# Lesson Plan Ideas

***Team up with other grade levels to create a compost system in the cafeteria. (track data, study effects on environment).**

## Kindergarten:

- NC.K.CC.4 Understand the relationship between numbers and quantities.
    - Have students pick seeds or fruit (tomatoes) from the garden. Create stations that the students rotate between. Where they count the amount of seeds/ fruit and write the corresponding number.
- K.L.1.2 Compare characteristics of living and nonliving things in terms of their:
    - Determine what makes plants living. Have students compare living vs nonliving things in the garden, such as the wood planks used for the bed vs. the plants.

## 1st:

- NC.1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.
    - Measure 3 different plants in the garden. Compare their heights and discuss what caused these plants to be different heights.
- NC.1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. • Unitize by making a ten from a collection of ten ones
    - Have students pick seeds from the garden. Students will sort the seeds into groups of 10. Seeds can be placed into a brown envelope and placed in a dark, cool place to be planted in the future.
- 1.E.2.2 Compare the properties of soil samples from different places relating their capacity to retain water, nourish and support the growth of certain plants.
    - Soil Shimmy! Take soil samples from the garden, playground, etc. Place the soil samples in a water bottle with a little dish detergent, and water. Put some music on and shake it up! Let it rest for a few hours and you will see the different layers of soil.
- Opinion writing: Plants have both a common name and a scientific name. The common name is different depending on where you are in the country. Have the students come up with their own common name for a plant in the garden. (It can be silly) Have students list reasons for why the plant should be called that name.

## 2nd

- NC.2.MD.1 Measure the length of an object in standard units by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
    - Measure 3 different plants in the garden. Compare their heights and discuss what caused these plants to be different heights.
- 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water
    - Use a soil thermometer to measure the temperature of a flower bed, and other locations around school. Are they the same temperature? Why or why not? How does this benefit the growth of a plant?
    - Hot Compost! Create a hot compost bin. Energy from the sun is used to help heat up a hot compost pile! Make a competition between groups to see who can create a compost pile that reaches the target temperature range (145-159˚F). Discuss how the sun helps heat up the decomposing material and speeds the process of breaking it down. (Pile temperatures must exceed 131°F to kill most pathogens harmful to humans and pets, and they must surpass 145°F to destroy most weed seeds. A pile temperature that climbs to 160˚F, however, can kill decomposers and slow the composting process.)

**3rd**

- 3.E.1.2 Recognize that changes in the length and direction of an object's shadow indicate the apparent changing position of the Sun during the day although the patterns of the stars in the sky, to include the Sun, stay the same.
    - Choosing the site for a garden takes a lot of work. One of the concerns for choosing a site is sunlight. Have students study different areas of the school and note the shade and sunlight in each areas. Did the school choose a good place to have the garden?
- 3.L.2 Understand how plants survive in their environments.
    - Create a testing/experiment site in the garden! Take soil samples in an area and do the soil shimmy (refer to 1st grade) to determine the soil types in the area.
    - Use different soils and amendments to see how they affect the growth of a plant (beans are typically the easiest to germinate and grow). Amendments (can be chemical fertilizer, lime, wood ash, coffee grounds, bone meal, chicken litter, etc.)
- Fractions: Students can use ingredients from the garden to create a recipe for a yummy dish. (See spanish lesson. Possible collaboration between grade levels?)

**4th**

- Fractions!(refer to 3rd grade and spanish)

- 4.E.2.1 Compare fossils (including molds, casts, and preserved parts of plants and animals) to one another and to living organisms.
    - Have students create fossils of plants found in the garden. Or pre-make molds of plants in the garden. Pass them out to students and see if they can go into the garden and identify which plant the fossil was made from.

- NC.4.G.2 Classify quadrilaterals and triangles based on angle measure, side lengths, and the presence or absence of parallel or perpendicular lines .NC.4.MD.3 Solve problems with area and perimeter.
    - Have students figure out the dimensions, area, and angles of flower beds in the garden.
    - Find a spot in the school or classroom and design a flowerbed that would fit the angles and dimensions of the space.

**5th**

- NC.5.MD.2 Represent and interpret data.
    - (Team up with 6th grade math)

- NC.5.NF.1 Add and subtract fractions, including mixed numbers, with unlike denominators using related fractions: halves, fourths and eighths; thirds, sixths, and twelfths; fifths, tenths, and hundredths. • Use benchmark fractions and number sense
    - Have students measure a flower bed. On paper, separate the garden into patches. Have students decide what they would plant in each patch and determine the fraction of that plant in the flower bed. https://www.multiplication.com/our-blog/jen-wieber/garden-patch-fractions

**Middle School MATH-** Try to correlate math problems to real life scenarios in the garden.

- NC.6.RP.3/ NC.6.RP.4 (Ratios in real world problems)
    - Composting can dramatically decrease the amount of material going into landfills. To see how much of their waste is compostable, have each youth weigh their discarded materials at the end of lunch each day for a week. Weigh the landfill/recyclables/compostables together, and then just the compostable materials to find the percent and ratio for each youth and for the entire group.

