobacco! By 1637, the need for food was so bad that England required colonists growing tobacco to also grow at least two acres of maize.

The Virtual Virginia database shows each household’s food resources during the 1624/1625 census. The spreadsheets illustrate how little food, other than corn, families had during the early days of the colony.

DISCUSSION

Before Viewing
What types of food do you think the Jamestown settlers grew? Write down students’ answers before taking them to view the exhibit.

After Viewing
After returning from the exhibit, ask again, what types of food settler’s grew. Why did they grow maize and tobacco more than other crops? Explain how supply and demand determines the worth of a crop.

CREATE
1. Visit http://www.virtualjamestown.org/Muster/food24.html. (To access this page from the Virtual Jamestown homepage, hover the mouse over “Resources” and click “Public Records.” Choose “Censuses” from the list, then click “1624/5 Muster Records.” From there, choose “Food Muster.”)
2. Explore the datasets available. By clicking on a location in the right column you will pull up a spreadsheet with family names and a list of the crops each family in that location grew.
3. Create a bar graph. Label the graph with the name of the location you chose.
4. Along the x-axis, label the various types of food listed in the chart. Along the y-axis, choose an appropriate scale to compare the types of food.
5. Add each column together to come up with the sum of each crop produced. Fill in your graph.
6. Optional: Create a box and whisker plot comparing the amount of one crop across several different locations.

FURTHER EXPLORATION
- Create different types of graphs using the other muster searches on the Virtual Jamestown website. For example, rather than clicking on location, you can click on the crop of interest and see all families that grew that crop.
- Combine with “Colonial Dinner Menu” activity (p. ). To make the project more challenging, have students create a meal using only the foods found on the spreadsheet.

Sources
DESCRIPTION
Students will create a 3D model of one of the plants shown in the exhibit.

OBJECTIVES
- Students will understand the botanical illustrator’s methods of scientific inquiry and artistic process.
- Students will identify the key parts of a plant, including its cellular functions.

SOLs
Science 4.4, 4.5, LS.2, LS.4
Math 8.9
Art 4.9, 5.10, 6.8, 7.9, 8.10, 8.11

BACKGROUND
Botanical illustrators draw plants for scientific inquiry. They strive to make accurate drawings with an emphasis on plant anatomy. Botanical artists, on the other hand, tend to focus more on beauty and less on scientific accuracy, although the two genres can overlap. Henri Louis Duhamel’s book, *Traites des Arbres Fruitiers*, is a great example of botanical illustration. Although he did not illustrate the book himself, Duhamel employed several artists to make scientifically accurate drawings of the 16 types of plants he wrote about. According to *An Oak Spring Flora*, Duhamel aims to dismiss “contemporary opinion that fruit could adversely affect health, and presents the work as a practical manual intended to aid the spread of both the cultivation and consumption of fruit.” The artwork from Hugh Ronalds, John Abercrombie, and Robert Thornton’s books are also examples of botanical illustration.

DISCUSSION

**Before Viewing** Talk about the difference between botanical art and botanical illustration. What are the uses for botanical illustration? How can a drawing help us understand plants?

**After Viewing** Which of the art works in the exhibit are examples of botanical illustration? What do you think the artworks would look like if they were made into 3D models?

CREATE
1. Choose a plant from the exhibit.
2. Research the plant looking for the following information: physical properties, cell structure, etc. (teachers, adapt this list to fit your science curriculum).
3. Create a small sketch of the plant, labeling key elements and other important information. Make sure to draw your plant using various viewpoints (top, bottom, front, side, close up of cell, etc.). Refer to Duhamel’s peaches for an example.
4. Make a 3D model of the plant, using paper, paper mache, clay, or a medium of your choice.

FURTHER EXPLORATION
- Make a 3D version of one of the artworks in the exhibit.
- Use your sculpture to teach the rest of the class about the plant you chose.

Sources
DESCRIPTION
Students will create a dinner menu based on the types of food available to 17th century Virginia settlers.

OBJECTIVES
- Students will learn about the types of food available to 17th century Virginia colonists.

SOLs
History VS.2, VS.4, USI.3, USI.4, USI.5, WG.3
English 5.7, 8.2

BACKGROUND
Food in 17th century Virginia was very different from the food we grow and eat today. Settlers brought seeds over to the New World with them and began to grow some of the foods they were used to in Europe, such as apples and peaches. They also received a portion of their food directly from England—items like sugar, flour, salt, and spices. Settlers adapted their eating habits and adopted some of the fruits and vegetables, domesticated by Native Americans as well as the foods available to them in the wild. Maize was central to culinary dishes. Colonists used it as a substitute for wheat and other English staples. Virginians ate the maize off the cob, ground it into meal for bread or porridge, and popped maize kernels. Because it was easily grown and stored, maize continued to feed Virginians throughout history, and remains a large agricultural asset in Virginia today.

DISCUSSION
Before Viewing What is your favorite fruit? What is your favorite vegetable? Do you think you could grow that fruit or vegetable in Virginia if you were an English colonist?

After Viewing What would your dinner menu look like if you could only eat the crops in the exhibit? It would be difficult to make a healthy meal! Settlers had a little variety in their food, but they were limited to the food they could buy from other colonies and England, pick from the wild, or grow themselves. Discuss how colonists obtained different foods. For the crops in the exhibit, talk about their origins and how they got to Virginia.

CREATE
1. Read the list of food available in Virginia in the 1600s (page 28) or research the types of food available during the era.
2. Using only the foods shown on the list, create a dinner menu for a colonial family. Items on the list can be combined or separated to create something new. For inspiration, research 17th century recipes at http://www.godecookery.com/engrec/engrec.html or http://www.townsend.us/blog/topic/savoring/17th-century-cooking/.
3. Share your menu with the rest of the class.
4. Optional class discussion questions: Whose dinner would you want to attend the most? What type of foods would you miss the most if you were a colonist?

FURTHER EXPLORATION
- Create a menu for the Powhatan Indians or another native group living in the region.

Sources
# Food Resources in the Early Colonial Years

## Imported from England

- Sugar
- Molasses
- Salt
- Alcohol
- Dried beef
- Dried pork
- Pepper
- Nutmeg
- Cattle
- Hogs
- Sheep
- Goats
- Poultry
- Honey
- Lime juice
- Oil
- Butter
- Ginger
- Cloves
- Currants
- Raisins
- Prunes
- Vinegar
- Lard
- Apricots
- Mellicotons
- Quinces
- Flour
- Meal

## Native to Europe/Asia, but brought to be grown Virginia

- Peaches
- Apples
- Pears
- Carrots
- Parsnips
- Turnips
- Artichokes
- Cucumbers
- Radishes
- Cauliflower
- Cabbage
- Colewort
- Lettuce
- Spinach
- Asparagus
- Cress
- Wheat

## Virginia Resources (Grown prior to European Arrival)

- Fish
- Shellfish
- Birds
- Corn
- Beans
- Peas
- Squashes
- Melons
- Wild onions
- Sweet potatoes
- Turkey
- Possum
- Raccoon
- Rabbit
- Turtles
- Strawberries
- Blueberries
- Mulberries
- Wild grains
- Acorns
- Chestnuts
- Sunflower seeds
- Basil
- Rosemary
- Dill
- Cumin
- Anise
- Spearmint
DESCRIPTION
Students will conduct an experiment to determine the effect companion planting has on plant growth and production.

OBJECTIVES
- Students will be able to identify companion plants, including the “Three Sisters.”

SOLs
- History VS.2, USI.3
- Science 4.1, 4.4, 4.5, 5.1, LS.1, LS.6
- Math 4.7

BACKGROUND
Some plants grow to be bigger, stronger, and healthier when planted together. Others, when put next to each other in the garden, can create a poor harvest. Strategically placing plants together so that they can help each other grow is called companion planting. Native American tribes such as the Iroquois utilized companion planting for over 300 years before European settlers reached the shores of Virginia. The Iroquois planted the “sister crops” of maize, beans, and squash. Iroquois legend claims that the “Great Spirit” gave the three plants as a gift to the Iroquois. They were sisters who were inseparable, destined to stay together for eternity.

The sisters support each other in the following ways:
- Maize supports bean growth, giving the plant a high and sturdy structure to climb.
- Beans are “nitrogen fixing”—they have a bacteria in their root system that enables the plant to pull nitrogen from the air and converts the nitrogen to a useable form. When the plant dies, the nitrogen is released, fertilizing the soil for the benefit of all three crops.
- Beans interlock the three plants by growing between the roots of squash and scaling up the maize stalks.
- The leaves of squash are large, which shades the soil and keeps the plants moist, cool, and prevents weeds. Squash leaves also have spines that deter animals and other pests.

Just as some plants grow well together, some affect each other negatively. Examples of incompatible plants include potatoes and sunflowers as well as onions and beans.

DISCUSSION
Before Viewing Lead students in a discussion about the resources Native Americans had prior to European settlement. What were some of the ways they lived and farmed sustainably? When viewing the exhibit, have students pay attention to the crops the Iroquois could have planted.

After Viewing Have students research sister crops, including the fourth, lesser known “sister”, the sunflower. How did these four crops support the Iroquois? Explain that there are other companion crops that can grow in Virginia gardens besides the “Three Sisters.”

CREATE
1. Conduct an experiment to see the effect companion plants have on each other's growth and health. Choose one of the following variables:
   - Closeness of different plants. Do crops that are closer to their companion grow any taller or produce more compared to a crop planted alone?
Type of plant. Which plants grow better together? Can you figure out which plants are companions based on their growth? See https://www.almanac.com/content/companion-planting-guide for a list of companion plants.

