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Unit Title: Plant Growth and Development	**Content Area:** Life Science	**Grade Level:** 3

Unit Summary: Students plant their own seeds to begin an eight-week inquiry into the life cycle of a simple plant, the Brassica rapa, in Plant Growth and Development. Using plants that complete their life cycle in 35 days, students are able to watch germination and maturation while learning about the specific parts of a plant and the function each serves. Because they care for their own seedlings, students learn that plants need light, soil, nutrients from soil and water to survive. In addition, students use dried bees to simulate the pollination process to understand the interdependence of bees and flowers. These activities deepen their understanding of the characteristics of living organisms and their relationship with and dependence
on the environment in general. Throughout this unit, students are asked to use their observation and recording skills, complete and analyze data tables, use simple tools, draw diagrams and apply scientific vocabulary.

The Cross Cutting Concepts presented throughout the Unit are patterns; cause and effect.

Scientific Practices that students will engage in are asking question and defining problems; developing and using models; engaging in argument from evidence; and obtaining, evaluating, and communicating information.

Unit Essential Questions:

What is inside a seed?

Unit Enduring Understandings:

- Seeds are made of internal and external structures that are essential to the development of a plant.
- Changes organisms go through during their life form a pattern.
- To live and grow, plants need light, water and nutrients from the soil.
- Many plants follow a life cycle that begins with growth from a seed and proceeds through the production of seeds.
- Gardening techniques provide the best possible growing conditions (ensuring that each plant will have ample space, light, food, water, and air circulation) so that plants thrive and produce the highest possible seed yield at harvest time.
- Organisms have distinctive stages in their life cycle that occur over time. Patterns are the similarities and differences in traits shared between offspring and their parents
- Predicted future growth can be made from observations and measurements. Changes organisms go through during their life form a pattern.
- Flowering plants must be pollinated in order to produce seeds. Many plants are pollinated by bees. Bees form colonies that help members survive. Many plants are pollinated by bees.
- A flower's pollen sticks to a bee, but some rubs off when the bee feeds at other flowers. Being part of a group helps animals (bees) obtain food, defend themselves, and cope with changes.
- Groups may serve different functions and vary dramatically in size.
  A symbiotic relationship in nature is a close union of dissimilar organisms. Some are mutually beneficial, where each partner is dependent on the other.
- After fertilization, there is very little upward growth because the plant expends its energy on seed production. Variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
- Plants and other organisms are part of an organized system that regulates their life cycles and their interactions with the environment. Developing and using models help make sense of phenomena.
- One seed produces one plant; one plant can produce many seeds.

Possible Student Misconceptions:

- The majority of students do not realize that seeds meet the criteria under living things, plants do not need air to survive, plants do not use oxygen, seeds need light in order to grow and that the only

factors that are necessary for a plant seed to germinate (sprout) are water and a certain temperature range.

- Students also may not recognize that trees, vegetables, and grass are all plants.
- In addition, students tend to believe that the only essential constituents that plants need in order to grow are: water, light, and nutrients from the soil or medium in which they exist.
- Although photosynthesis is recognized as a plant function, students still maintain the idea that plants obtain their food from their environment.

NJCCCS: 5.3.4.A.2, 5.3.4.E.1, 5.3.4.D.1

- **NGSS Performance Expectations:** *Students who demonstrate understanding can…*
- 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death.
- 3-LS2-1: Construct an argument that some animals form groups that help members survive.
- 3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
- 3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.
- 3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates and reproducing.
- 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Primary CCSS ELA/Literacy Connections: RI.3.1, RI.3.3, RI.3.4, RI.3.7, W.3.2, W.3.4, W.3.8, SL.3.1, SL.3.2, SL.3.5, SL.3.6

Primary CCSS Mathematics Connections: 3.OAD.8, 3.OAD.9, 3.NF.1, 3.NF.3, 3.MD.3, 3.MD.4

Lesson Pace & Sequence

Lesson Title/Number: Pre-Unit Assessment: What do you know about Plants?/Lesson 1	**Learning Objective(s):** TLWBAT make predictions about a bean seed and give reasons for their predictions using their observations.	**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Ask students to reflect on how much they already know about plants (schema) and what they would like to learn.				
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Think, Pair, Share: Students will first think/brainstorm about something they already know and what they would like to learn about plants. Students will then pair up with a peer and exchange their thoughts as teacher circulates the room. Finally, students will be asked to share their prior knowledge and learning interests on plants while teacher documents student responses on newsprint. Student responses that go under the category of "What We Know"	• 2 large sheets of newsprint (Label first newsprint "What We Know About Plants" and the second newsprint should be labeled as " What We Would Like to Know about Plants") • Markers	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. -Use evidence (e.g., observations, patterns) to		