- NC.8.F.4
  - Youth will use the data they collected on the growth of a bean plant to create a graph.
  - Write an equation in slope-intercept form to model a linear relationship by determining the rate of change and the initial value, given at least two (□, □) values or a graph.

- NC.6.NS.3
  - Determine how many pounds of nitrogen are in 1 bag of fertilizer. The label on a 10-pound bag reveals that it contains 34% nitrogen, 0% phosphorus and 4% potassium, in addition to its other beneficial ingredients. If a farmer determines she needs about 12 pounds of nitrogen to help fix the problems in the soil, then how many bags does she need to buy?
    - (By multiplying 10 pounds by .34, you'll see that one 10-pound bag contains slightly more than 3 pounds of actual nitrogen.)

**Middle School SCIENCE**

- 7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis).
  - Youth will create new plants using asexual propagation, learning the techniques of cutting and the benefits of propagating plants with the same genetic code. Cuttings of Coleus, African violets, mints, salvia, Creeping Jenny, or Baby Tears all work well and will root quickly. (1st grade has coleus growing). Cut the plant just below a node and place it in wet soil. Keep the soil moist and in a few days it will root. Have students use their knowledge of genetics to hypothesize how closely the new developing cutting resembles its parent (it will be exactly the same).

- **6.L.1.2** Explain the significance of the processes of photosynthesis, respiration, and transpiration to the survival of green plants and other organisms.
- **7.L.1.2** Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).
  - Stomata printing: Plant a Jade plant outside. Lay a jade leaf on the table, with the side that you want to examine under the microscope facing up.

- Paint a thin layer of clear nail polish on the leaf.
- Wait a few minutes, then gently test a corner of the nail polish to make sure it is completely dry.
- If dry, take a small piece of tape and put it directly over the nail polish on your leaf. Rub your finger over the tape firmly to make sure it is stuck to the nail polish.
- Slowly peel the tape off of the leaf. The nail polish should remain on the tape. *Important to note: This creates a print of the plant cells, rather than peeling a layer off of the plant. The nail polish and tape act together to act like a plaster making a mold.
- Stick the tape to the center of a microscope slide. Then, place on the stage of your microscope.
- Begin with your microscope in the lowest magnification with the stage all the way up. Find the center of the slide and focus with coarse, then fine adjustment. Draw what you see.
- Next rotate the higher power objective into place, and then focus using ONLY the fine adjustment knob. Again, draw what you see, labeling what you think the plant might use for gas exchange.
- As a class, have students bring up their sketches and show the class the structures that they believe might let air in/out of a leaf and their reasons for making that choice.
- Then, show them pictures of stomata and reveal the ways that these structures work.

- **6.E.2.4** Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and stewardship.
  - Students can run soil tests to determine what nutrients the soil in the garden is lacking. Team up with the social studies teacher to discuss the dust bowl and the importance of maintaining healthy soil and cover crops.
  - Soil is also a very important barrier for properly and effectively filtering water that enters our groundwater supply.
    - Cut the bottom off of one of the soda bottles- ¾ down from the top. Take a piece of cheese cloth and cover the bottle opening. Secure the cheese cloth to the top with a rubber band. Invert the top so that it creates a funnel to drain into the bottom piece. Tape the bottles together. To create your filter, you will layer different soil particles and components. Each layer represents a different activity of the soil--each layer removes different impurities. For the first layer, take ½

cup of activated charcoal (pre-rinsed) and put it into the bottom of the filter. Next, layer 1 cup of sand. Then layer 1 cup of the small pebbles. The last layer is to be made up of 1 cup of larger pebbles or stones. Create a dirty water solution, and pour through the filter. Watch the water become cleaner! To explore how filtration works even more, have students make their own individual filters, giving them the freedom to create what they hypothesize to be the most effective filter--choosing how much of each component to put in, and in what order. Once students filter the water, have them compare the clarity of the filtered water to find the most effective filter. Have students journal why they think the filter that resulted in the clearest water did so.

**Middle school SOCIAL STUDIES**

- **8.G.1.3** Explain how human and environmental interaction affected quality of life and settlement patterns in North Carolina and the United States (e.g. environmental disasters, infrastructure development, coastal restoration and alternative sources of energy).
  - In relation to talking about agriculture and the soil type in the garden, have youth start by researching the Dust Bowl. Write down facts about the event on strips of white paper. Next, do the same things with a natural disaster or drastic landscape change that has occured due to poor farming practices in North Carolina and the United States (Ex. fertilizer runoff). Crumple the white strips into balls. Now time for a snowball fight! Collect the white strips and have students sort the facts into which disaster it matches. Use this to compare and contrast the events. What plants should our garden plant next?