Check on your garden at least once a week to take measurements and observations.

FURTHER EXPLORATION

Read about the “Three Sisters” Legend. A concise story, along with detailed instructions on how to create a sister plant garden can be found on the Cornell University website:
http://gardening.cals.cornell.edu/lessons/curricula/the-three-sisters-exploring-an-iroquois-garden/a-legend/

Sources


DESCRIPTION
In this science activity, students will learn how to press and preserve flowers and other leafy plants.

OBJECTIVES
- Students will be able to explain the steps of pressing flowers.
- Students will learn the history of pressing flowers.

SOLs
Science 4.1, 4.4, 5.1, LS.1, LS.4

BACKGROUND
People have been pressing flowers since prehistoric times. Archaeologists have discovered the remains of pressed flowers on the walls of caves as well as in the tombs of ancient Egyptian royalty.

In the early 16th century, Oshibana, a Japanese art that uses pressed flowers to form images, became popular. Oshibana revived the ancient art of flower pressing. Thanks to global trade, Oshibana-type collages became popular throughout the Americas, Europe, and Asia. Soon after, the Scientific Revolution instigated a desire to document the natural world. People began to press plants into books to preserve and document them. People kept pressed flower scrapbooks for sentimental reasons as well.

Pressed flowers often look similar to botanical art. Sometimes, publishers would even omit drawings from their herbariums and replace the art with pressed specimens. The result looked like an illustration, but was really a dried plant.

DISCUSSION

Before Viewing How can you preserve plants and flowers? Why would someone want to preserve a flower?

After Viewing Which of the plants in the exhibit do you think would be easy to press? Which plants would be more difficult and why?

MATERIALS
Plant Press
Empty book with blank pages
Blotting paper

List of plants best suited for pressing (see page 33) Scissors

CREATE
Research (optional)
1. Divide into small groups. Assign each group a section of the “List of Plants” on page 33.
2. Research the assigned plants using reference books and/or the internet, gathering pictures for each plant to use as a reference when picking.

Picking
1. Only pick flowers that are not wet from dew or rain. The best time of day to pick is late morning or early afternoon after dew has dried but the sun has not yet wilted flowers.
2. Try to conserve the plants. Only pick as much as you need!
3. The sooner you can press the plants after picking, the better.
Pressing

1. Follow the instructions listed on the sheet included with the press.
2. When specimens are dry, label them accordingly using their common and scientific name.
3. Use forceps if you need to move the specimens around—they can be delicate!

FURTHER EXPLORATION

- Turn the pressed flowers into a bookmark or picture frame.
- Examine the dried specimens underneath a microscope.

Sources


**List of Plants Best Suited for Pressing**

### Flowers

<table>
<thead>
<tr>
<th>Plant</th>
<th>Plant</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allium</td>
<td>Delphinium</td>
<td>Montbretia</td>
</tr>
<tr>
<td>Anthemis</td>
<td>Flowering cherry</td>
<td>Pansy</td>
</tr>
<tr>
<td>Astrantia</td>
<td>Golden Rod</td>
<td>Poppy</td>
</tr>
<tr>
<td>Auricula</td>
<td>Goose Grass</td>
<td>Polyanthus</td>
</tr>
<tr>
<td>Avens</td>
<td>Ground Elder</td>
<td>Potentilla</td>
</tr>
<tr>
<td>Borage</td>
<td>Heather</td>
<td>Rose petals</td>
</tr>
<tr>
<td>Buttercup</td>
<td>Heuchera</td>
<td>Rosebay willowherb</td>
</tr>
<tr>
<td>Celandine</td>
<td>Sanguinea</td>
<td>Saxifrage</td>
</tr>
<tr>
<td>Clematis</td>
<td>Honeysuckle</td>
<td>Scabious</td>
</tr>
<tr>
<td>Clover</td>
<td>Hydrangea</td>
<td>Sycamore flowers</td>
</tr>
<tr>
<td>Coreopsis</td>
<td>Laburnum</td>
<td>Tobacco plant</td>
</tr>
<tr>
<td>Cosmos</td>
<td>Lady’s Bedstraw</td>
<td>Tulip</td>
</tr>
<tr>
<td>Cow Parsley</td>
<td>Lilac</td>
<td>Vetch</td>
</tr>
<tr>
<td>Daffodil</td>
<td>Marigold</td>
<td>Wild marjoram</td>
</tr>
<tr>
<td>Daisy</td>
<td>Mimosa</td>
<td></td>
</tr>
</tbody>
</table>

### Grasses and Seedheads

<table>
<thead>
<tr>
<th>Plant</th>
<th>Plant</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astilbe</td>
<td>Meadow oat-grass</td>
<td>Sea carrot</td>
</tr>
<tr>
<td>Barren Brome</td>
<td>Mousetail</td>
<td>Trembling Grass</td>
</tr>
<tr>
<td>Bellflower</td>
<td>Pond Grass</td>
<td>Wheat</td>
</tr>
<tr>
<td>Columbine</td>
<td>Rosehead</td>
<td>Wild barely</td>
</tr>
<tr>
<td>Mallow</td>
<td>Rye</td>
<td>Yarrow</td>
</tr>
</tbody>
</table>

### Ferns

<table>
<thead>
<tr>
<th>Plant</th>
<th>Plant</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asparagus Fern</td>
<td>Hard Fern</td>
<td>Mountain Buckler Fern</td>
</tr>
<tr>
<td>Beech Fern</td>
<td>Holly Fern</td>
<td>Spleenwort</td>
</tr>
<tr>
<td>Bracken</td>
<td>Hart’s Tongue</td>
<td>Sweet Cicely</td>
</tr>
<tr>
<td>Common Horsetail</td>
<td>Leather Fern</td>
<td></td>
</tr>
<tr>
<td>Crested buckler Fern</td>
<td>Ostrich Fern</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polypody</td>
<td></td>
</tr>
</tbody>
</table>
### Leaves and Bark

- Abutilon
- Aspen (silver)
- Ash
- Beech
- Blackberry
- Centaurea Gymnocarpa
- Cineraria Maritima Diamond
- Dead-nettle
- Earth Nut
- Echinops
- Eryngium
- Hellebore
- Holly
- Wild Geranium
- Ivy
- Magnolia
- Maples
- Oaks
- Periwinkle
- Poplar
- Prunus
- Senecio
- Strawberry
- Viburnum
- Virginia Creeper
- Wood Spurge

### Other

- Seaweed
- Mosses
- Toadstools
- Litchen
- Mushrooms
- Fruit and Vegetables

### Add your own. What worked best for you? Which plants were more difficult to press?

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25
THORNTON’S PICTURESQUE FLORA
GRADES 6-8 • ART

DESCRIPTION
Students will create a work of art inspired by Thornton’s ‘picturesque flora.’

OBJECTIVES
- Students will learn about Thornton and the significance of his book of flora in botanical art.
- Students will learn how to merge observational drawing with imaginative, expressive drawing

SOLs
Art 6.1, 6.5, 6.6, 6.7, 6.9, 7.1, 7.6, 7.8, 7.10, 8.8, 8.9, 8.20

BACKGROUND
Robert Thornton authored the New Illustration of the Sexual System of Carolus von Linnaeus, which was published in the early 19th century. He employed some of the most well-known botanical illustrators at the time to create his masterpiece, and even drew some of the images himself. The book is well known because, in addition to the detail and complexity of the images, Thornton paired botanical illustration, a more scientific discipline, with non-observational painting. The book’s famous third section, “The Temple of Flora,” place the flowers in a picturesque background. Picturesque is a term that refers to an ideal, overly aestheticized landscape that has elements of both beauty and wildness. It is a cross between pure beauty and the sublime and in practice and typically results in a darker image softened by the select use of lighter colors. Thornton’s art is picturesque because each flower appears in an altered version of its natural setting.

DISCUSSION

Before Viewing
Discuss the differences between botanical art and botanical illustration (refer to the “Drawing from Observation: Botanical Illustration Collaboration” activity on page 23 for an explanation). When viewing the exhibit, ask students to note whether the Thornton in the exhibit is botanical art or botanical illustration. Can the same book have both types of art in it? (Answer: yes!).

After Viewing
Show students some of the other images in New Illustration of the Sexual System of Carolus von Linnaeus, particularly from “The Temple of Flora” (Search for “Temple of Flora” on Google Arts and Culture https://artsandculture.google.com/ ). Make a chart comparing Thornton’s sunflower with another, more picturesque, image. Define picturesque art, showing examples from other artists.

CREATE
1. Choose a flower or plant to observe, either through online images or in person.
2. Make a series of sketches that accurately describe your selected flower. To determine an appropriate background, try placing the flower in various natural settings. Try to mimic different elements of the picturesque paintings.
3. Once you are happy with your sketch, draw it on a larger sheet of paper. Add detail and color.

FURTHER EXPLORATION
- Facilitate a classroom critique, comparing elements from students’ work to Thornton’s.

Sources
BOTANICAL LITHOGRAPH PRINT
GRADES 7-8 • ART, ENGLISH

DESCRIPTION
In this hands-on printmaking activity, students will learn the methods of nineteenth century engravers by creating a botanical lithographic print using household materials.

OBJECTIVES
- Students will be able to list the different types of early printmaking.
- Students will learn how to create a lithographic print.

