Grade Level	Content Area	Unit Title
4th Grade	Science Standards for the Inquiry Process: Scientific Testing	Building Our Vegetable Garden

Length of Unit	Time of Year Taught	Expected Prior Knowledge
2 Weeks plus ongoing observations	1st Quarter	Students will be expected to have a basic understanding of measurement along with the concept of identifying the meaning of a value and tools used to measure.

Unit Description

Summary: Within this unit, students will identify the importance of accurate measurements and selecting appropriate tools. The students will begin by comparing seeds to the fruit which the plant produces. The focus will be on length and mass/weight. The students will then be split up into subgroups that are all researching and designing our vegetable garden. The students will research the measurements needed for their specific plant to grow: row spacing, plant spacing, and depth. The groups will come together to plan a garden layout and then construct the garden. The unit will continue throughout the year as the students write in their journal a variety of measurements as their plants grow.

Standards: See instructions on page 14.	Strand 1: Inquiry Process Concept 2: Scientific Testing Performance Objective 4: Measure using appropriate tools (e.g., ruler, scale, balance) and units of measure (i.e., metric, U.S. customary).
Summative Assessment *Students will take a twenty question assessment that will require the students to identify measuring tools and units, along with accurately measuring a variety of items.*	The summative assessment focuses on identifying the units of measures and tools that we use during experiments. The first part of the assessment focuses on the identification of units and tools while the second part requires the students to select the appropriate tool to measure an item based on the desired unit.
Scoring for Summative Assessment *Since each question is worth one point, students need to correctly answer 16 questions to show mastery.*	Summative Assessment Scoring: 16 – 20 = Mastery 12 – 15 = Approaches 14 > = Falls Far Below Each question is worth 1 point.

Materials/Resources Needed	Laptops Rulers Measuring tapes Yard sticks Meter sticks Scales Balances Garden tools Shovels of different sizes & rakes Area of land for our garden Interactive Science Journals Seeds & the fruit produced A variety of shapes and sizes Seed packets Chart paper Seed & Fruit Comparison Chart Graphing paper Customary & Metric System Unit Worksheet

	Lesson 1	**Lesson 2**	**Lesson 3**	**Lesson 4**	**Lesson 5**	**Lesson 6**
Instruction and Timeline	Opening Question: How do we know that the measurements we make are accurate? The students will be given five minutes to discuss the opening question and use prior experiences to develop an opinion. The teacher will construct a KWL	Opening Question: How and why do we give measurements meaning? The teacher will post 8 situations around the room. Here is an example of a situation: "Maggie is so excited on going on her all day hike. She packed her backpack, filled up her water bottled,	Opening Question: Will the size of a plant seed determine how big the fruit which is produced will be? The teacher will setup the classroom with numerous measuring stations. Each station will be supplied with rulers, measuring tapes, yard sticks, meter sticks, scales, and	Opening Question: Using measurements, how do we make sure that we provide ideal conditions for our plants to grow? The students will return to their original group from the experiment to begin researching plants for the vegetable garden. The teacher will	Opening Question: How can we layout our garden so the plants from each group will grow? The teacher draws a diagram of the land for the garden on the board. He/she discusses the importance of maximizing the amount of land and how this layout is	Construction and ongoing observations: The student foreman (with support from the teacher) will direct the class and lead them in the construction. The students will first have to dig up the area and prepare the land. The will seek assistance from the maintenance crew to help in the initial