- **6.H.2.3** Explain how innovation and/or technology transformed civilizations, societies and regions over time (e.g., agricultural technology, weaponry, transportation and communication). **8.H.3.2** Explain how changes brought about by technology and other innovations affected individuals and groups in North Carolina and the United States (e.g. advancements in transportation, communication networks and business practices).

- Study the agricultural inventions of the industrial revolution. Plant cotton together.
    - Option 1: Pass out cotton. Have students try to remove seeds by hand. Discuss difficulty of the task and techniques used. Show a picture of a cotton gin. Examine charts of cotton sales. How did this affect the production of cotton? Then show a chart representing the relationship between cotton production and the slave population. Discuss the positive and negative effects of the cotton gin. Have students fill in a chart listing at least 2 positive and 2 negative effects of the cotton gin.
    - Option 2: Ask students to write a journal entry as someone who was affected by the invention of the cotton gin (slave or plantation owner). In their entry, they should explain who they are and how the cotton gin changed their life.

- **6.H.2.3** Explain how innovation and/or technology transformed civilizations, societies and regions over time (e.g., agricultural technology, weaponry, transportation and communication).

    - Separate youth into small groups. Pass out pictures of farming tools from different time periods, including tools used in our garden (ex: caveman tool, plows, manure spreaders from 1900s, mayan stone axes). Each group should receive one picture. The group should put themselves in the shoes of someone during that time period. They will develop their own comic strip explaining how the tool was used during that time and what the character would experience.

**Middle School ELA**

- CCSS.ELA-LITERACY.RL.7.4, CCSS.ELA-LITERACY.RL.8.4 Determine the meaning of words and phrases as they are used in a text
    - Read, *Nothing Gold Can Stay,* by Robert Frost
    - Have youth collect leaves or flowers from outside. Allow them to do a leaf rubbing or press the leaf on a sheet of white paper. Youth will use their rubbings to inspire them to create their own poem about leaves changing.

- Argumentative writing:
  - Flowers that contain both a pistil and a stamen are referred to as perfect flowers. Study the flowers in the garden to decide which are perfect and which are not. Divide the youth into two groups. One group will convince the scientific community to rename that category of flowers as something different. Their favorite flower only contains one part and you don't think it is fair that they are not called perfect. The other group will come up with an argument for why the category of flower should not be renamed.
  - Have youth research and brainstorm ways to make their school a greener place. Then write a letter to the principal supporting their claim for the school to use greener practices.

- Informative/explanatory texts
  - Propagate sweet potatoes. Read *1905* by Marilyn Nelson
    - Ask youth to get into small groups and to share the words, images, and phrases in "1905" that jumped out at them.
    - What do these words, images, and phrases tell them about George Washington Carver?
    - Explain to youth that George Washington Carver was able to share his farming techniques to those whom were not able to go to college. It is now their job to write their own explanatory text about how to propagate a _____. Using enough details to teach someone who has never had experience with the plant before.

**Media:**

- Read books in the garden!
- Read Tops and Bottoms and discuss what plants in the garden they would want to eat the tops or bottoms of.
  - Turn the story into a play and create props and puppets. Host the play in the garden.
- Read The Bad Seed. What can they create with seeds from the garden.
- Can students come up with their own story about what happens to a seed? or can they come up with a story that has a lesson similar to Tops and Bottoms.

**Technology:**

- Story of a seed. Have students create a film documenting the story of a seed. Where is starts, travels, how it grows, etc.
- Can students build a aquaponics system?
- Have students brainstorm a technology that would help to solve a problem in the garden (sunlight, nutrient deficiency, drought). They could study how much water goes into making each food/ snack that they eat. Then determine ways to reduce the amount of water used in the garden (create a drip system?).

**Art:**

- What artists have used nature to inspire their masterpieces? Have students find a spot in the garden and use locations to inspire them. Encourage students to use the same technique that the artist they studied used.
- Create pinch pots from clay. How is clay beneficial in a garden?
- Have students study the pollinators in the garden. Can students create their own pollinators using seeds, pods,leaves and stems from the garden.

**Music:**

- Have students create instruments using seeds, stems, and pods from the garden.
- Have students sit by the garden and listen to the sounds that they hear in nature. Then have students listen to songs inspired by nature. What instruments did the musicians use? Can they use instruments in the classroom to mimic sounds that they heard?

**Spanish:**

- Have students study the spanish names for the plants in the garden.
- Have the students pretend to be in a spanish cooking show! Use ingredients from the garden to create and explain dishes that they are making.

**PE/Health**

- Study the benefits of healthy foods. Together grow food that they would not typically choose themselves to eat (Kale, beans, radishes). Have students try the foods that you grew.
- Can you create a game that talks about seed dispersion? How do the seeds in our garden disperse? (Wind, animals, water). Use gator balls to represent the seeds. Can they complete an obstacle course to get their seeds across the gym?