SOLs
Art 7.4, 7.8, 7.10, 7.1, 8.1, 8.13, 8.20
English 8.1, 8.2

BACKGROUND
The Chinese were the first to invent the relief print—also known as the woodblock method—as early as the 6th century CE. Slowly, Chinese relief printing traveled west and made the woodblock print a standard in 15th century Europe. The first herbarials, or books on herbs for medicinal and culinary uses, included small black and white images created by woodblock prints. These images were minimally designed and often lacked detail and accuracy. Scholars believe that these prints were typically distorted because printing was still in its early stages and artists based their illustrations off of previous woodcuts completed by other artists. The result was distorted, unrealistic looking images.

By the 1600s, copperplate engraving replaced woodcuts and set a higher standard for engravers across Europe. Copperplate engraving allowed artists to create a more detailed and realistic looking image. However, this process was long and required skilled workers to create good prints. When a German engraver invented lithography in the 19th century—a cheaper and easier printing process—the new method took printing presses across Europe by storm. Lithography was a printing method in which a thick, ink-attracting material was drawn onto large slabs of limestone or metal. Some of these prints were hand-colored with watercolor paint or gouache after they were printed. Other works, such as John Abercrombie's pineapple in The Hot-House Gardener on the General Culture of the Pineapple, were printed using colored ink.

DISCUSSION

Before Viewing Explain the history of prints and different printmaking techniques to students.

After Viewing Which of the prints in the show do you think are lithographs? How can you tell?

MATERIALS
*You will need a press to complete this activity

2 8.5x11 sheets of plexiglass
Sheet of heavy weight aluminum foil, slightly smaller than plexiglass (unwrinkled)
8.5x11 or larger piece of printmaking paper
Masking tape
1200 grit sandpaper
Litho crayon

¼ cup White vinegar
2 Tablespoons vegetable oil
2 liter soft drink (any kind)
Damp sponge
Disposable gloves
Roll of paper towels
Etching ink and brayer
CREATE

Research
1. Divide the class into three groups. Research the three different early printmaking methods: woodblock engraving, copper engraving, and lithography.
2. Groups present their findings to the class.

Preparation
1. Working individually, choose a plant from the exhibit.
2. Gather reference images, and sketch the selected plant from different angles, showing the different parts of each plant. Once you are happy with the sketch, set aside and you are ready to begin printmaking!

Printing
1. Put on disposable gloves to protect the foil from the oils in your hands.
2. Tape the sheet of foil to the plexiglass, ensuring there are no wrinkles or creases in the foil (any wrinkle will show when printed). This will be your plate.
3. Lightly sand the foil with sandpaper, working in small circles.
4. Wipe the foil with a paper towel dipped in vinegar to remove any residue left from sanding.
5. Draw image on your plate with the litho crayon. Be sure to plan first--you cannot erase once you put down the crayon!
6. Over a sink or empty bucket, pour the soft drink over the image for at least five seconds, ensuring that the entire image is exposed to the liquid. The carbonation will etch the surface of the image!
7. Dab your plate with a dry paper towel until it is mostly dry.
8. Pour the oil over your plate and rub clean with the damp sponge. The crayon should disappear from the surface of the plate.
4. Dampen the plate by squeezing clean water onto its surface with the sponge.
5. Squeeze out a quarter size drop of ink onto the second sheet of plexiglass (you can use another smooth material, if desired).
6. Roll and cut the ink using a piece of cardboard and you brayer. Cut the ink by repeating short strokes through the center of the pile, until it is malleable. Take the brayer and roll out the ink in different directions until it is thin and distributed evenly (if the ink is not thin enough, your image will come out too dark).
7. Using the brayer, transfer a small amount of the ink onto your plate, rolling it in different directions until the lines of your image are visible. Again, if you use too much ink, the image will turn out blurred and dark. There is no need to ink the parts of the plate that do not have your image over it.
8. Continue to dampen the plate with water in between layers of ink to ensure it does not dry out.
9. Place your plate on a printing press, image size up. Place a damp sheet of printing paper over the plate. Put the felt down, and slowly crank the press, using an even speed. When through the roller, lift the felt.
10. Slowly peel back the paper, starting at the corner. Place your finished print on a drying rack.
11. If you aren’t happy with your results, re-ink the plate and try again!

FURTHER EXPLORATION
- Turn the pressed flowers into a bookmark or picture frame.
- Examine the dried specimens underneath a microscope.

Sources
COLONIAL CENTERPIECES  
ART, HISTORY

DESCRIPTION
In this multidisciplinary project, students will research colonial dinner table centerpieces to construct their own centerpiece.

OBJECTIVES
- Through research and application, students will learn the meaning behind the fruits and vegetables used by wealthy families in their table centerpieces.

SOLs
- **Art** AI.2, AI.6, AI.16, AII.3, AIII.12
- **History** WHII.1

BACKGROUND
Wealthy colonists held dinner parties to entertain their colleagues, neighbors, and friends. Creative displays of food, were the responsibility of the woman of the house. Table arrangements were a way for her to demonstrate her family's wealth and her own personality. Hostesses would compete with one another, attempting to create the largest, most impressive tables displays and centerpieces. Pineapples were commonly used in these displays. The pineapple represented wealth and hospitality because it was so rare and difficult to obtain. When a pineapple appeared at the dinner table, the guests would know they were appreciated. Other fruits, such as grapes, apples, peaches, and pears also made an appearance within the centerpieces. Flowers, pine needles, and laurel branches would accompany the pyramid of fruit.

DISCUSSION

Before Viewing  Provide students with the background information on colonial centerpieces and dinner parties.

After Viewing  How do the fruits used in centerpieces connect with the other plants in the exhibit?

MATERIALS  Use clay, plants, found objects, or another sculptable material to create a three-dimensional centerpiece.

CREATE
1. In a journal, research the items commonly included in colonial centerpieces and what they represent.
2. Sketch a model for your sculpture. Show all views, including the front, back, sides, and top of your sculpture.
3. Using hand-building techniques, create a three-dimensional sculpture of your centerpiece design.
4. Have students present their final product to the class, encouraging them to discuss any social or cultural symbols that were used in their centerpiece.

FURTHER EXPLORATION
- Create a colonial centerpiece still life after having students practice drawing the various fruits and flowers.
- Explore how the pineapple historically and presently is still used as a symbol in hospitality -- in logos, architecture, and elsewhere. For example:
  - In Dunmore Park, Scotland, a pineapple structure sits on top of a garden pavilion erected in 1761 by John Murray, the 4th Earl of Dunmore who went on to become the last Colonial Governor of Virginia.
  - The pineapple appears prominently in Colonial Williamsburg Christmas decorations, ceramics, and art.

Sources
DESCRIPTION
Students will create a map for a mock marketing campaign either promoting or discouraging European settlement in Virginia.

OBJECTIVES
- Students will learn how to use a map as a tool for persuasion.

SOLs
English 9.1, 9.2, 10.2, 11.2, 12.2
History WHII.1, WHII.1, WG.1, WG.2, VUS.2, GOVT.12
Art AI.17, AIII.12

BACKGROUND
Maps are an important tool for communicating places and mapmakers play an important role in selecting how physical places are represented. For example, most of the maps you grow up seeing in school is the map created by the Flemish geographer and cartographer Gerardus Mercator in 1569—known as the “Mercator projection.” As with any map that attempts to convert a sphere to a flat surface, the Mercator projection distorts the true size and shape of places. In the Mercator projection, the further the landmass gets from the equator, the more exaggerated in size it appears. Therefore, landmasses along the equator, such as central Africa or South America, appear relatively smaller than landmasses at the poles, such as Antarctica. The countries that appear the largest due to distortion tend to be developed countries whereas some lesser developed countries appear smaller than they actually are. Because of this, the Mercator projection has been accused of reinforcing the notion of western idealism and global power.

Whether intentional or not, every map has the ability to influence perspectives and persuade the viewer. The two maps in the exhibit, created by Jefferson and Jefferys, may not have intentionally made their maps as a persuasive tool. Jefferson’s Map of Virginia in Notes on the States of Virginia describes the various settlements in the area, as well as the major ports, land formations, and bodies of water. He also describes territories using English names instead of their original Native American names. In fact, Notes on the State of Virginia discusses Native American tribes in detail, yet there is no mention of them on the map. By deliberately choosing to describe Virginia through the eyes of the English, Jefferson asserts the English’s perspective over the natives.

Jefferys’ map serves a different function: it encourages world trade. The map leaves out political boundaries and replaces them with the names of major countries. Jefferys chooses to leave out most of Europe and list only the major trade states: England, Spain, France, etc. He also pays more attention to coastal cities, islands, and bodies of water. Words are inscribed across the Atlantic Ocean mentioning rocky areas and places where previous ships wrecked. Based on observation, one can assume that this map is meant as a practical guide.

DISCUSSION
Before Viewing What roles did maps have in the discovery of the New World and the worldwide trade movement that came as a result of this discovery? What other purposes could maps have other than to document a place?
After Viewing Who was Jefferson’s audience? How about Jefferys’? How did their audiences affect their maps? Introduce the idea of maps as a persuasive tool by reading the “background” section aloud to students and comparing a map to a globe.

