Horticulture
Seed Anatomy and Germination

BASIC INFORMATION	
Summary	Students are to explore factors that influence seed germination.
Grade Level	8th
Time Frame	1.25hrs
Subject(s)	Exploring Agriculture
Topic(s)	Seed Anatomy and Germination
Instructional Materials & Prep	PPT Scenarios Notes
STANDARDS AND OBJECTIVES	
CA Content Standard(s)	Investigate plant systems, nutrient transportation, and energy storage. Label the seed's essential parts and describe their functions.
Lesson Objective(s)	Students will be able to 1. Define seed and plant vocabulary with an increase of at least 50% accuracy between the 1st and 2nd rounds of vocabulary assessment. 2. Make predictions, cite evidence from content knowledge and provided information, and support their reasoning using content vocabulary.
PLANNING CONSIDERATIONS	
Vocabulary and/or Vocabulary Resources	• Seed • Seed coat • Embryo • Cotyledon • Organelles • Maturation • Dormant • Germination Rate • Germination • Impermeable • Stratification • Viability • Dehydration
ASSESSMENT	
Assessment of Learning	Objective 1 – Quizziz 1st Round vs 2nd Round Objective 2 – Students are to collect at least 3 observations of all vegetable seeds.

	Objective 3 – Simplistic version of CER
LEARNING EXPERIENCES	

Sequence of Activities	**10min - Mind Moover/Phenomena – Uneven plant growth**
	• Look at the picture on the TV. Identify 2 differences between the fields of corn.
	  ○ Pair-Share with elbow partners.
	• Lead students to field B is quite uneven in terms of plant growth.
	• What can cause this?
	  ○ Think-Write-Pair-Share Elbow Partners
	  ▪ Follow up questions
	
	10min - Quizzizz Round 1
	Note to students that questions that were incorrect will be reviewed during the lecture.
	
	25min - Lecture
	• Seed Structure
	• Seed Maturation
	• Maintaining Dormancy
	  ○ What does it mean to be dormant?
	  ▪ Round 1 – Pair-Share Only
	  ○ What living things go dormant? Both plants and animals
	  ▪ Round 2 – Think-Write-Pair-Share
	  ○ Are seeds dormant? Why or why not?
	  ▪ Round 3 – Think-Write-Pair-Share
	  ▪ Assign partners A & B
	  ▪ Each partner must write the other's response
	  • Sentence starters
	• Breaking Seed Dormancy
	  ○ What is the main barrier between a seed breaking dormancy or not breaking dormancy? Why?
	  ▪ Sentence starter
	• Seed Viability
	• Seed Germination
	  ○ Germination rate examples
	  ▪ If 100 seeds are planted and 75 germinated, what is the germination rate? Etc.
	  ▪ Compare back to corn example
	
	15 min – Scenario Activity

	For each of the scenarios…
	1. Read the scenario
	2. Determine which stratification process is needed.
	3. Explain why that stratification process should be used in 3 sentences.
	    1. Sentence 1 – Answer the question directly.
	    2. Sentence 2 – Use evidence to defend your answer.
	    3. Sentence 3 – Describe how your evidence connects to your answer.
	
	Scenario 1 – An FFA member is conducting an FFA agriscience fair project on the effect of different temperatures on asparagus seed germination rates. He graphed his results on the chart below. Based on his results. what type of stratification would be most effective to break dormancy in asparagus plants? Explain your answer.
	
	Scenario 2 – A scientist who studies plant life was asked to evaluate the conditions of the land and wild plants after last year's wildfire. She notices that there is a lot of brand-new growth of prairie grasses.
	If she wanted to grow these grasses on her own, which type of stratification would she use to break dormancy? Explain your answer.
	
	Scenario 3 – An agronomist (someone who helps farmers with their crops) is assisting a farmer in starting a new crop season of growing beans. This is the first time the farmer is growing this crop. After all the bean seeds are delivered to him, he calls the agronomist concerned that the seeds would have a difficult time germinating due to their extremely hard seed coat.
	These bean seeds must have skipped what stratification process? Explain your answer.
	10 min - Quizzizz Round 2
	
	If there are at least 20min left in class – students head to the greenhouse and plant their seeds in their planter boxes.

CLOSURE	
Closure	Quizziz Round 2

Horticulture

Plant Nutrients

BASIC INFORMATION	
Summary	Students are to examine macronutrient deficiencies, NPK levels in fertilizer, and read fertilizer labels.
Grade Level	10-12
Time Frame	47min
Subject(s)	Environmental Horticulture
Topic(s)	Macronutrient Basics and Fertilizers
Instructional Materials & Prep	• Lecture Notes • Projector • Computer • Writing utensils
STANDARDS AND OBJECTIVES	
CA Content Standard(s)	• C10.4 Differentiate among the types, uses, and applications of amendments and fertilizers. • Analyze how primary and secondary nutrients and trace elements affect ornamental plants. • F6.3 Analyze organic and inorganic fertilizers to understand their appropriate uses. • F6.4 Read and interpret labels to properly apply fertilizers.
CA ELD/ELA Standard(s)	• Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language.
Lesson Objective(s)	Given the notes and lecture, students will be able to with 80% accuracy… • Recall the three macronutrients of plants and their purposes • Evaluate nutrient deficiencies and their fertilizer solutions • Determine the NPK levels of fertilizers by percentage and weight
PLANNING CONSIDERATIONS	
Vocabulary and/or Vocabulary Resources	• Nitrogen • Potassium • Phosphorous • Deficiency • Fertilizer
ASSESSMENT	
Assessment of Learning	Check for understanding at end of lesson
LEARNING EXPERIENCES	

Sequence of Activities	• Welcome and FFA Announcements
	• Show first slide that has three columns of plants showing different health issues. Students are to take write what they observe and think what may be causing such issues.
	  o Pair-share
	• Plant Macronutrients
	• Discussion questions
	• What is fertilizer
	• Major ingredients
	• Check up
	• Calculator and analyze
	• 1st number = nitrogen
	• 2nd number = phosphorous
	• 3rd number = potassium
	• Complete fertilizers
	• Reading a fertilizer label
	• Final Check for Understanding - Students are exposed to first slide again. With their new found information regarding NPK, they are to evaluate the conditions more accurately and determine the fertilizer concentration that would be fix the health issue.
	• If extra time…
	  o Students are to identify NPK levels of various fertilizers scattered around the room.

Closure	
Closure	• Sentence prompts