	must be supported with evidence.		support an explanation. (3-LS3-2) -Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		
Explore: What hands-on/minds-on common experience(s) will you provide for students?	In order to practice observation skills, students will be given a bean seed. Students will be reminded that scientists don't just use equipment to study their cases. Sometimes scientists use their five senses to observe their subjects. For this study, students will be asked to use their eyes, nose and finger to observe the dry bean seeds.	• 1 dry lima bean seed per student • Pencils (1 per student) • 1 hand lens for every students			
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students will have the opportunity to record their seed observations under the section entitled, "Dry Bean." Students will be informed that it is important that their observations are documented because the final part of the lesson will be to soak the seed in water. Therefore, it is important to have a record of what the seeds were like when they were dry.	• 1 copy of Activity Sheet (Recording Chart for Seed Observation) found in TG page 8			Patterns: -Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Now that students have observed the bean seed, they will be reminded that a "prediction" is not just a guess. It is based on observations, experiences or scientific reasons. Students are informed that their beans will sit in water overnight. Teacher will ask students to make a prediction of what they think will happen to the seeds and give reasons for their predictions. Predictions will be recorded on newsprint paper.	• 1 large sheet of newsprint paper labeled "Predictions"	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. -Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-		Patterns: -Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) -Patterns of change can be used to make predictions. (3-LS1-1)

			2) -Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Recording Chart for Seed Observations (Activity Sheet 1) found in TG on page 8			LS3.B: Variation of Traits: -Different Organisms vary in how they look and function because they have different inherited information, (3-LS3-1) -The environment also affects the traits that an organism develops. (3-LS3-2)	
Extend: How will students deepen their conceptual understanding through use in new context?	Students can conduct a seed survey at home by trying to find various seeds or seed products at home and sort them based on their similarities. Students can bring the list to class and share some of the examples they found. This list will vary, but some examples of seeds and seed products are oats, peas, beans, coffee, peanut butter, corn chips, mustard, sunflower seed oil and chocolate.				Patterns: -Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

Lesson Pace & Sequence

Lesson Title/Number: What is inside a Seed?/Lesson 2 Day 1	**Learning Objective(s):** After the read aloud, "A Seed is Quiet" and an introduction to the lesson vocabulary, TLWBAT describe and identify the internal structures of a bean seed.	**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Briefly review the 5 senses with the class and discuss each of the senses that were used with the dry bean seed and what it communicated about the seed.				

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will engage in the reading aloud of, "A Seed is Sleepy" by Dianna Hutts Aston. In this text, the author tells the reader ten things that a seed is.	• "A Seed is Sleepy" by Dianna Hutts Aston			
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Talk about the adjectives that the author used to describe the seeds and what they mean as well as the pictures they create in the students' minds. Create a graphic organizer on large newsprint and document the adjectives. As whole group, discuss the following questions: Can any of these adjectives be used to describe the dry bean seed? What adjective can the students add to the list?		Scientific Knowledge is Based on Empirical Evidence: -Science findings are based on recognizing patterns. (3-LS1-1)	LS3.B: Variation of Traits: -Different organisms vary in how they look and function because they have different inherited information. (3-LS3- 1)	Patterns: -Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) -Patterns of change can be used to make predictions. (3-LS1-1)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Teacher will display Figure 2-1 and explain to students that all seeds have two main parts: the embryo and the cotyledon. Teacher will discuss the meanings of these two terms as well as the roles that the seed coat and leaves play at this stage.				
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	After reviewing the new vocabulary for this Unit, the words will be added to the Science Word Wall. Teacher will then divide students into four groups. Each group will receive Figure 2-1, but this time without the vocabulary words. Students will then use their newly acquired vocabulary to label Figure 2-1 appropriately.				
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Each group must submit Figure 2-1, fully labeled				
Lesson Pace & Sequence					

Lesson Title/Number: What is inside a Seed?/Lesson 2 Day 2		**Learning Objective(s):** TLWBAT observe and record how a bean seed changed after being soaked in water overnight as well as identify the two main internal structures.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Teacher will display the "Predictions" newsprint that had the student ideas of what would happen to the bean seeds after being soaked overnight. The predictions will be discussed briefly.	• "Predictions" newsprint from Lesson 1			
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Teacher will inform students that today they will be using as many senses as possible (except for taste) to observe the soaked seeds. They will also have a dry seed so that they can compare it too.				