CREATE

1. Explore the following websites to get a greater understanding on the ways maps can influence people:
   - https://persuasivemaps.library.cornell.edu
   - http://theconversation.com/five-maps-that-will-change-how-you-see-the-world-74967

2. Place yourself in early Virginia. You are a cartographer who wants to create a map that depicts Virginia and its land. However, you must use your map to argue for or against English colonization.
3. Choose your perspective and research the different people groups and physical attributes of early Virginia.
4. Draw your map. Use both pictorial references and geographical description to label the features you feel are most important to your point of view. Alteration: Divide students into small groups to make a collaborative map.
5. Separate into two groups: those who chose to promote colonization in one group and those who discourage it into another group. Present your map to your group, comparing the physical features of your map with the maps of your groupmates.
6. As a class, evaluate the differences between the two types of maps. Discuss: What tools did you use to persuade the viewer of your opinion? Can a map be geographically accurate and still leave out points of view?

FURTHER EXPLORATION

- Use the map your created in a multimodal presentation arguing for or against colonization.
- Read about and view contemporary election maps and the various ways the truth can be represented:
  - https://www.wired.com/story/is-us-leaning-red-or-blue-election-maps/.

Sources
HISTORICAL GARDEN PLAN
ART, SCIENCE

DESCRIPTION
Using photographs and maps of early Virginia plantations and gardens as a reference, students will use digital software to create a garden plan for an uninhabited Virginia location.

OBJECTIVES
- Students will learn about historical and contemporary landscape design.
- Students will identify horticulture related careers.

SOLs
- Art AII.5, AII.13, AII.16, AIII.3
- Science BIO.8

BACKGROUND
When the first settlers arrived on the shores of North America, they had to adapt quickly to an unfamiliar environment and what they considered the harsh conditions of Virginia. Early gardens and landscapes served primarily as a means of taming the land. These “tamed” natural environments protected inhabitants from the environment. Once tobacco took off as a major “cash crop” for the colony, Virginians abandoned their gardens and focused solely on the growth and cultivation of the plant. The colonists began to shift their focus back to recreational gardening when the first slaves and English women arrived in 1619. Flower and vegetable gardens began to appear as large plantations were built in the South. Science and art merged with the creation of these gardens. In order to properly design a fruitful plantation, landscape designers had to determine the richness and type of soil, location of the land in relation to the sun and water sources, and the elevation of the land.

DISCUSSION

Before Viewing
Have students brainstorm the various plant- and art-based careers of the 17th and 18th centuries. Are these careers still relevant to us now?

After Viewing
In addition to the artists hired to draw and paint plants, garden designers were hired to design the layout of gardens and plantations in early Virginia. Today, these designers, who are often also practicing artists, are known as landscape architects. Discuss other jobs related to landscape, garden, and design fields.

CREATE

1. In Google Earth, select an uninhabited piece of land within Virginia.
2. Research the area to determine the location of the land (latitude and longitude), its soil type, climate, and native plants.
3. Open a new document on Adobe Photoshop, CADD, or a digital design program of your choice.
4. Create a bird’s eye view garden map of the land they wish to landscape. Consider adding the following objects: buildings, kitchen gardens, flower gardens, fruit trees, flowering trees, water, and pathways.

FURTHER EXPLORATION

- Visit https://www.monticello.org/site/house-gardens for examples of Thomas Jefferson’s gardens at Monticello.
- Learn more about young people in horticulture careers by reading “The Horticulture Industry’s Age Problem is Bigger Than You Think” at https://www.washingtonpost.com/lifestyle/home/the-horticulture-industries-age-problem-is-bigger-than-you-think/2018/08/05/3ec7d3618-734f-11e8-805c-4b67019fcfe4_story.html?noredirect=on&utm_term=.3ade950a44fc.

Sources
DESIGN A 19TH CENTURY FOOD LABEL

ART

DESCRIPTION
Inspired by J.Pean’s tobacco labels, students will design a unique label for a 19th century product.

OBJECTIVES
- Students will understand how the development of product labels impacted global trade.
- Students will understand how to target consumers through illustration and design.

SOLs
Art AI.5, AI.7, AI.16, AI.17, AII.7, AII.19, AII.21, AIII.8

BACKGROUND
The first known product labels appeared on small medicine bottles around the year 1700. Early labels distinguished different products and brands from one another. Because the process for woodblock printing was costly and time-consuming, most products did not have labels until lithography emerged in the 19th century. Afterwards, labels were cheaper and easier to print and often included elaborative designs, illustration, and color. Sellers soon realized that products with attractive, iconic, and memorable labels sold better than products with simple black and white labels, or no labels at all.

The creation of grocery stores also brought about change in product label design. Previously, consumers bought food from markets with multiple sellers, similar to the contemporary farmers market. Consumers would walk up to a stand and the grocer would fill their orders for them. In rural locations, most towns had a single “general store.” People could not choose between sellers or brands. When the first modern day grocery store, Piggly Wiggly, arrived in 1916, the label design of a product was even more important. Buyers could now choose from a plethora of product brands.

DISCUSSION

Before Viewing What brand labels can you draw from memory? Why do you think you can remember the design of some labels and not others? Have students pay extra attention to the tobacco labels when viewing the exhibit.

After Viewing The imagery used on J.Pean’s tobacco labels targets consumers by including colorful images and scenes of history and daily life. Although tobacco is not a food, sellers used the same marketing and design techniques for food and drink to attract consumers to a product. Have students view the labels again, this time having them note why the designers may have included the imagery shown in each label.

CREATE
1. Choose a 19th century food or beverage product. The product can be from any location.
2. Choose a time and place to sell your product. Research this location to determine what types of images buyers would relate to.
3. Pair off. Pitch your ideas to your partner to get feedback on your design idea.
4. Create your product label using digital design software.
5. Write a reflection or artist statement explaining who your target audience is and why your design caters to their interests.
FURTHER EXPLORATION

- Participate in a mock 19th century world market. Students can either create physical models of their product and label or share their work digitally. Using pretend money, students ‘purchase’ each other’s products based on its use and label design. Afterwords, facilitate a group discussion on why certain products sold better than others.

Sources
DESCRIPTION
In this hands-on printmaking activity, students will learn the methods of 19th century engravers by creating a botanical lithographic print using household materials.

OBJECTIVES
- Students will be able to list the different types of early printmaking.
- Students will learn how to create a lithographic print.

SOLs
Art AI.6, AI.10, AI.12, AII.12
English 9.8, 11.1

BACKGROUND
The Chinese were the first to invent the relief print—also known as the woodblock method—as early as the 6th century CE. Slowly, Chinese relief printing traveled west and made the woodblock print a standard in 15th century Europe. The first herbals, or books on plants, included small black and white images created by woodblock prints. These images were minimally designed and often lacked detail and accuracy. Scholars believe that these prints were typically distorted because printing was still in its early stages and artists based their illustrations off of previous woodcuts completed by other artists. The result was distorted, unrealistic looking images.

By the 1600s, copperplate engraving replaced woodcuts and set a higher standard for engravers across Europe. Copperplate engraving allowed artists to create a more detailed and realistic looking image. However, this process was long and required skilled workers to create good prints. When a German engraver invented lithography in the 19th century—a cheaper and easier printing process—the new method took presses across Europe by storm. Lithography was a printing method in which a thick, ink-attracting material was drawn onto large slabs of limestone or metal. Some of these prints were hand-colored with watercolor paint or gouache after they were printed. Other works, such as John Abercrombie’s pineapple in The Hot-House Gardener on the General Culture of the Pineapple, were printed using colored ink.

DISCUSSION

Before Viewing Explain the different types of printmaking methods used by early artists and engravers.

After Viewing Direct students’ attention to the linework in each of the artworks. Have them guess each work’s medium, based on the linework and use of color. Instruct them to also pay attention to the work’s date, which may play a factor in what type of materials were used to complete the work.

MATERIALS *You will need access to a press in order to complete this activity.

2 8.5x11 sheets of plexiglass
Sheet of heavy weight aluminum foil, slightly smaller than plexiglass (unwrinkled)
8.5x11 or larger piece of printmaking paper
Masking tape
1200 grit sandpaper
Litho crayon
¼ cup White vinegar
2 Tablespoons vegetable oil
2 liter soft drink (any kind)
Damp sponge Disposable gloves
Roll of paper towels
Etching ink and brayer
CREATE

Research
1. Divide the class into three groups. Research the three different early printmaking methods: woodblock engraving, copper engraving, and lithography.
2. Groups present their findings to the class.

Preparation
1. Working individually, choose a plant from the exhibit.
2. Gather reference images, and sketch the plant from different angles, showing the different parts of each plant. Once you are happy with the sketch, set it aside and you are ready to begin printmaking!

Printing
1. Put on disposable gloves to protect the foil from the oils in your hands.
2. Tape the sheet of foil to the plexiglass, ensuring there are no wrinkles or creases in the foil (any wrinkle will show when printed). This will be your plate.
3. Lightly sand the foil with sandpaper, working in small circles.
4. Wipe the foil with a paper towel dipped in vinegar to remove any residue left from sanding.
5. Draw the image on your plate with the litho crayon. Be sure to plan first—you cannot erase once you put down the crayon!
6. Over a sink or empty bucket, pour the soft drink over the image for at least five seconds, ensuring that the entire image is exposed to the liquid. The carbonation will etch the surface of the image!
7. Dab your plate with a dry paper towel until it is mostly dry.
8. Pour the oil over your plate and rub clean with the damp sponge. The crayon should disappear from the surface of the plate.
9. Dampen the plate by squeezing clean water onto its surface with the sponge.
10. Squeeze out a quarter size drop of ink onto the second sheet of plexiglass (you can use another smooth material, if desired).
11. Roll and cut the ink using a piece of cardboard and your brayer. Cut the ink by repeating short strokes through the center of the pile, until it is malleable. Take the brayer and roll out the ink in different directions until it is thin and distributed evenly. If the ink is not thin enough, your image will come out too dark.
12. Using the brayer, transfer a small amount of the ink onto your plate, rolling it in different directions until the lines of your image are visible. Again, if you use too much ink, the image will turn out blurred and dark. There is no need to ink the parts of the plate that do not have your image over it.
13. Continue to dampen the plate with water in between layers of ink to ensure it does not dry out.
14. Place your plate on a printing press, image size up. Place a damp sheet of printing paper over the plate. Put the felt down, and slowly crank the press, using an even speed. When through the roller, lift the felt.
15. Slowly peel back the paper, starting at the corner. Place your finished print on a drying rack.
16. If you aren’t happy with your results, re-ink the plate and try again!

