Module 1: Radish Module

**Driving Question(s)**

Driving Question: How can we produce crops outside all year long?

Examples of Sub-Driving Questions:

* How do we plan our garden to maximize the harvest of radishes?
* How do we observe the garden and collect information?
* What information should we record in a science notebook?
* How is this project similar and different to what happened to the colonists?
* How can we use math and measurement in gardening?

**Overview**

Students will learn the basics in gardening; planning, planting, watering, mulching, and harvesting using radishes. The students will make observations of their garden and take scientific notes in a science notebook. They will learn the importance of creating diagrams and maps to plan out the garden. Students will practice finding the area and perimeter and using measurement in the garden. Then students will make connections between their experiences and those of early colonists.

This unit should be started as early as possible. It is best to get the seeds in the garden by the middle of August at the latest.

**Major Products & Performances**

Lesson 1: notebook entries

Lesson 2: area and perimeter sheet

Lesson 3: garden map

Lesson 4: diagram and PowerPoint slide

Lesson 5: Venn diagram

Extension: paragraph

Overall: Garden producing mature crops of radishes and collaboration and communication with peers

**Teacher Background**

About the Plants:

Radishes are a quick growing (as short as 20 days) plant with a wide variety of different species. This module suggests using the round or oval radishes that have a quicker growing season. Seeds should be planted about ½ inch deep and 1 inch apart. Gently cover with soil and lightly water. The plants should sprout in 4-6 days. Radishes will be ready to harvest as soon as 3 weeks or up to 6 (depending on the type). The radishes should be harvested when they are young and tender. The longer they are left in the ground the tougher, hot tasting and stringy the radishes will taste. Although not commonly used, radish greens are also edible and are a spicy addition to salads and soups. Suggested Radishes to grow: Rover (21 days to harvest), Ping Pong and Amethyst (26 days to harvest)

Great Resource: <http://aggie-horticulture.tamu.edu/vegetable/files/2010/10/E-516_radishes.pdf>

Setting up the Garden Bed:

Before planting make sure that the soil is moist but not wet. After sowing, make sure to keep the soil moist. You do not want the soil to form a crust or germination will be greatly compromised. A light mulch of moist leaves or organic straw will help keep the soil moist.

For more information on starting a garden visit: <http://anr.ext.wvu.edu/lawn_garden/start_a_garden>

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| Title | Lesson 1: Setting up a Science Notebook |
| Overview | In this lesson, the students will learn about the importance of keeping a science notebook. Students will be introduced to the format of their notebook and the information that must be included (date of entry, observations, and measurements). Students will also practice using descriptive language.  Duration: 1 day but then students will continue note taking throughout the module. |
| Standards | ELA.4.W.C12.1: write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.  21st Century Skills: 21C.O.3-4.1.LS.3  Student articulates thoughts and ideas accurately and effectively through oral, written or multimedia communications. |
| Materials/Advance Preparation Needed | Materials:   * one Science Notebook per student (can be a spiral or composition notebook) * objects to observe (garden bed from the year before, nature area, vegetables from a market, etc.)   Advanced Preparation: There will need to be a lesson on descriptive language to prepare students to use it in their writing. One way to do this would be to provide students with an object and have them describe it. Help guide students to be more descriptive in their explanation and encourage them to use vocabulary that describes the size, shape, and location. Explain to students that they are trying to describe the object in a way to put a picture in the mind of someone else. |
| Procedures/Steps:  (Emphasis on students making inquiry, e.g., posing questions/problems and working towards answers and solutions) | The lesson will start in the classroom. Students will be given their notebooks and told that this is where we will record our observations about our plants. Today we are going to practice making observations with the garden beds that have been growing all summer (or a nature area). The teacher will share that students are to record facts and observations in their notebook. They can also include a section for questions about what is happening in the garden or predictions about what they think will happen the next time they visit the garden. But students should not include their opinions.  Next students will be taken outside to one of the garden beds. Before the students write in their journals we will have a discussion about what we see. Students will be asked prompting questions: What do you see? How can you describe what you see? How can you describe it to someone who can’t see what you are looking at? What are some facts we can collect about the plants (height, how they feel, what they smell like)? What are some things we would not include in our observations and why?  Then students will be given some time (10 minutes) to record their observations. Students will find a place to sit around the garden bed and record their observations about the garden.  Finally, the students will return to the classroom and share their observations with the class. We will discuss parts of the observations that make them strong observations and what we might do to improve our observations.  \* Students will continue to make observations throughout the growing experience. Take students outside weekly to make observations of the garden and record them in their science notebooks. Observation sessions can be 10-15 minutes. Include some time for students to share what they observed. Remind students to include the date and descriptive words about what they observed. |
| Assessment (What will be the evidence of student learning?) | Students understanding of how to set up their scientific notebook and taking notes will be assessed by looking at the students notebooks. Students will be assessed on their use of descriptive language, written observations and statement of facts. |