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students are then asked to record their new observations of the outside soaked seed on Activity Sheet 1. Students peel off the seed coat and gently pry open the two halves of the seed. Teacher will circulate the room to ensure all students are locating the two main structures (embryo and cotyledon).	• Activity Sheet 1 (Recording Chart for Seed Observations) • Soaked been seeds • 1 dry seed • 1 paper towel • Student Science Binders/Notebooks • Student hand lens for every two students	Analyzing and Interpreting Data: Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. -Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)	LS3.B: Variation of Traits: -Different organisms vary in how they look and function because they have different inherited information. (3-LS3- 1) -The environment also affects the traits that an organism develops. (3-LS3-2)	Cause and Effect: -Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2),(3-LS4-2)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Teacher will pass out the extra seeds to give students a second chance to dissect. Students will now have the chance to replicate their findings just as real scientists do. Students will then draw what they saw on their observation sheets.	• Activity Sheet 1 (Recording Chart for Seed Observations) • Extra soaked bean seeds • 1 Dry bean seed • 1 Paper Towel • Student Science Binders/Notebooks • Student hand lens for every two students			:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	The Recording Charts for Seed Observations will be used to assess student progress. Drawings and Observations will be evaluated based on clarity, completeness, accuracy, and the appropriate use of vocabulary.	• Activity Sheet 1 (Recording Chart for Seed Observations)			
Extend: How will students deepen their conceptual understanding through use in new context?	Project overhead transparency (Figure 2-2) and explain that it is an example of a scientific drawing. Ask students to point out the features that make it a good, clear, complete and accurate picture of a plant.	• Overhead Projector • Transparency of Figure 2-2			

Lesson Pace & Sequence

Lesson Title/Number: Planting the Seeds/Lesson 3 Day 1		**Learning Objective(s):** After a discussion on how our actions could affect our seeds, TLWBAT explain how certain changes can occur based on cause and effect relationships.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Students will be asked to list supplies that could be used to plant seeds. Once students have volunteered a few responses, they will be reminded that in order for seeds to grow into healthy plants, it is extremely important that the supplies are used responsibly and that the planting process is done correctly. The way in which we design our plant trays directly affects our seeds development.	• Whiteboard/chalkboard to write down student responses			Cause and Effect: -Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2),(3-LS4-2)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will be asked the following questions orally: What can occur if the planters are not appropriately set up? How could the seeds be affected? What would happen if they received too much of one element and not enough of another?				Cause and Effect: -Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2),(3-LS4-2)

Explore: What hands-on/minds-on common experience(s) will you provide for students?	The teacher will distribute "Activity Sheet 2." the planting instructions and checklist. Review the lists with the class so that they become familiar with the process. Bring students to the "Distribution Station" and pick up their supplies. Once students have picked up their supplies, they will return to their seats and check off the items they have received to ensure they are ready to begin. Circulate the room and ensure that students are progressing well as they set up their planters. Students will only be completing Steps 1-5 of Activity Sheets 2. Once completed, students will begin to clean up their work area and return supplies.	-Activity Sheet 2 " How to Plant Wisconsin Fast Plants Seeds: Instructions and Checklist on pages 20-23 in TG -1 Planter Quad - 4 Wicks - Potting Mix - 12 Fertilizer Pellets -Forceps -1 Spoon	Developing and Using Models: Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop models to describe phenomena. (3.LS.1)	LS3.B: Variation of Traits -Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1). The environment also affects the traits that an organism develops. (3-LS3-2)	
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students will be evaluated on their abilities to follow a written set of instructions to perform a task.				

Lesson Pace & Sequence

Lesson Title/Number: Planting Seeds/ Lesson 3 Day 2		**Learning Objective(s): TLWBAT**		**Lesson Duration: 50 minutes**	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?					

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Gather students and read aloud, "Fast Plants for Fast Times" as they follow along. Have students mark up the text so that they can easily see parts of the text that had words or phrases that confused them. Pick three or four of those words and have students predict what the word means based on text clues and hold a discussion with the class to properly define the terms.			LS1.B: Growth and Development of Organisms: Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.A: Inheritance of Traits: Many characteristics of organisms are inherited from their parents. (3-LS3-1) Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2) LS3.B: Variation of Traits: Different organisms vary in how they look and function because they have different inherited information. (3-LS3- 1) The environment also affects the traits that an organism develops. (3-LS3-2) LS4.B: Natural Selection: Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)	

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Have students share what the procedure was at each of the stations. Students will then take out their checklists, planting instructions and Activity Sheet 2. Students will get their supplies and this time complete steps 6 - 11 of the Checklist.		Developing and Using Models: Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop models to describe phenomena. (3-LS1-1)		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students will make predictions about their seeds. Students will log their predictions into their Science Notebooks/Binder so that they can be reviewed in the future.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	The students'' ability to make a reasonable prediction of what will happen to the seeds based on previous observations and experiences. Students must use evidence (from their observations, etc.) to support their predictions.				