FURTHER EXPLORATION
- Participate in a mock 19th century world market. Students create models of their product, with its attached label. Using pretend money, students ‘purchase’ each other's products based on its use and label design. Afterwards, facilitate a group discussion on why certain products sold better than others.

Sources
DESCRIPTION

Inspired by the work of Maria Sibylla Merian, students will create a work of visual art or writing that illustrates the connection between plants and insects.

OBJECTIVES

- Students will learn about Maria Sibylla Merian and her impact on the fields of botany and entomology.

SOLs

Art  AI.5, AI.10, AI.21, AII.10, AIII.11

English  9.6,

Science  BIO.8

BACKGROUND

Maria Sibylla Merian worked within the fields of art, botany, and entomology in the late 17th and early 18th centuries. She was one of the first scientists, and certainly the first female scientists to merge insects, their food and habitats, and plants into one ecological composition. While creating her art, she made acute observations about plants and insects which contributed to science and medicine. In fact, her observations dispelled the then-popular belief that insects spontaneously emerged from mud. Most of her work includes images of both plants and insects. Even though her botanical drawings are not always completely accurate, her decision to display plants and insects from the same habitat together allows viewers to better understand the interactions between them in their mutual ecosystems.

In 1699, Merian and her daughter, artist Dorothea Maria, traveled to the coast of Suriname to study and illustrate the interaction between plants and insects in the tropical region. The pair were only in South America for a short time, yet, the end result was some 60 botanical engravings and descriptions to create *Insects of Suriname*. It is arguably some of the most important work of Merian’s career.

DISCUSSION

Before Viewing What are some overlaps between the fields of art and science? More specifically, describe the potential connections between visual art and biology.


CREATE

Choose your medium: create a piece of writing or artwork (or both!).

Art

1. Choose a plant from within or outside the exhibit to focus your artwork on.
2. Research--or, like Merian, observe the plant in the wild--to find out the types of insects that interact with your selected plant. Take notes on the interactions between the plant and the insects in its environment. Do the insects affect your plant positively or negatively? Why?

3. Create an observational artwork that documents the interaction between your selected plant and one or more of the insects that affect the plant.

Writing

1. Choose a plant from the exhibit to focus your writing on.
2. Research--or, like Merian, observe the plant in the wild--to find out the types of insects that interact with your selected plant. Take notes on the interactions between the plant and the insects in its environment. Do the insects affect your plant positively or negatively? Why?
3. Write a poem or short story about your plant and the insects that affect it.

FURTHER EXPLORATION


- To lead the discussion on the relationship between insects and plants, introduce the monarch butterfly and how it is dependant on its host plant, Milkweed, which the monarch exclusively uses for food and laying eggs on. While there are lots of media on the topic, this video by the National Park Service represents the issue, including how the loss of habitat has contributed to the decline of both milkweed and monarchs:https://www.youtube.com/watch?v=V3ipu2th34o. The butterfly story is also relevant to Merian’s work, since her observations contributed to the finding that caterpillars turn into butterflies.


Sources


DRAWING FROM OBSERVATION:
BOTANICAL ILLUSTRATION COLLABORATION
ART, ENGLISH, SCIENCE

DESCRIPTION
Students will collaborate to create a botanical illustration of a plant of their choice.

OBJECTIVES
- Students will understand the difference between botanical art and botanical illustration
- Students will facilitate collaboration in small group settings
- Students will conduct research on local plant species

SOLs
Art AI.2, AI.10
English 9.5, 9.6, 9.8
Science BIO.6, BIO.8

BACKGROUND
Although the terms are often used interchangeably, there is a difference between botanical art and botanical illustration. Botanical illustrators focus on recording plants for scientific accuracy. Botanical art can be scientifically accurate, but the artist places emphasis on aesthetic value and artistic quality and focuses less on accuracy. Artists who label themselves “flower painters” do not care about accuracy; they want to create a beautiful image. Still life painters, abstract painters, and impressionist painters all fall under the “botanical art” category. Maria Sibylla Merian’s pineapple is an example of botanical art because she often purposely drew fruits inaccurately and for beauty. John Abercrombie’s pineapple is an example of botanical illustration. To tell the difference, the viewer must pay attention to the artist’s intent: is it to inform, describe, persuade or entertain?

Before modern printing methods, creating an illustrated book was a collaborative process. Artists would be employed to create original drawings. Engravers would turn the drawings into reproducible prints. Another artist would go back in and color the print. Finally, in the case of herbals and other botanical books, a scientist would write about the plant being portrayed. Artists, especially female artists, were often not given credit for their role in the process. For example, the apples in Hugh Ronalds’ A Concise Description of Select Apples, were illustrated by his daughter, Betsy. She is not credited for her work in the book.

DISCUSSION
Before Viewing Explain the difference between botanical art and botanical illustration.

After Viewing Which artworks in the exhibit were examples of botanical art? Which were examples of botanical illustration? Can an artwork fall into both categories?

CREATE
1. Pair off into groups of three. In each group, select an “artist,” a “scientist,” and a “writer”. The artist is in charge of illustrating the plant. The scientist is in charge of identifying and researching the plant. The “writer” is in charge of taking notes and writing a description of the plant.
2. As a group, go outside and select a plant from your school garden or other plant-rich area. Photograph the plant or take notes of its color, shape, size, texture, etc.
3. With the help of teammates, the scientist will use online and print resources to research the plant, looking for the following information: common name, scientific name, classification, origin, effect on the environment, habitat, and uses. These questions should be answered on a separate description sheet.
4. The artist will draw the plant as accurately as possible. The artist should include various viewpoints of the plant (above, front, back, etc.). Be sure to include the common name and scientific name of the plant on both the illustration on the description sheet.

5. The writer will describe it on a separate sheet of paper, based on the scientist’s research.

6. Present your findings to the class. Highlight important findings from your research.

FURTHER EXPLORATION

- Combine with “Contemporary Media” or “Art, Botany, and Entomology” activities.
- Use a plant press to permanently preserve the plant you chose. Try drawing or photographing the plant in field and again after it is pressed. Compare the differences.
- Download “Garden Answers,” a free app for iOS and Android users. Take a picture of the flower or plant you wish to identify. Within seconds, the app gives you possible matches for the name of the plant.

Sources
CONTEMPORARY MEDIA:
THE NEW WAVE OF BOTANICAL ART
ART, SCIENCE

DESCRIPTION
Inspired by the work of Maria Sibylla Merian, students will create a work of visual art or writing that illustrates the connection between plants and insects.

OBJECTIVES
- Students will research past and present botanical artists.
- Students will develop their own style of botanical art using personally selected media, techniques, and subjects.

SOLs
Art AII.2, AII.3, AII.4, AII.5, AII.12, AII.14, AIII.3, AIII.6, AIII.11, AIII.20, AIV.5, AIV.15
Science BIO.8

BACKGROUND
Prior to the age of photography, people distributed information via prints and hand-colored imagery. The artists in the exhibit either used paint or engraving methods to create their masterpieces. All the works in the exhibit are dated before the 20th century. As technology has evolved throughout the last two centuries, so has the presentation and purpose of botanical art and illustration.

Although botanical drawing began with our prehistoric ancestors, the widespread recording of plants did not begin until the 1400s in the form of herbal books. Herbals were mostly text with a few basic, often distorted, images made from woodblock prints. On the contrary, artists around the same time painted flowers in great detail, proving that the art of flower painting could be completed accurately. By the 1600s, people started to pay more attention to flowers and gardening emerged as a recreational activity. Consequently, a new genre of painting came to the forefront: flower painting. Flower painting focused strictly on the aesthetic pleasure of flowers. Artists in this genre did not care about accuracy; they painted with the intention of creating a beautiful, sellable piece of art.

As the 1600s brought about the development of copperplate engraving, artists and engravers were able to make more detailed images and to better distribute their books to the public. Two hundred years later, the lithograph replaced copperplate engraving and allowed publishers to make and distribute botanical books for a fraction of a cost. In the 19th century, the development of photography took route and allowed artists and scientists to experiment with how to create images of plants. By the early 20th century, lovers of traditional botanical art and illustration feared that technology, particularly the camera, would completely replace the traditional methods of visually recording plants. Luckily, these skeptics were wrong.

Botanical art has not declined because of technological advances. Rather, contemporary artists such as Rob Kessler, Margaret Stones, Arthur Church, Rory McEwen, and Pandora Sellars have all invented new ways of documenting plants, both for scientific purposes and for beauty. Some have even merged old methods with technological advances to create an entirely unique product. In the 21st century, technology and innovative ways of thinking about plants and art are altering the way people see and interact with the world around them. Our era marks a new wave of botanical art.