	chart and begin filling in the columns based on the opening question. Students will be chosen at random and discussions will stem from the students' ideas. The students will take out their journals and take notes based on the teacher's modeling lesson on using appropriate tools and units of measure. The teacher will model how to accurately use each measuring tool. First, the teacher will hold up ruler. He/she will think aloud the process of examining a ruler and demonstrating the proper procedure for measuring. The importance of accuracy and the proper technique will be stressed throughout the modeling process.	and put on her sunscreen. She knows it will be tough but she is so excited to go on her 5 _____ hike." Each situation will range in the type of measurement being described. The students will be broken up into groups of 8 and will spend 1 minute at each station. After the groups discuss each station, they will return to their seats and the teacher will begin the lesson on units of measure. Referring back to the question: "How and why do we give measurements meaning?", the teacher will present each situation. He/she will elicit ideas from random students about what words they used to fill in the blanks. The teacher will stress the importance of units of measure and how the meaning	balances. A variety of seeds and fruit will be placed at each station for the experiment. The students will be broken up into groups of four students and given the <u>Seed & Fruit Comparison Chart</u> to glue into their journals. They will be directed with the instructions and expectation of the lab. The students will be focused on comparing the length, width, and mass/weight of the seeds to the fruit which they produce. The students will be able to use the appropriate measuring tools for each specific measurement to complete the chart. The teacher will monitor and question the students. The goal will be for the students to justify the units and tools	explain that each group will be responsible for one type of vegetable in the garden and they will track the growth of the plants throughout the school year. Mini-lesson: Students will discuss in partners what plants need to survive. They will come up to the front an write their ideas on chart paper. After the students have been given ample time to write down their ideas, the teacher will go into important measurements plants need when designing a garden: row spacing, plant spacing, and planting depth. The teacher and students will draw examples of these concepts and discuss their importance. The students are directed to begin researching vegetables that grow	like putting pieces of a puzzle together. A member of each group will come up and write down the plant they chose along with the measurements need for the plant to grow. After each group has come up to the board, the teacher will give everyone graph paper. Their task will be to draw a garden layout that will allow for every group to have space for their plants. He/she reminds them to think about row spacing, plant spacing, and how many plants each group will have. After students are given plenty of time to sketch out a design, the students will walk around the room discussing the designs. The teacher will select the top designs and the class will vote on their favorite design. The winner	portion of the construction. After the ground is prepared, the students will measure off the rows and other measurements needed to prepare for planting. The foreman will go around and make sure each group is aware of what area of the garden is theirs. The groups will take their seed packets and measure out their area for planting. They will make sure they have spaced the plants out to the correct distance and depth. The teacher will monitor and question students ensuring accuracy of all measurements being done. After construction is complete, the students will take the summative assessment. Ongoing: Once the plants

	The teacher will then pose the question for the students to share with their shoulder partner: "We use a ruler to measure _____?" After sufficient wait time, the teacher will randomly call on students to share their discussions. The responses will be recorded on chart paper to refer to as the unit progresses. This process will be done for multiple measuring devices: balance, scale, measuring cups, and thermometers. At the end of the process, the teacher will post the charts of the measuring tools on the wall which will include multiple measuring tools and what they are used to measure. Ticket out the door: The teacher will prompt the students to write a reflective summary based on	changes based on the units. The teacher will post the units of the customary system and the metric system. The class will be led in a discussion on the characteristics of each system and their relationship. The probing questioning is essential for the students to build their level of understanding on not only what the units of measure are but why is accurate use of the units essential in everyday life. Independent practice: The students will be given a basic US Customary and Metric system worksheet where they will label correct unit of measure for multiple measurements along with what units go with each measuring	along with how they are maintaining accuracy in their measurements. Closure: Each group member will receive a number 1-4. New groups will be formed based on the numbers they were given. The new groups will be used to discuss and reflect on the experiment. The students should be talking about these two questions: "How do we know that the measurements we make are accurate?" and "Will the size of a plant seed determine how big the fruit which is produced will be?" After giving time for each group member to share, one representative from each group will summarize their discussions for the entire class.	in Arizona and the space needed to be successful. As a team, each group will decide on what plant they want and gather the information on row spacing, plant spacing, and planting depth. They will meet with the teacher to discuss their ideas and get approved. Closure: The students will write a ticket out the door on why it is important to accurately measure out our garden.	will be foreman for the construction of the garden. Closure: In their journals, students will reflect on the research and planning it takes to build a successful garden.	begin to sprout, the students will record the growth of their plants in their journals. In the beginning, they will measure stem length and thickness, along with the size of the leaves. The students will also be measuring the weight/mass of the leaves and fruit produced by the plants. This lesson/garden will be utilized as a learning tool for the rest of the school year and beyond.

	the opening question. The teacher will review the summaries to track student understanding and look for areas of remediation and re-teaching.	tool.				