Extend: How will students deepen their conceptual understanding through use in new context?	Plant a few "normal" seeds to serve as comparisons to the Wisconsin Fast Plants.				
Lesson Pace & Sequence					
Lesson Title/Number: Thinning and Transplanting/Lesson 4		**Learning Objective(s):** TLWBAT draw and label one of their uprooted seedlings and document their observations in their Science notebooks.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Teacher begins lesson by stating that, as gardeners, there are two important techniques that we must do to help maintain a healthy garden. Teacher will then write the words "Thinning" on one side of the board and "Transplanting" on the other side, Students will be asked to generate some ideas/predictions as to what these words could mean and how they relate back to their seeds. Responses will be documented on the board.				Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Teacher will play a video clip that explains the thinning and transplanting of a seedling with a spinach plant. How to Thin and Transplant Young Seedlings http://youtu.be/AMaWKAiuM4E Help students see that the purpose of thinning and transplanting is to improve growing conditions for the plant. Students will be told that the work they are about to perform requires a lot of care because the less amount of time a plant is in transit, the lower the risk of root damage .				
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will be allowed to decide how they would like to thin their seedling (pinching, cutting or pulling them up from the soil line). After they have thinned their seedling, they will transplant their plant into a new cell. Once the students have chosen a technique, students will begin task.	-1 student notebook -1 toothpick - 1 pair of scissors -1 hand lens for every two students -1 forcep for every two students -Potting mix -Surplus planter quads -several small containers for the class plot -Wicks for the above containers		LS3.B: Variation of Traits: The environment also affects the traits that an organism develops. (3-LS3-2)	

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Class Discussion: Closing discussion focusing on observations of individual differences in seedlings that are exactly the same age. Require students to use claims and evidence from the two tasks.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	The quality of the notebook entry will be reviewed by teacher. The notebook entry should have: -a complete drawing -descriptive word usage -date -age of the seedling -evidence to support any claims made				
Extend: How will students deepen their conceptual understanding through use in new context?	Save some of the leftover plants to use in the pollination lesson. They can be used as a "control" to see what happens when pollination does not take place.				

Lesson Pace & Sequence

Lesson Title/Number: How Does Your Plant Grow?/Lesson 5	**Learning Objective(s):** TLWBAT measure the height (in centimeters) of their seedling and use graphing skills to record results.	**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Class Discussion: Students will be asked if they have ever used a graph before. Students will orally list the types of graphs they used, what they were used for and where they think the information used in graphs comes from.				
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will be asked if they have ever put on a pair of pants that used to fit really well and then all of a sudden were too short at the bottom. Teacher will inform the class that this is the period in their plants life where they will be growing the most! This means that they should measure their plant frequently during these first 18 days of the cycle. The measurements between Day 9 and Day 13 will be the most dramatic because, just like people, they will be going through their growth spurt.				

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will use pre-cut strips or centimeter cubes to measure the height of plants. After marking the height of the plant by drawing a line on the strip, students will double check their measurements by re-measuring for accuracy. Students will then cut off the darkened square and lay the strip on the sheet of graph paper above the correct day number and paste it in place. (See Figures 5-1, 5-2 in TG)	-1 Quad of plants -1 ruler (centimeters) -1 sheet of centimeter graph paper -1 strip of paper precut to 1 centimeter wide -1 pair of scissors -1 student notebook - 1 bag of 500 snap together centimeter cubes -glue -crayons		LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.A: Inheritance of Traits: Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2) LS3.B: Variation of Traits: The environment also affects the traits that an organism develops. (3-LS3-2)	Patterns: -Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) -Patterns of change can be used to make predictions. (3-LS1-1)
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Read aloud "Making Food out of Air" to the class. Using the information from the text, have students answer the following: Explain the importance of light to the existence of all life; give an example of how an organism is dependent on another organism; describe the pathways of sunlight, water and air in the process of photosynthesis.	STC Literacy Series™, Plant Growth and Development, Making Food Out of Air, p. 28, Regions and Seasons, p. 9-11	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students should be able to interpret their own graph. Do they understand the purpose of the title? Can they read the two coordinates?				
Extend: How will students deepen their conceptual understanding through use in new context?	Ask each student to cut and color a second strip representing the plant's height. Have one student collect these strips and sort them by height. Then set up a class graph showing number of plants and their height in centimeters on that day. Ask students to explain why all the plants are not exactly the same height even though they are the same age. Relate ideas about plants' heights to the range of student's heights in the classroom. Talk about normal variation.				