DISCUSSION

Before Viewing How did people document plants before the era of photography? How were these documents distributed to mass culture? Do you think early botanical artworks are more or less valuable (in terms of aesthetic) than contemporary botanical art? Do they serve the same purposes?
**After Viewing** Have students record in their sketchbooks their overall impression of the exhibit. Ask them which piece was their favorite and why? If the artists were alive today, what feedback would they give the artists?

**CREATE**

1. Research different contemporary botanical artists, noting what media, techniques, and styles of art they are drawn to. A great site to start with is [http://www.botanicalartandartists.com/what-is-botanical-art.html](http://www.botanicalartandartists.com/what-is-botanical-art.html), which lists a select group of artists.
2. Brainstorm various methods of recording and exploring the world of plants. In a graphic organizer or list, write down the botanical subject matter or plant themes that are most interesting to you and the types of media you may want to use to explore your concept.
3. Write an art proposal, telling the viewer how you will approach the subject of botany and plants through your artwork.
4. Once your proposal is approved by your teacher, begin to work!

**FURTHER EXPLORATION**

- Conduct a classroom critique on the exhibit or on the student’s finished artworks.
- Write a research document (traditional paper or creative form, like a blog post) synthesizing your research on contemporary botanical artists.
- Tools for teachers can be found at [https://www.asba-art.org/botanical-art/teaching-botanical-art](https://www.asba-art.org/botanical-art/teaching-botanical-art).

**Sources**


DESCRIPTION
Students will create a collage using pressed flowers.

OBJECTIVES
- Students will be able to explain the steps of pressing flowers.
- Students will understand the impact pressed flowers has on the historical development of botanical art.

SOLs
Art AI.3, AI.4, AI.5, AI.6, AI.7, AI.8, AI.20, AI.22, AI.4, AI.5, AI.7, AI.8
Science BIO.1, BIO.6

BACKGROUND
People have been pressing flowers since prehistoric times. Archaeologists have discovered the remains of pressed flowers on the walls of caves as well as in the tombs of ancient Egyptian royalty.

In the early 16th century, Oshibana, a Japanese art that uses pressed flowers to create images, became popular. Oshibana revived the ancient art of flower pressing. Thanks to global trade, Oshibana-type collages became popular throughout the Americas and Europe, and Asia. Soon after, the Scientific Revolution instigated a desire to document the natural world. People began to press plants into books to document them. People kept pressed flower scrapbooks for sentimental reasons as well. Pressed plants were also used to replace illustrations in books. Some publishers chose to omit botanical drawings and include pressed specimens. The specimens looked as if they were botanical illustrations because of their delicacy and detail.

DISCUSSION
Before Viewing Discuss the potential overlap between art and science. Who are some artists that work within both fields?

After Viewing Are the works in the exhibit scientific or artistic? Can they be both? What if one of those prints was actually a pressed specimen; could a pressed flower be considered art?

MATERIALS
Plant Press (included in box)
Forceps
List of plants best suited for pressing (page 33)
Blotting paper
Paper or fabric backing card
Rubber cement
Empty notebook or sketchbook
Spray glue
Toothpicks
Soft brush (watercolor brushes work well)
Small scissors

CREATE
Research (optional)
1. Divide into small groups. Assign each group a section of the "List of Plants" on page 33 of this guide.
2. Research the assigned plants using reference books or the internet, gathering pictures for each plant to use as a reference when picking.
Picking
- Only pick flowers that are dry. The best time of day to pick is late morning or early afternoon after dew has dried but the sun has not yet wilted flowers.
- Try to conserve the plants. Only pick as much as you need!
- The sooner you can press the plants after picking, the better.

Pressing
1. Follow the instructions listed on the sheet included with the press.
2. When specimens are dry, label them accordingly using their common and scientific name.
3. Use forceps to move the dry flowers to a separate sheet of paper. Spread them out so students are able to see all the specimens.

Collage
1. In a sketchbook, plan out a composition using the plants you dried. Sketch in pencil first, then loosely arrange your specimens, using the forceps, to see what looks good. This step is important: you cannot take off what you glue down!
2. Cut out the backing card (paper or fabric) and brush rubber cement over its surface. You may need to do small sections at a time, depending on how fast you place your specimens on the paper.
3. Glue leaves or larger items down first. This will be your background.
4. Trim the background plants where they overlap the card.
5. Use forceps to handle the delicate flowers. Using a toothpick, dab rubber cement on the back center of the flowers. Use spray glue for the petals (rubber cement may break them).
6. Continue to glue mosses, seeds, and smaller flowers.
7. Glue stems down last. For any stems you want to hide, apply rubber cement to the bottom third of the stem, using a toothpick and tuck behind another object.

FURTHER EXPLORATION
- Helpful pressing tips can be found at http://www.wwpfg.com/content/pressed-flower-tips


Sources
DESCRIPTION
Students will create a recipe blog for 17th century cuisine.

OBJECTIVES
- Students will learn about different types of 17th century food and cuisine.
- Students will investigate plants used for food and their origin.

SOLs
- English 9.5, 9.8, 10.5, 12.5
- History WHII.1, WHII.4, VUS.2

BACKGROUND
Food in 17th century Virginia was very different from the food we grow and eat today. Settlers brought seeds over to the New World with them and began to grow some of the foods they knew in the Old World, such as apples and peaches. They also received a portion of their food directly from England—items like sugar, flour, salt, and spices. Settlers adapted their eating habits and ate a few of the same foods as Native Americans. Colonists attempted to mimic traditional English cuisine with the food available to them as much as possible, however, strictly English diet was difficult to maintain in Virginia. Colonists had to alter some of their eating habits and adopt many of the fruits and vegetables domesticated by the natives. They also ate plants and animals they found in the wild.

Maize was a main product for colonial dishes because it was used as a substitute for wheat and other English staples. Virginians ate maize off the cob, ground it into meal for bread or porridge, and popped maize kernels. Because it was easily grown and stored, maize remained a staple through the years and is still a large agricultural asset in Virginia today.

DISCUSSION
Before Viewing Read the article “A Brief History of Baking” at https://www.historyextra.com/period/medieval/a-brief-history-of-baking/. Students should consider the following question as they view the exhibit: How can food illustrate global economic and social histories?

After Viewing Settlers had a little variety in their food, but they still were limited to the food they could buy from England, pick from the wild, or grow themselves. Discuss how colonists obtained different foods. For the crops in the exhibit, talk about their origin and how they got to Virginia.

CREATE
1. Find or create one recipe for each of the following 17th century people groups: Native Americans, Virginia colonists, and the English.
2. On your classroom blog site, make three posts: one for each recipe. Each post should include a description of the recipe—where it is from, what it tastes like, etc.—a list of ingredients, and cooking instructions.

FURTHER EXPLORATION
- Make an additional blog post about one of the crops in the exhibit.
- Make an additional blog post explaining how food can illustrate economic and social histories.
- For extra credit, choose a recipe from the blog and make it yourself!

Sources
DESCRIPTION
Students will solve statistics-based word problems using the food resource data from the Virtual Jamestown website. The word problems will ask students to find mean, standard deviation, and z-scores of various data sets.

OBJECTIVES
- Students will use statistics to better understand food resources in early Virginia.

SOLs
- Math A.9, PS.1
- History WHIII.1

BACKGROUND
For food, the Jamestown colonists relied mainly on imports from England. Although they supplemented their diets with native Virginia plants, seeds, and meats, they did not typically use family gardens as a source of food. Instead, farmers focused their attention on cultivating tobacco. Having a variety of healthy food to eat was the least of their worries—they just wanted to get rich off of tobacco! By 1637, the need for food was so bad that England mandated any colonists growing tobacco to also grow at least two acres of corn.

The Virtual Jamestown database shows each household's food resources during the 1624/5 census. The spreadsheets illustrate the little variety in food that families had during the early days of the colony.

DISCUSSION

Before Viewing What do you think the most popular food crop was in the Jamestown settlement?

After Viewing After viewing the exhibit, has your answer to the previous question changed? How do you think they were able to keep track of the quantities and types of food consumed by each family in Jamestown?

CREATE
1. Visit http://www.virtualjamestown.org/Muster/food24.html. (To navigate to this page from the Virtual Jamestown homepage, hover the mouse over “Resources” and click “Public Records.” Choose “Censuses” from the list, then click “1624/5 Muster Records.” From there, choose “Food Muster.”)
2. Click on “Jordan’s Jorney” in the right column. This should pull up a spreadsheet with family names and crops listed. Look at the “Corn” column.
3. Follow the instructions on the worksheet (page 56).

FURTHER EXPLORATION
- Use the Virtual Jamestown database to come up with your own mathematical word problems.

Sources
The Virtual Virginia database shows each household’s food resources during the 1624/5 census. Every household in Virginia took part in a food census in which a surveyor documented how much of each type of food they had. Corn was cheap, easy to grow, and easy to store, so most families heavily relied on it for their main source of food.

Use the online database at [http://www.virtualjamestown.org/Muster/food24.html](http://www.virtualjamestown.org/Muster/food24.html). If accessing the website from the Virtual Jamestown homepage, hover the mouse over “resources” and click “public records.” Choose “censuses” from the list, then click “1624/5 Muster Records.” From there, choose “food muster.”

Once you are on the food muster, click on “Jordan’s Journey” in the right column. This should pull up a spreadsheet with family names and crops listed. Use the “corn” column to answer the z-score questions below. Round your answers to the nearest hundredth.

**Show your work in the right column.**

1. How many families participated in the survey (population number)?

2. Find the mean and standard deviation for the amount of corn households in Jordan’s Journey had during the 1624/5 census.