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| Title | Lesson 2: Area and Perimeter |
| Overview | Students will determine and relate area and perimeter of different shapes.  Duration: 1 day |
| Standards | Math:  M.4.MD.2: use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects and money, including problems involving simple fractions or decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit and represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.  M.4.MD.3: apply the area and perimeter formulas for rectangles in real world and mathematical problems. |
| Materials/Advance Preparation Needed | Materials:   * graph paper * Optional: get maps or blueprints to show students the use of scale   Advanced Preparation: None |
| Procedures/Steps:  (Emphasis on students making inquiry, e.g., posing questions/problems and working towards answers and solutions) | Perimeter:  Ask the students what they can remember about the word perimeter? When we are talking about perimeter, what are we measuring? How do we measure it? How could I find the perimeter of a desk?  Distribute graph paper and have students draw a square that is 2 boxes long and 2 boxes wide. Ask students how long the box is and how wide the box is.  Take the measurements of a student desk and share them with students. Explain to students that we are going to make a scale drawing to represent the desk. Bring up the term scale and explain to students that sometimes maps and blueprints represent something much bigger (this is a great time to show examples of scale used in maps or blueprints). Explain to students that in the case of this practice sheet each box will represent an inch. Work with the students to create a drawing of the desk by asking them what the length and width would be and how many boxes we would need to include.  Then work together to find the perimeter of that shape. Discuss how the perimeter is the measurement around the outside of the shape. The students can count the boxes along the edge of their drawing. Students can also be assisted to come up with a formula to help them figure out the perimeter. |
| Procedures/Steps (continued) | Area:  Ask the students what they can remember about the word area? When we are talking about area, what are we measuring? How do we measure it? How could I find the area of a desk? (Connection can be made to area rugs and the space or area they cover.)  Refer back to the practice sheet and work to find the area of the shape they drew to represent a desk. Be sure to explain to students that they are squaring the units. Explain to students that they are squaring the units because they are multiplying them together (unit x unit = unit squared). Talk about counting the number of squares inside the shape and make a connection to creating an array. Then lead students to develop the formula length x width. Create other sample shapes to work through together.  Connection to Garden:  Explain to students that they can use what they have learned to create a diagram of the garden (what students are doing in the next lesson). Ask students how they could create a map if they knew the area of a space? (Count the number of boxes to equal the area.) Provide the students with a sample area for the garden (example 72 square meters). Have the students work independently to create a shape that has an area of 72 square meters. Then have students find the perimeter of their garden.    Have students get with a group of 3-4 students and share their shape. Ask students to compare the area and perimeter of their shapes. What is the same? What is different? Why do you think that your shapes could have the same area but different perimeters?  Challenge: How many shapes can you create that have a perimeter of 44 meters? (11 shapes) What is different about these shapes?  Discuss with students how they will be using this in the next lesson as they create their garden map. |
| Assessment (What will be the evidence of student learning?) | Students will be assessed through observation of their conversations and explanations of area and perimeter during the group discussion. Students will also be assessed in their use of area and perimeter on the student sheet. |