Lesson Pace & Sequence

Lesson Title/Number: Observing Leaves and Flower Buds/Lesson 6		**Learning Objective(s):** TLWBAT observe the first true leaves and the buds on their Brassica plants and record their observations in both words and pictures.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students are instructed to observe their quad of plants with a hand lens and share what they notice (i.e. the differences between the seed leaves and the true leaves, number of each kind of leaf, color/size/shape/number of buds, etc.) Students will then record their observations in as much detail as possible on their observation sheets.	- 1 Quad of plants with buds -Observation Sheet -Student Science notebook/binder -1 hand lens for every two students -Life Cycle cards1,2,3,4,5 and 6			

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Read pages 22-23 aloud to the class. Then have students re-read the text and compare the functions of plant structures to that of humans by choosing 2 structures that they believe are most similar in function and justify their answer using unit vocabulary.	STC Literacy Series™, Plant Growth and Development, It Takes Teamwork, pp22-23	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students will be asked to create a timeline of the events that have transpired with their seedlings. Teacher will jot down the events in order of occurrence on the board. Students will be encouraged to use unit vocabulary. Use Life Cycle Cards (Figure 6- in TG) for assistance. Ask students to predict what will happen next.			LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1)	Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Frequent monitoring of student work should tell if students are selecting observable properties to describe, completing clear and accurate observations, using newly acquired plant vocabulary and are including drawings that are properly labeled, dated and include the plants age.				

Extend: How will students deepen their conceptual understanding through use in new context?	Ask students to think of examples of leaves and buds that we eat. Create a list to see how many items could be named. Have students ask their parents so that the items could be added to the list at the next class.				

Lesson Pace & Sequence

Lesson Title/Number: Observing the Growth Spurt/Lesson 7		**Learning Objective(s):** TLWBAT measure and record the growth of their Brassica plant for one week.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Inform students that today they will be tracking their plants growth spurt. This will involve making observations, taking measurements and making predictions every school day for 1 week.	- 1 Quad of plants - Activity Sheet 3, Observing the growth spurt - 1 Sheet of centimeter graph paper -1 strip of paper precut to 1 centimeter wide -1 pair of scissors - 1 student notebook	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)	LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.B: Variation of Traits: The environment also affects the traits that an organism develops. (3-LS3-2)	Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Closing Question and Answer Session: When did your plant go through its growth spurt? What proof do you have? Give evidence to back up your claim. How tall was your plant before the growth spurt? How tall was it after the growth spurt? In looking at your graph, what was the most your plant grew in 24 hours? How close were your predictions to what really happened? Did you make better predictions after you had some practice? Or was your plant unpredictable?		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students should be evaluated on their record keeping skills, ability to take accurate measurements and ability to make reasonable predictions based on evidence.				Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)
Extend: How will students deepen their conceptual understanding through use in new context?	Practice making predictions. Choose the next time it will rain. Make observations based off of recent weather patterns, collect data and record the class prediction.				Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)
Lesson Pace & Sequence					
Lesson Title/Number: Why Are Bees Important?/Lesson 8		**Learning Objective(s):** TLWBAT to share what they already know about the bee and about pollination.			**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students will tell what they already know about bees and pollination as the teacher documents their responses on newsprint under the title, "What we know about bees."	-1 large sheets of newsprint and markers			Patterns: -Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Pose the question: What have you always wanted to know about bees? Answers should be documented on newsprint under the headline, "What We Would like to Know about Bees." Teacher will tell students that we hope to have these questions answered as we begin learning about bees and why they are important.	-1 large sheets of newsprint and markers		LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.B: Variation of Traits: The environment also affects the traits that an organism develops. (3-LS3-2)	
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Teacher will distribute art supplies. Have students draw a picture of a bee. Collect the drawings and store in a location that students do not access. This way, at the end of the unit students can re-draw a picture of a bee and assess how much they have learned about bees.	-1 sheet of drawing paper -Crayons -markers			
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Have students view "Get the Buzz on Honey Bees" classroom map:http://www.scholastic.com/content/collateral_resources/pdf/b/bee_poster_version6.pdf		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of		:

	Students practice using a scale to measure the distance between two locations. Activity: Every map includes an important tool: a scale. A scale shows the relationship between distance on a map and distance on the ground. For instance, one centimeter on a map may represent 10 miles on the ground. Use the scale on the Get the Buzz on Honey Bees map to answer the questions below. 1. Orange blossom honey is valued for its fragrance and is harvested in Florida and California. Approximately how far is the capital of California from the capital of Florida? 2. Alfalfa is a pasture crop fed to horses and cows. Alfalfa honey is found in many states, including Oregon, Idaho, and Nevada. Approximately which is greater, the distance from Oregon's capital to the capital of Nevada, or the distance from Oregon's capital to the capital of Idaho? How do you know? Use evidence (measurements and scale) from your map to support your conclusions. 3. Now, use the scale to approximate the distance from Newark to Sacramento?		evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	This lesson is a pre-assessment on the subject of bees. Teachers should make note of student's current knowledge of bee anatomy, pollination and interdependence of bees and flowering plants through student participation during the class discussion				
Extend: How will students deepen their conceptual understanding through use in new context?	Students can continue the study of bees by reading various trade books and researching topics on their own. You can challenge your students to read and to find out the answers to these questions: What is a "honey stomach?" Why do bees dance? Why are African Bees called "killer bees?"		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		