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Student Activities	The students will discuss the focus question of the lesson: *How do we know that the measurements we make are accurate?* With student to student and student to teacher interaction, the class will develop a KWL chart that drives the initial ideas and promotes inquiry towards our objective. The students will be actively observing the modeling of each measuring tool. The students will	In their groups, the students will rotate from station to station discussing what needs to go in the blank for each situation that will make the scenario accurate. After completing all stations, the students will share their ideas to the class and discuss the importance of units of measure. The students will then be lead in a class discussion "how and why do we give measurements meaning?" The teachers will be encouraged to	The students will complete a lab which will focus on the measuring of plants seeds and their fruit to determine if there is a correlation between the two. Students will select appropriate measuring tools and units to represent the accurate measurements they record on their <u>Seed and Fruit Comparison Chart</u>. After the completion of the lab, the students will be broken up into different groups of four so they can discuss and reflect on the experiment.	The students will research plants of Arizona and the ideal conditions for them to grow in. The emphasis of the research will be on row spacing, plant spacing, and planting depth. The measurements need to include accurate units to develop a layout for the class garden. Closure: The students will write a ticket out the door on why it is important to accurately measure out our garden.	After sharing the plant each group wants to include in the garden, students will draw out a design for the layout of the garden. They will need to make sure that the measurement requirements for each plant are taken into consideration. At the end of class, the students will vote on the winning design. Closure: In their journals, students will reflect on the research and planning it takes to build a successful garden.	The construction of the garden begins. The students must use the knowledge gained from the previous lesson to accurately measure the design of the garden and select the appropriate tools. The garden will serve as a place for the students to continue practicing measuring and selecting units that will represent accurate measurements of stem length and thickness, along with the size of the leaves. The students will also be measuring the weight/mass of

	take down notes in their journal and write key information from the think aloud. After each tool is presented the students will discuss with their shoulder partner all the uses of the tool. The students will share responses to the teacher to develop the measuring tool charts. The students will write down the responses in their journals to have a reference guide with them at all times. Ticket out the door: The students will write a reflective summary based on the opening question: How do we know that the measurements we make are accurate?	expand their thinking on the US Customary System and Metric system through teacher-led probing questions. The students will be writing their thoughts in their journals. After the discussion, the students will complete the US Customary and Metric System worksheet that focuses on the different units of measure and how the units relate to the measuring tools discussed in the previous lesson.	After giving time for each group member to share, one representative from each group will summarize their discussions for the entire class.			the leaves and fruit produced by the plants.

Summative Assessment

Mastery 16 / 20

Each question is worth 1 point.

Name 3 tools we use to measure length:

1. _____
2. _____
3. _____

Name 2 tools we use to measure mass/weight:

4. _____
5. _____

Name the units of measure for length:

US Customary	Metric
6.	10.
7.	
8.	
9.	

Name the units of measure for mass/weight:

US Customary	Metric
11.	14.
12.	
13.	

On your table you have 4 different items. Using your measuring tools, accurately measure the item based unit desired.

15.	Jumbo paper clip	mm
16.	Penny	g
17.	Pen	Inches
18.	Length of a large index card	cm

Steve is observing the life cycle of cockroaches. In his journal, he tracks the length the cockroaches grow every 2 days and how much weight they gain. His teacher reminds him how important it is to find accurate measurements. In order to accomplish this, what are the two most important aspects of measurement Steve needs to keep in mind?

19. _____

20. _____

Summative Assessment – Answer Key

Mastery 16 / 20

Each question is worth 1 point.

Name 3 tools we use to measure length:

1. __ruler_____
2. __yard stick or meter stick____
3. __measuring tape_____

Name 2 tools we use to measure mass/weight:

4. ___scale_____
5. ___balance_____

Name the units of measure for length:

US Customary	Metric
6. inches	10. meters
7. foot or feet	
8. yards	
9. miles	

Name the units of measure for mass/weight:

US Customary	Metric
11. ounces	14. grams
12. pounds	
13. tons	

On your table you have 4 different items. Using your measuring tools, accurately measure the item based unit desired.

15.	Jumbo paper clip	52 mm
16.	Penny	Range from 2.42 – 3.18 g
17.	Pen	6 inches
18.	Length of a large index card	15.2 cm

Steve is observing the life cycle of cockroaches. In his journal, he tracks the length the cockroaches grow every 2 days and how much weight they gain. His teacher reminds him how important it is to find accurate measurements. In order to accomplish this, what are the two most important aspects of measurement Steve needs to keep in mind?

19. __appropriate unit of measure_____

20. __appropriate measuring tool_____