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| Title | Lesson 3: Creating a Garden Map |
| Overview | Students will create a garden map to help prepare for planting. Students will work to make their map to scale so that they can determine the placement of each seed in the garden. Students will use the map at a later time to plant their seeds.  Duration: 1 day (Can be broken into two days if time is short.) The first day the students could collect the data from the garden and the second day they could make the plan. |
| Standards | Science and Engineering Practices: using mathematics and computational thinking; obtaining, evaluating, and communicating information  Math:  M.4.MD.1: know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec, within a single system of measurement, express measurements in a larger unit in terms of a smaller unit, record measurement equivalents in a two column table, (For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in.) and generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36)  M.4.MD.2: use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects and money, including problems involving simple fractions or decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit and represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.  M.4.MD.3: apply the area and perimeter formulas for rectangles in real world and mathematical problems.  21st Century Skills: 21C.O.3-4.2.LS.1  Student engages, with teacher assistance, in a critical thinking process that synthesizes knowledge and ideas.  21st Century Skills: 21C.O.3-4.2.LS.3  Student engages in a problem solving process that promotes questioning, planning investigations and finding answers and solutions. |
| Materials/Advance Preparation Needed | Materials:   * prepared garden bed, * rulers/yard sticks, * science notebook, * pencils, * graph paper (optional), * seed packets (suggested varieties: rover, ping pong, and amethyst)   Advanced Preparations:  \* Prepare garden bed (built and filled with soil)  \*Possible research about growing radish plants or gardening directions from the seed packet (See background information in the module overview) |
| Procedures/Steps:  (Emphasis on students making inquiry, e.g., posing questions/problems and working towards answers and solutions) | The students will need their science notebooks and a ruler to take outside to the garden bed. Together the students will measure and collect data about the garden (length and width). Make sure to discuss the importance of measuring in centimeter because the science community uses the metric system. This is a great time to review how to use a ruler (make sure you start at 0) and the importance of accurate measurements.  Return to the classroom to have a discussion about the plan for the garden bed. Ask students: How can we use this information to create a scale drawing of our garden? What do we mean when we say scale drawing? Why would it be helpful to have a scale drawing or plan for what we plant? Why can’t we just scatter the seeds into the garden? Where can we get information on how to best plant our seeds? Why do plants need space?  After consulting the information on the seed packet, the students will help to determine how to best create a garden plan. Students will use a ruler to draw a garden bed into their science notebook. The teacher should help the students determine how to create the drawing so that it is to scale and fits on the page (for example: 1mm= 1cm). \*The teacher might want to use grid paper to help the students create their drawing.  Have students calculate the area and perimeter of the garden. Ask students why this information is helpful. Discuss what would happen to the area and perimeter if we changed the measurements of the garden. Then have students discuss with their group where to place the seeds in the garden. Ask groups to sure what they decided. Then as a whole class make a plan for where to plant the seeds. All students will record this information on their garden map. Explain to students that they will be using this plan when they plant their seeds in the garden.  \* Follow up lesson- Take the class outside and have them use their map to plant the seeds in the garden. |
| Assessment (What will be the evidence of student learning?) | Students will be assessed on their completion of the garden map. Students will include measurements and placement of plants on the map. |