Lesson Pace & Sequence

Lesson Title/Number: Getting a Handle on Your Bee/Lesson 9		**Learning Objective(s):** TLWBAT use a hand lens to observe dried bees and create a bee stick to be used as a tool for cross pollination.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Teacher will take newsprint and draw a vertical line down the middle. On one side she will write the word "Families." Teacher will ask students why it is helpful for us to be a part of a family. Student responses will be documented on the "Families" side of the newsprint. Some answers may include some people in the family cook, others work, chores/tasks are easier to complete as a group, everyone has a job to do in the family etc. Teacher will then write the word "Colony" on the board and teacher will ask students to "think-pair-share" about what they know about a bee colony. After students have thought for a minute about bee colonies, they will turn to their partners and take turns discussing their thoughts for about 2 minutes. Teacher will circulate the room to ensure all pairs are participating. Once the two minutes are up, the class will be asked to share their ideas while the teacher documents their answers under the "Colony" section. Final thoughts: Are bee colonies different from families? Why or why not?		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Preview Activity Sheet 4 with students. Explain that they will need to make sure that they have collected all of their supplies from the distribution center in order to complete this task. Once everyone is clear on what to do, students will take turns getting the items from the distribution center and will check them off of their checklist. Students will be asked: Why is it important to make sure we have and know how to use the tools to complete this activity? Answers may vary (i.e. We are helping the plant and animal with its life cycle, If not done correctly we are not giving providing healthy environments to grow, etc.)			LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.B: Variation of Traits: The environment also affects the traits that an organism develops. (3-LS3-2)	
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Prior to students beginning their activity, ask the whole group" Why are we making bee sticks?" and "What do you think we will be doing with the bee sticks?" Once students arrive at the connection, they may begin by examining the dried bees with their hand lens. Encourage students to work independently and to follow the instructions on Activity 4. As they work, students should be asking their group members the questions and trying to find answers together, not relying on the teacher for guidance. Circle around the classroom and check for students that are not on task. This is also a good time to take anecdotal notes on students that may assist in identifying areas where help is still needed. Once students have completed the Activity Sheet, they may begin to clean up and return unused	- 1 dried bee -1 toothpick -1 tray 1 pair of forceps - hand lens -Activity Sheet 4, How to Make a Bee Stick -1 small cup of white glue for every four students -1 cup -Overhead transparency, "The Worker Bee's Body" -Overhead projector and screen	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		

	items to the distribution center.				
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Assess students on the following: -How detailed are the bee observations? -Are students able to differentiate between observations and opinions? -To what degree are students able to follow instructions and complete the task independently?		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		
Extend: How will students deepen their conceptual understanding through use in new context?	Suggest to students that show an interest in the bees to do further reading in related trade books from the classroom library, public library or school library.				

Lesson Pace & Sequence

Lesson Title/Number: Looking at Flowers/Lesson 10		**Learning Objective(s):** TLWBAT observe details of the flower's anatomy and identify main parts.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will begin by observing their plants with their hand lens, specifically the flower part. Students will then be asked to talk about the different parts of a flower that they see and use their plant as a reference point to support their observations. Some of the observations that students should have been able to see from their plant are four flower petals (yellow and rounded), six anthers (4 short and 2 tall), yellow pollen, pistil in the center, and the sticky stigma on top of the pistil.	-1 flowering plant -1 student handbook -1 Observation Sheet -1 hand lens for every two students -1 overhead projector -Equipment	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Using a transparency, have students view the picture of crucifers found on page 60 of the TG, Figure 10-2. Using the graph paper found in Appendix C, record the results of the crucifer "taste" survey on the graph. Discuss the results as a whole group while students critique the evidence presented by their classmates.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		

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Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Review the parts of a crucifer plant with the class and remind students that it will be very important to notice any changes in the flowers over the next week as the plant further develops.			LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1) LS3.B: Variation of Traits: The environment also affects the traits that an organism develops. (3-LS3-2)	
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Check the student drawings for accuracy, completeness and use of terms.				
Extend: How will students deepen their conceptual understanding through use in new context?	Students will write two predictions in their Science Notebook/Binder in which they decide what changes they foresee happening to their plant and why. Students will continue to observe the flower closely over the next week and continue to document their findings.				Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)