**Use the mean and standard deviation you found for question #2 to answer the questions below.**

3. The Jordan family owns the most corn in the town Jordan’s Journey. How far is the Jordan family from the mean?

4. What is the probability that a colonist has more than 10 bushels of corn?

5. What percentage of families own between 50 and 100 bushels of corn?
6. What percentage of families own less than 68 bushels of corn? What do you notice about this percentage when you compare it to the data set?

7. How reliable is the data set for Jordan’s Journey? Explain your answer.

8. What is the mean and standard deviation of the data set without the outlier?

9. The 1624/5 census also tallied the food owned by James Citty residents. The following amounts of dry fish were recorded in James Citty: 100, 300, 100, 4000, 700, 500, 2000, 100, 200, 200, 1200, 180. What is the mean and median amount of dry fish in James Citty?

10. All 12 of the residents in James Citty that own dry fish also own corn. If you were to calculate the probability of a family owning x amount of corn using the data from the fish owners, would you calculate the sample standard deviation or the population standard deviation?
Answer Key

1. 15
2. Mean: 37.4, SD: 46.27
3. 3.51
4. 72.24%
5. 30.51%
6. 74.54% There is only one number (200) above 68, yet the percentage of owning less than 68 bushels of corn is only 74.54%
7. The data set contains an outlier of 200 bushels which skews the data set to the right, making the values appear larger than they would be without an outlier.
8. Mean: 25.79, SD: 16.45
9. Mean: 798.33, Median: 250
10. Sample
COLUMBIAN EXCHANGE SIMULATION
HISTORY

DESCRIPTION
Students will engage in an interactive activity simulating the interaction of goods between the Old and New Worlds during the Columbian Exchange.

OBJECTIVES
- Students will be able to identify the various food crops, animals, and diseases that crossed between the Americas and Eurasia during the Columbian Exchange.
- Students will understand the costs and benefits of global interactions during the Columbian Exchange.

SOLs
History WHII.1, WHII.4, WHII.5, WG.3, WG.4, VUS.2, GOVT.12

BACKGROUND
In the 15th century, Europeans really liked pepper. In fact, the demand for pepper was so great, it helped launch a series of events that resulted in the Columbian Exchange.

India was the largest pepper exporter in the 15th century. When the Ottoman Empire took over the Mediterranean Sea in the early 1400s, they blocked trade routes to India, causing the price of pepper and other South Asian goods to skyrocket. Portugal— one of the countries hit hardest by the increase in cost— decided to find a way around the blockades. Portugal’s Prince Henry the Navigator sent sailors to see if Africa could be travelled around in order to reach India. During the first voyage, the sailors were blown off course and became too afraid to continue. A few years later, Vasco de Gama decided to make the trip again. This time, the Portuguese reached India.

Because the voyage around Africa was so long, Portugal hired Christopher Columbus to find a quicker route to Asia. Columbus thought he could reach Asia by sailing across the Atlantic; he had no idea the Americas existed. When he landed in the Caribbean sea in 1492, he thought he had reached India. This is (which is why the region was named “The West Indies”. Columbus refused to believe that he was not in Asia and died in denial.

After the initial discovery of the Americas, many goods were exchanged across the Atlantic. Plants, animals, and diseases traveled from Europe to the Americas while a wide variety of calorie-rich foods made their way from the West back to Europe. European settlers forcibly brought slaves from Africa to maintain colonial plantations. As a result, the sugar and tobacco industries flourished. Without the exchange, Ireland would not have potatoes, Italy would not have tomatoes, and Native Americans would have never been introduced to the horse. Ideas, goods, and diseases went global, all because of pepper!

DISCUSSION

Before Viewing Split students into pairs or small groups and have them research the different goods traded in the Columbian Exchange. Were some of these goods more valuable than others?

After Viewing Discuss the costs and benefits of the Columbian Exchange, including its effect on local and global economies, world populations, and culture. Watch the video by John Green (link is under Further Exploration) for a brief overview of the Columbian Exchange and its impact on our lives today.
**CREATE**

**Preparation**

1. Make enough copies of the food cards on pages 61-65 so that each student can receive two cards. **Cards labeled 1-16 are Old World cards. These are foods from Europe and Asia. Cards labeled A-H are New World Cards. These are foods native to the Americas that the colonists ate. Cards labeled i-xvi are American Indian cards. These are foods that are native to the Americas that the natives ate— there are more of these cards than the New World cards because colonists often refused to eat some of the types of foods consumed by the American Indians. Each card is labeled with a shape on the right hand corner. The shapes represent the card’s value and are worth the following points:**
   - Square: 4
   - Circle: 3
   - Star: 2
   - Triangle: 1
   *Do not reveal the worth of each shape until the end of the activity.*

2. On the backs of about two thirds the **American Indian cards**, draw a tiny x (big enough to see, but small enough it will not stand out). On half of the **New World Consumers** draw a tiny x. **Leave all the Old World cards blank.**

**Activity**

1. Divide students into three groups: American Indians, New World Consumers, and Old World Consumers. Distribute the cards within their corresponding groups. Explain the goal of the activity is to trade so that you have the most valuable cards. Students will not know which cards are valuable and must guess their worth.

2. For five minutes, students can trade cards **within their groups**. Students can choose whichever cards they feel will benefit them the most as consumers, as long as they have two cards at all times. Students can also choose not to trade at all. At the end of the five minutes, ask students to raise their hand if they feel they benefited from the trade. Record the results.

3. For another five minutes, the **American Indians and New World Consumers** can trade with one another. Again, ask is they feel they benefited from the trade and record the results.

4. For another five minutes, students can trade with **anyone in the class**. Once the five minutes are up, announce that some people have caught a disease they are not immune to. Have students turn their cards over.

5. Students in the **American Indian** group that have an x on any of their cards have caught a disease from the Europeans and have died. They are no longer in the game.

6. Students in the **New World Consumers** group with an x on their card have also caught a disease as a result of the trade. They are not immune to American Indian diseases, so they are also out of the game.

7. Students in the **Old World Consumers** group are okay because they have immunity to European diseases and are safe from American Indian diseases in Europe. No Old World Consumers die.

8. With a large amount of the population diseased, again, ask students if they feel they benefited from the trade.

9. Compare these results to the previous results.

10. Reveal the worth of each card to see which of the surviving consumers has the most valuable set of goods.

**FURTHER EXPLORATION**

- Watch this humorous video by John Green about the Columbian Exchange at [https://www.youtube.com/watch?v=HQPA5oNpfM4](https://www.youtube.com/watch?v=HQPA5oNpfM4)


**Sources**


Meal (grain)

Cabbage

Honey

Peach

Butter

Cheese

Pepper

Flour
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td>Corn</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Poltury (birds, eggs)</td>
<td>Squirrel</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>Strawberries</td>
<td>Cider</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>H</td>
</tr>
<tr>
<td>Shellfish</td>
<td>Mullberries</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Squash
Wild Onions
Sweet Potatoes
Corn
Berries
Fish
Turkey
Deer
FOOD AND CULTURE: A RESEARCH PROJECT
ENGLISH

DESCRIPTION
Students will use a variety of print and digital sources to write a comprehensive research paper on a food crop that represents their background or culture. The paper will include their selected plant’s history, origin, effect on local and or global cultures, and future outlook.

OBJECTIVES
- Students will gain a better understanding of their personal history and culture.
- Students will be able to explain the connection between plants, food, and culture.

SOLs
English 9.5, 9.7, 9.8, 10.5, 10.7, 10.8, 11.7, 12.7, 12.8

BACKGROUND
The transfer of food crops has a rich global history. Plants such as the pineapple and apple began on the opposite side of the planet and made their way across the globe. The trade of plants affected the culture and traditions of many peoples and places on their journeys. For example, anthropologist Berthold Laufer writes that American Indian agriculture “has encompassed the globe in its entirety, made its influence felt everywhere, changed the surface of the earth, and brought mankind together into closer bonds.” Maize, tobacco, and sunflowers have completely altered the way we experience life. This project will help students better understand the effect crops and food have had on their culture and personal histories.

DISCUSSION

Before Viewing How does food contribute to culture? Facilitate small group discussions on how plants and food have impacted students personal culture or family traditions. Ask students to look for plants in the exhibit that have had a large impact on both culture and history.

After Viewing Discuss the various plants in the exhibit that have had a large impact on a region’s history and culture.

CREATE
1. Select a food crop that you personally connect with through family tradition, culture, or personal experiences.
2. Develop a research paper explaining your selected plant’s history, origin, effect on local and or global cultures, and future outlook (ie. do scientists believe it is headed towards extinction? How does modern farming trends affect the crop?).

FURTHER EXPLORATION
- Facilitate a recipe exchange. Have each student bring in a recipe that includes their crop Have each student exchange it with a classmate.

Sources
APPLE SCIENCE: BREEDING NEW CULTIVARS

DESCRIPTION
Students will learn about apple breeding and selection, then conduct an experiment to determine which apples are best for breeding new cultivars.

OBJECTIVES
- Students will understand the historical and cultural significance of apples and apple cultivation.
- Students will identify the traits considered when selecting apples for breeding.

SOLs
History BIO.1, BIO.5, BIO.7, BIO.8

BACKGROUND
Prior to the 17th century, apples were not available in North America. When English colonists arrived on the shores of Virginia in 1607, they brought different types of apples and apple seeds along with them. These apples would eventually expand into the hundreds of cultivars, or varieties of apples, we have available to us today.