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| Title | Lesson 4: All about plants |
| Overview | In this lesson, the students will share what they already know about the parts of a plant. The students will then research root vegetables. The students will create a PowerPoint slide based on their research about the structure and function of the parts of root vegetables.  Duration: 3 days |
| Standards | Science Standard: 4-LS1.1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.  Science and Engineering Practices: Asking questions and defining problems  Reading/Writing:  ELA.4.R.C.1.4: refer to details and examples in an informational text when explaining what the text says explicitly and when drawing inferences from the text.  ELA.4.R.C.1.5: determine the main idea of an informational text and explain how it is supported by key details; summarize the text.  ELA.4.W.C11.1: Conduct short research projects that build knowledge through investigation of different aspects of a topic.  ELA.4.W.C.11.2: recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.  ELA.4.W.C12.1: write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.  ELA.4.SL.C13.1: engage effectively in a range of collaborative discussions with diverse partners on grade 4 topics and texts, building on others’ ideas and expressing their own clearly. |
| Materials/Advance Preparation Needed | Materials:   * computers for research and completing PowerPoint slide, * science materials/books to help with research   Advanced Preparations:   * Mini-Lesson on creating a PowerPoint slide, insert a picture, create a hyperlink to a resource * Mini-Lesson on researching skills, safely using the internet, how to determine if your source is good and reliable |
| Procedures/Steps:  (Emphasis on students making inquiry, e.g., posing questions/problems and working towards answers and solutions) | Day 1: As a class discuss what the students already know about plants. Ask students: What are the parts of a plant? How do these parts help the plant survive? What parts do all plants have in common? What parts might be different?  Explain to students that we are going to be researching root vegetables. Ask students to think about what they may know about root vegetables. Explain to students that they will be working in a small group to research something about plants and creating a PowerPoint slide to share what they have learned. Ask the students what type of information should be included on this slide. Together the students should come up with a list of criteria (example criteria might include; slide title, at least 3 facts, a picture, and the source for the information). Discuss that the focus will be on the internal and external structure and discuss how this will help the plant grow and survive. Then place students into small groups (2-3 students) and provide them a topic to research.  Example topics: roots, examples of root vegetables, stem, leaves, how it produces food, where it stores its food, what season it best grows in, etc. The teacher might also want to include some topics on other types of plants (some examples include: tubers, stalk vegetables, onions, cabbages, salad greens, inflorescent vegetables, beans, peas, fruit vegetables, cucurbits) so that the students can compare them to root vegetables.  Allow students some time to start their research.  Day 2: Students continue to work on research and prepare create their slide(s).  Day 3: Students present to their classmates. At the end of the presentation the students could write in their science notebooks about what they learned. |
| Assessment (What will be the evidence of student learning?) | Students will be assessed through observation of their group work skills and completion of their PowerPoint slide. Students will be assessed according to the criteria that they developed about what information should be included in their PowerPoint. Students will also be assessed on their presentation of their slide. |