Lesson Pace & Sequence

Lesson Title/Number: Pollinating Flowers/Lesson 11		**Learning Objective(s):** TLWBAT use the bee stick to cross pollinate their plants.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Students will be shown 3 pictures that exemplify symbiotic relationships (shrimp/Goby fish, Cattle/Cattle egret and Dog/Person). Students will begin to discuss what these three pictures have in common while giving his/her rationale. What is the connection between the organisms in each picture? This whole class discussion will begin to reveal how the organisms rely on interdependence. Students may not know the term during the discussion but should be able to identify that each organism "needs" the other.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will pick up their materials at the distribution center. Students will be instructed to use the bee stick to transfer pollen from one bee to another. They will pollinate every blossom that is open by rotating the bee gently. Teacher will circulate the room and remind students to cross pollinate by taking pollen from one plant and transferring it to another. Teacher should periodically stop the pollination process and ask students to look for pollen on different parts of the plant and pollen trapped in the bee's hairs. Once the pollination process is completed and students have cleaned up, project "Bee Pollinating a Brassica Flower" (Figure 11-1) and initiate a discussion that helps students come to the conclusion that both	-1 bee stick -Plants with open flowers -1 hand lens for every two students -1 Overhead transparency of "Bee Pollinating a Brassica Flower" (Figure 11-1) -1 projector and screen	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)	LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1)	

	the bee and the flower benefit from each other. Have students explain in what ways they benefit and support their responses with evidence.				
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	After reading, " The Bee and the Brassica: Interdependence," use details from the text to explain: how bees and flowers are related, why cross-pollination is important,; what would happen if cross pollination would not take place; how pollinated plants are different than plants that have not been pollinated.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Assess that students are understanding the basic vocabulary of plant reproduction (in particular pollen, anther and stigma) and interdependence through a Vocabulary quiz.				
Extend: How will students deepen their conceptual understanding through use in new context?	Label the plants the extra plants that were removed from their planters in lesson 4 as "Control Plants: Do NOT Pollinate." Students will predict what will happen to these unpollinated plants while teacher records their responses. These predictions will be saved until Lesson 16, when students harvest and thresh their crop.				Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)

Lesson Pace & Sequence					
Lesson Title/Number: Observing Pods/Lesson 12 Day 1		**Learning Objective(s):** TLWBAT observe and record the development of fertilized pods.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will observe their plants using a hand lens and focus on the flowers. Students will see that many will be dead and will have to be replaced by the pods. Students will record any questions/comments they may have into their science notebooks.	- 1 plant with pods developing -1 sheet of centimeter graph paper (Appendix C) -1 Observation sheet -1 toothpick -1 student notebook -1 hand lens for every two students - pair of forceps -Life Cycle Card 8 and 9		LS1.B: Growth and Development of Organisms: The environment also affects the traits that an organism develops. (3-LS3-2)	
Explain: How will you help students connect their exploration to the concept/topic under investigation?	A discussion will be held as to about the changes students observed. Students will be asked to describe what is happening to the petals, the anthers and the pistil. Students will use their observations and plants as evidence to support their claims and will be asked to make predictions as to what other changes they foresee taking place.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	After reading pages 14-15, answer the following questions while using evidence: -What is the function of three tools the beekeeper uses? -What does extract mean? -Why does the author say "busy as a bee?" -Is it just as accurate to say "busy as a beekeeper?" -Why does the author list the harvesting method used in Malaysia as "unusual?" -How can bee stings be therapeutic and fatal?	STC Literacy Series™, Kids Discover-Bees: Beekeeping, p. 14-15	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Monitor students' progress in the following areas: Observations that are clear and accurate, drawings of pods show the changes that are being observed and the student's ability to graph independently.				

Lesson Pace & Sequence

Lesson Title/Number: Observing Pods/ Lesson 12 Day 2		**Learning Objective(s):** TLWBAT observe and record the development of fertilized pods.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students are informed that their task is to continue observing their plant and to record the progress of its life cycle in their notebooks. Students will then receive an observation sheet and graph paper. Students will draw the plant and describe it on the observation sheet as well as record its height.	- 1 plant with pods developing -1 sheet of centimeter graph paper (Appendix C) -1 Observation sheet -1 toothpick -1 student notebook -1 hand lens for every two students - pair of forceps -Life Cycle Card 8 and 9		LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1)	
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Albert Einstein once predicted that if bees were to disappear, man would follow only a few years later. Use language from this article to provide reasoning and evidence to support or deny Einstein's claim. Write an argumentative essay explaining your viewpoint.	STC Literacy Series™, From Then Until Now, p. 16-17	Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Monitor students' progress in the following areas: Observations that are clear and accurate, drawings of pods show the changes that are being observed and the student's ability to graph independently.				
Extend: How will students deepen their conceptual understanding through use in new context?	In the Science Center, feature a pod collection. Students will make predictions as to what they may see/find prior to dissecting the pods.			LS1.B: Growth and Development of Organisms: Plants and animals have unique and diverse life cycles. (3-LS1-1)	Patterns: -Patterns of change can be used to make predictions. (3-LS1-1)