In the 1600s, apples were often used to barter. Merchants would exchange their finest apples for other goods and services. Back then, apples were not as sweet as the apples we know. They were primarily used for making ciders and baking. Many of these old varieties, such as Thomas Jefferson’s favorites—the Newtown Pippin and Hewe’s Crab—are extremely rare now. After years of neglect and accidental cross pollination, almost all of the heirloom varieties in Hugh Ronald’s A Concise Description of Select Apples have gradually gone extinct. They have been replaced by the scientifically engineered cultivars we see in stores today, such as Granny Smith, Gala, Pink Lady, and Golden Delicious, among others.

DISCUSSION

After Viewing Introduce the idea of cross-pollination and apple grafting. Why would we want to genetically cross different varieties? Is it worth it to spend over five years waiting on a different type of apple tree to grow? (NPR’s “The Apple Miracle” addresses some of these questions, see under “Further Exploration”).

MATERIALS
Variety of apples
Knife (or pre-cut apples)
Paper plates
Paper towels
Small dropping pipette
Lab Worksheet
Cornell Starch test graphic (on worksheet)
25ml Tincture of iodine (avoid formulations of Povidone-Iodine aka Betadine which won’t work for this test)
Disposable gloves

CREATE
Preparation
1. Purchase several different types of apples (one apple per 2-4 kids in your class). The more variety, the better!
2. Make copies of the worksheet on page 69.
3. Cut the apples prior to class if knives in the classroom are an issue.

Lab

1. Explore the website https://www.sciencelearn.org.nz/resources/844-breeding-a-new-apple-cultivar with students. Watch the videos and read the text to learn more about apple breeding.
2. Divide students into pairs or small groups. Give each group an apple to examine. Make sure at least one group member is willing to taste the apple!
3. Pass out the lab worksheets. Students should answer all the questions on the worksheet.
4. While students are working, go around to each group and place a couple drops of iodine on a small slice of their apple to determine starch levels. Keep this apple on a separate table, away from the other slices of apples used for taste sampling. Use gloves to handle the apple and iodine solution.
5. Immediately dispose of the iodine affected apple. Iodine is poisonous and should not be consumed.

FURTHER EXPLORATION

- Listen to the NPR podcast “The Miracle Apple” that talks about how the apple industry transformed from a monoculture to the wide variety of apples we see in stores today. Find the 14 minute long podcast at https://www.npr.org/sections/money/2015/05/27/410085320/episode-627-the-miracle-apple.
- Using the apples you tested, make punnett squares to determine the outcome of the following if you were to breed two of the apples: color, sweetness, size, texture.

*Lesson adapted from https://naite-api.usu.edu/media/uploads/2016/08/01/Apple_Genetics_worksheet.pdf

Sources
# Apple Science: Breeding New Cultivators

**Part 1: Fill in the table below.**

<table>
<thead>
<tr>
<th>Type/Brand of Apple:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Look</strong></td>
<td>Describe what the apple looks like. Include color, texture, size, shape, seed layout, and stem structure.</td>
</tr>
<tr>
<td>Inside of apple</td>
<td></td>
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<tr>
<td>Outside of apple</td>
<td></td>
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<tr>
<td><strong>Smell</strong></td>
<td>Describe how the apple smells.</td>
</tr>
<tr>
<td>Inside of apple</td>
<td></td>
</tr>
<tr>
<td>Outside of apple</td>
<td></td>
</tr>
<tr>
<td><strong>Taste</strong></td>
<td></td>
</tr>
<tr>
<td>Sweetness (scale 1-10, 10 being as sweet as sugar).</td>
<td></td>
</tr>
<tr>
<td>Juiciness (scale 1-10, 10 being as juicy as a watermelon).</td>
<td></td>
</tr>
<tr>
<td>Firmness (scale 1-10, 1 being as mushy as a banana, 10 being as firm as a carrot).</td>
<td></td>
</tr>
<tr>
<td><strong>Ripeness</strong></td>
<td>Part 2: Use the iodine test to determine ripeness.</td>
</tr>
<tr>
<td>Starch Index (1-8)</td>
<td></td>
</tr>
</tbody>
</table>

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Name: ______________________________

Apple Science: Breeding New Cultivators

**Part 2: Use the iodine test to determine ripeness.**

<table>
<thead>
<tr>
<th>Starch Index (1-8)</th>
<th></th>
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</table>
Part 2: Testing for Ripeness

The chart above measures the ripeness of an apple.

Test by cutting the apple in half and dipping the apple, core side down, into the iodine solution or by placing a few drops of the solution onto a slice of the apple. Wait 2 minutes before recording results.

Part 3: Analyzing the data

1. If you were trying to sell your brand of apple, how would you describe it to consumers?

2. Do you think your apple was over or under ripe based on your observations? Based on your observations, at what starch index number should your apple be picked?

3. Compare your data with the data from a classmate in another group. How do your apples compare? Explain the similarities and differences between the two apples.
Part 4: Punnett Squares

When you completed your observations, you were determine the traits of different apples. Traits are determined by the parent apple’s genes. If you cross breed two different types of apples, such as the Gala apple and the Braeburn apple, the result would be an apple that looked and tasted like a Gala, but had the seeds and genetic makeup of a Braeburn. If you planted these new seeds, you would create a new hybrid fruit that has traits of both apples.

In this activity, we will imagine that we are looking to breed new apple cultivars using the apples that you tested. Traits can be determined by Mendelian inheritance which is when a single gene results in a specific trait. Using the genotypes below, determine the likelihood that your hybrid apple will possess a specific trait. Note: These genotypes are examples and not representative of accurate genotypes.

- Firmness is dominant (1’s genotype is Ff, 2’s genotype is FF)
- Red skin coloring is dominant (1’s genotype is RR, 2’s genotype is Rr)
- Fragrance is dominant (1’s genotype is Ee, 2’s genotype is Ee)
- Tartness is recessive (Apple 1’s genotype is TT, Apple 2’s genotype is tt)
- Sweetness is dominant (1’s genotype is Ss, 2’s genotype is SS)
- Juiciness is recessive (1’s genotype is jj, 2’s genotype is JJ)

Fill in the Punnett Squares.

<table>
<thead>
<tr>
<th>Firmness  (example)</th>
<th>Tartness</th>
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<th>Fragrance</th>
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<th>Sweetness</th>
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<table>
<thead>
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<th>Juiciness</th>
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</table>
Part 5: Answer the questions below.

1. What is the probability your apple will be sweet?

2. What is the likelihood your apple will not be firm?

3. How likely is it that your apple will be juicy?

4. What is the probability that your apple will have a dominant genotype for red skin coloring?

5. Is your apple more likely to be tart or not tart?

6. List the probabilities of the three offspring genotypes for fragrance.
Across
3. Plant popular in Virginia; Natives introduced it to colonists
4. Old World Crop that originated in China
6. She was an artist, botanist, and entomologist
9. Indian tribe in coastal Virginia near Jamestown
12. Wrote book on pineapples; image of hot-house included in the exhibit
14. Wrote book on hot-houses; image of pineapple included in the exhibit
16. Flower that originated in North America
18. To prepare and use land to grow crops
19. Wrote Notes on the State of Virginia

Down
1. Study of plants
2. Printmaking technique used in the 1800s
3. Another word for corn
7. Published book on apples
8. English King that disliked tobacco; first settlement named after him
10. Region of China, mentioned in the exhibit
11. Crop that represents hospitality
13. Cartographer mentioned in exhibit
14. Popular Old World crop
15. Term meaning Europe, Africa, and Asia
17. Term meaning the Americas
Glossary

**Algonquin** - Native American group that settled on the coast of Virginia.

**Botanical Art** - artwork is always scientifically and botanically correct but not necessarily complete; more emphasis is placed on the aesthetic value of the plant or flower.

**Botanical Illustration** - type of artwork in which the artist places emphasis is on the scientific record and botanical accuracy to enable identification of a plant.

**Columbian Exchange** - widespread transfer of plants, animals, culture, human populations, technology, and ideas between the Americas and the Old World in the 15th, 16th, and 17th centuries; also known as the *Transatlantic Exchange*.

**Companion Planting** - the close planting of different plants that enhance each other's growth or protect each other from pests.

**Copperplate Engraving** - printing method in which an image is carved into a thin plate of varnish-coated copper.

**Cultivar** - a plant variety that has been produced through selective breeding.

**Cultivation** - to prepare and use land for crops and gardening.

**Entomology** - Scientific study of insects.

**Flora** - the plants of a particular region, habitat, or geological period.

**Flower Painting** - Type of painting where the artist places emphasis on the beauty and aesthetics of a flower or plant.

**Greenhouse** - a heated building, typically made largely of glass, for rearing plants out of season or in a climate colder than is natural for them.

**Gunter Chain** - colonial surveying tool consisting of four poles attached together by 66 feet of chains.

**Herbal** - Book of medicinal plants.

**Hot-house** - predecessor to the greenhouse; stove heated by animal dung or transferred heat.

**Iroquois** - Native American group that settled in Northeast America.

**Lithograph** - printing method using a stone or metal block on which an image is drawn with a substance that attracts ink.

**Oshibana** - Japanese art technique in which one collages dried flowers to create an image, typically a landscape.

**Picturesque** - ideal type of landscape that has an artistic appeal, in that it is beautiful but also has some elements of wildness.

**Surveyor** - Person who examines and records the area and features of the land to construct a map, plan, or description.

**Three-sisters** - Corn, beans, and squash; Native American method of agriculture.

**Woodblock Engraving** - a type of relief print in which one carves into a block of wood.