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| Title | Lesson 5: Colonial comparison |
| Overview | In this lesson the students will compare their experience gardening with that of the colonists. The students will create a Venn-diagram to compare gardening now and then.  Duration: 1 day |
| Standards | Social Studies:  SS.4.H.CL1.2: compare and contrast community life, family roles, and social classes in colonial America.  SS.4.H.CL1.3: compare and contrast backgrounds, motivations, and occupational skills between English, French and Spanish settlers (e.g. economics, culture, trade, new agricultural products, etc.)  Reading/Language Arts:  ELA.4.R.C.1.6: explain events, procedures, ideas or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the informational text.  ELA.4.R.C3.5: integrate information from two informational texts on the same topic in order to write or speak about the subject knowledgeably.  Writing:  ELA.4.W.C.11.2: recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.  Speaking and Listening:  ELA.4.SL.C13.1: engage effectively in a range of collaborative discussions with diverse partners on grade 4 topics and texts, building on others’ ideas and expressing their own clearly. |
| Materials/Advance Preparation Needed | Materials: Venn-Diagram  Advanced Preparation: Students will need background information on the lifestyles in the thirteen colonies. |
| Procedures/Steps:  (Emphasis on students making inquiry, e.g., posing questions/problems and working towards answers and solutions) | Activate prior knowledge that students have about studying life in the colonies. Ask students what they remember about life in the colonies? Where did they get their groceries? How did they preserve their food? What do we know about their jobs? Lifestyles? Farming?  Then tell students that they are going to use a Venn-diagram to compare and contrast our gardening experience with that of the colonists. Have students spend some time brainstorming on their own as they work on their graphic organizer. Then have the students pair up or get into small groups to discuss and add to their graphic organizer.  Bring the whole class back together and discuss the information students came up with. |
| Assessment (What will be the evidence of student learning?) | Completion of student Venn-diagram and participation in small group and whole class discussions. |
| Title | Optional Extension: Pickled Radishes |
| Overview | After you have a plentiful harvest of radishes it will be time to do something with the crop. It is a good idea to cut some up and have the students taste them, but chances are you will have more radishes than the kids will want to eat. In this lesson the students will complete some research on different radish recipes and then give them a try. |
| Standards | Reading/Language Arts:  ELA.4.R.C3.3: interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the informational text in which it appears.  ELA.4.W.C9.1: Write opinion pieces on topics or texts supporting a point of view with reasons and information. |
| Materials/Advance Preparation Needed | Materials:   * plastic bowls and spoons (no aluminum should be used when pickling), * knives or slicers (great to have parent volunteers help with this), * measuring cups and spoons, * jars, * ingredients for student recipes might include: garlic cloves, vinegar (regular and apple cider), salt, pepper, sugar,   Advanced Preparation: Have jars cleaned and ready to go. Ask for a few parent volunteers to come in and help supervise the students. You might want to select recipes for the students and have them ready before hand. There are some recipes that require cooking but several are just mixing. |
| Procedures/Steps:  (Emphasis on students making inquiry, e.g., posing questions/problems and working towards answers and solutions) | Put students into 4 or 5 groups and have them search for a pickled radish recipe (you might want to find a few and allow students to pick from the options). The students will then provide the recipe and a list of supplies.  \*\*Some sample recipes:  From: [www.epicurious.com/recipes/food/views/Pickled-Radishes-366455](http://www.epicurious.com/recipes/food/views/Pickled-Radishes-366455)  Ingredients: 10 red radishes, quartered; 10 garlic cloves; 1tsp whole black peppercorn; 2 cups white vinegar; 1tsp kosher salt; 1 tsp sugar  Directions: Combine in 1 quart jar, shake until salt and sugar begin to dissolve and refrigerate at least 3 days.  From: [www.bhg.com/recipes/how-to/cook-with-fruits-and-vegetables/how-to-pickle-radishes/](http://www.bhg.com/recipes/how-to/cook-with-fruits-and-vegetables/how-to-pickle-radishes/)  Ingredients: 2 cups radishes thinly sliced; 1 small onion thinly sliced; ½ cup white vinegar; ½ cup sugar; 1-1/2 tsp salt (optional: 3 heads fresh dill weed)  Directions: Mix radishes and onions separately. Then mix the rest of the ingredients and pour over radish/onion mix. Refrigerate for at least 8 hours and eat within 3 days.  From: <http://foodformyfamily.com/recipes/quick-and-easy-pink-pickled-radishes>  Ingredients: 1 pound of radishes thinly sliced; 1 cup vinegar (any variety); ½ cup cold water; 1-2 tbsp honey or sugar; 2 tsp sea salt; 1 clove garlic sliced  Directions: In a sauce pan combine all ingredients except for the radishes. Stir and bring to a boil then remove from heat. Pour in a jar over radishes and cover. Allow to cool and then refrigerate. Use in the next 10 days.  Once you have all the supplies the students need, students will be able to follow their recipe and create a pickled radish recipe. Students will work in groups to follow the directions on the recipe and prepare their radishes (this is a great opportunity to get some parent volunteers involved).  Allow radishes to marinate for a few days (the longer the better) in the fridge.  Then bring out the radishes and have a class taste test. Set up the four/five different types and label them A-E. The students will taste the different types and then write a review for their favorite one. This is a great opportunity to use descriptive words and vivid vocabulary to explain what makes one recipe better than the rest.  \*\* Possible extension: Students could create an advertisement for their pickled radishes. |
| Assessment (What will be the evidence of student learning?) | Student’s participation in the activity and their descriptive paragraph about their favorite recipe. |