Lesson Pace & Sequence					
Lesson Title/Number: Making a Brassica Model/Lesson 13 Day 1		**Learning Objective(s):** TLWBAT build a model of a Brassica flower.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Teacher will open up a discussion on models. -What is a model? -What are some examples of models? -Have you ever used a model to help you do something?				
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Students will be placed into cooperative work teams. In their teams, they will brainstorm: -about what the model should look like -about what materials they will try to collect -about what each team member will be responsible for				

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will cut out 4 yellow petals and attach them to each other with staples. Then they will trace and cut the pistil, four tall anthers and two short anthers. They will then staple the anthers to the pistil and after having cut a slit in the bottom of the Styrofoam, poke the bottoms of the pistil and anthers through the slit. The cup will then be forced in the center of the four petals and the blossom should be complete.	-4 yellow Styrofoam meat trays -1 plastic milk jug (painted yellow) -6 Styrofoam packing "peanuts" painted yellow -6 yellow jelly beans -6 pipe cleaners			
Lesson Pace & Sequence					
Lesson Title/Number: Making a Brassica Model/Lesson 13 Day 2		**Learning Objective(s):** TLWBAT build a model of a Brassica flower.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students work in small groups to discuss the most essential parts of the Brassica plant that should be included in a Brassica plant model and why these parts essential. Groups will present their essential parts and the class comes to consensus a "must include" list.		Scientific Knowledge is Based on Empirical Evidence: -Science findings are based on recognizing patterns. (3-LS1-1)		
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?					

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Working within cooperative work teams, the students will engage in a series of steps with common and familiar objects that will allow them to construct a model of a bee.				
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students will critique other students' models checking for scientific accuracy. They will need to look for the following: -Does the model show the correct number of petals and anthers? -Is only one pistil shown? -Are the parts in the right places? -Has the model been done neatly? -Is it attractive? -How much effort does it show?		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)		:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Assess the models using the same criteria that students used to assess one another.				
Lesson Pace & Sequence					
Lesson Title/Number: Making a Bee Model/Lesson 14		**Learning Objective(s):** TLWBAT construct an accurate model of a bee.			**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students will inventory the inherited traits of bees. Students will engage in discussion and development of questions on traits as a result. This list of traits will be used while students work on the construction/design of their bee model.			LS1.B: Growth and Development of Organisms Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)	
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Working within cooperative work teams, the students will engage in a series of steps with common and familiar objects that will allow them to construct a model of a bee.	List of materials and steps are available in the Teachers Guide, pages 89-94 and some materials are included in the Science Kit	Developing and Using Models: Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop models to describe phenomena. (3-LS1-1)		
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students will then critique each group's model by answering the following questions: Does the model show the correct numbers of petals and anthers? Is only one pistil shown? Are the parts in the right places? They then provide a critique for improvement (for each model.)				:
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Evaluate each model on the same criteria that that students used to evaluate the models of their peers.				

Lesson Pace & Sequence

Lesson Title/Number: Interpreting Graphs/Lesson 15		**Learning Objective(s):** TLWBAT interpret information on two different graphs.			**Lesson Duration:** 50 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Teacher will show students a graph and ask the class to identify some of the different things they notice about it. This activity will then lead to class discussion on what a graphs are, their purpose and the many different forms a graph may take.				
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Distribute Figure 15-1 to each student. After a few minutes of observation, have students share what the graph is about and to describe the different elements that they see within the graph.				
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students will use the graph to answer the questions on page 43 and 46 of their Students Investigation Book.				
Extend: How will students deepen their conceptual understanding through use in new context?	Collect data about members of the class and graph it (i.e. birthday month, number of siblings, etc.)				

Lesson Pace & Sequence

Lesson Title/Number: Harvesting and Threshing the Seeds/Lesson 16	**Learning Objective(s):** TLWBAT harvest and thresh seeds.	**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students are asked to remember how many seeds were originally planted (8) and to make a prediction as to how many seeds they believe they will have after the threshing process.				
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students observe their plants in their dried out conditions. Students will then harvest the pods and thresh the seeds from the pods while recording their findings.		Analyzing and Interpreting Data: Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students are encouraged to ask questions about the plants.				

Lesson Pace & Sequence		
Lesson Title/Number: Post Unit Assessment/Lesson 17	**Learning Objective(s):**	**Lesson Duration:** 50 minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objective(s)?*** ****Elements do not have to be conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students revisit the lists created at the beginning of the unit entitled, "What We Know About Plants" and "What We Want to Know about Plants." Students are now knowledgeable enough to revise the information on the first list using evidence and they may be able to answer the questions they had on the second list.		Constructing Explanations and Designing Solutions: Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)		
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Address questions students may still have. Allow them to complete post unit assessment.				Cause and Effect Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)