

Germination Module

Objective: Using the concept of seed germination, by the end of this module, students will be able to conduct research of various germination phenomena to develop their own scientific study, conduct an experiment based on the questions developed through observations, and gather data to develop a sound conclusion about their hypothesis.

Standards:

NGSS- [3-LS1-1](#), [4-LS1-1](#), [5-LS1-1](#) From Molecules to Organisms: Structures and Processes

Common Core-

ELA: [RI.3.7](#), [SL.3.5](#)

Math: [MP.4](#), [3.NBT](#), [3.NF](#), [W.4.1](#), [4.G.A.3](#), [RI.5.1](#), [RI.5.9](#), [W.5.1](#), [MP.2](#), [MP.4](#), [MP.5](#), [5.MD.A.1](#)

Vocabulary:

- Seed
- Cotyledon
- Seed coat
- Embryo
- Germination, germinate
- Scientific Method
- Observation
- Question
- Variables
- Independent variable
- Dependent variable
- Constants
- Data
- Data table
- Qualitative
- Quantitative
- Conclusions
- Roots
- Stem
- True leaves
- Grap

Bitmoji Classroom (Asynchronous Module)

Lesson Outline (In-class/Synchronous)

Elicit-

Objective: Student will demonstrate their prior knowledge on the subject of germination and the scientific method through the use of an interactive online quiz

Resources:

[Pear Deck Presentation](#)

Engage-

Objective: Students will be prompted to begin forming an idea of the criteria for germination through the guided practice of a matching game.

Vocabulary	Materials
Tomato Squash Corn Wheat Sunflower Seed Seedling Graph Germination, germinate	Presentation Matching game



Lesson Sequence:

1. Students will first be asked to share their prior knowledge about the concept of germination with a bell ringer. Ask the students to share what they already know and create a record of their ideas.
2. Students are then prompted to play a matching game. They must match the seed with the full plant to get the correct answer. Give the students time to play the game.
3. Ask the students to share how the seed grew into a full grown plant.
4. The students watch a seed germination time lapse video that shows a seed's growing roots and a stem, until the leaves finally grow out of the jar.
5. As a closure activity, students are asked to provide a visual representation of what is needed for the seed to begin to germinate.
6. Share out answers with the class.

Resources:

[Presentation on NearPod](#)

[Matching game](#)

Explore-

Objective: Students will be able to use science and engineering practices to understand the requirements that need to be met for a seed to break dormancy.

Vocabulary	Materials
Germination, germinate	Radish seeds
Scientific Method	Cotton balls
Observation	Petri dishes
Question	
Variables	
Independent variable	
Dependent variable	
Constants	
Data	
Data table	
Qualitative	
Quantitative	
Conclusions	

Lesson Sequence:

1. Students begin the lesson working together to create a collaboration board depicting the needs that are required for the seed to break dormancy and begin to germinate. Discuss with the students if all these things are necessary to get a seed to germinate? What are the bare minimum requirements that we need to meet to germinate a seed?
2. Students are then asked to watch a video where they are led through the process of science to answer the question "What are the conditions needed for a seed to germinate?"
3. Throughout the video, students are prompted to answer questions and interact with the video.
4. Students are then given a prompt explaining the parameters of the experiment and the equipment provided in the kit.
5. Students are asked to make scientific observations of their seeds then given an opportunity to develop a question based on the scientific prompt
6. Students are then asked to specify the dependent, independent and constant variables for the experiment as described. Remind them we learned about it in the video.
7. Students are prompted to form a hypothesis for each experiment based on the information they have been given and their own knowledge of germination.
8. Once they have picked out the individual parts of the experiment, they are asked to set up their own experiments and develop a procedure and materials to conduct their research. They will then be prompted to develop their own data table to collect their data.
9. After growth has begun, students are prompted to observe, sketch, and label the growth of their plant after the first week.



10. Students are then provided with a writing template to lead them through writing a conclusion based on the results of their experiments.
11. Finally, students are asked to share the results of their experiment in a collaboration board for public review.

Resources:

[Presentation in Near Pod](#)

Video about scientific method

Explain-

Objective: Students will use their bodies to develop an understanding of the process of germination in order to develop an experiment.

Vocabulary	Materials
Seed	Yoga video
Cotyledon	Notebooks
Seed coat	pencils/pen
Embryo	Yoga mats (optional)
Germination, germinate	
Roots	
Stem	
True leaves	

Lesson Sequence:

1. Students begin the lesson by calmly participating in a yoga session. Give students an opportunity to center themselves and become quiet, then begin the sequence.
2. Ask students what the movements made them feel. Did it remind them of anything we have been working on in this unit? Have them share out their thoughts.
3. Students are then asked to recall the anatomy of a seed to prepare them to elaborate on the process.
4. Students are asked to watch and participate in a video about the germination and the conditions for seed germination.
5. Before you begin the sequence, have the student find a comfortable spot and settle in by taking in a deep breath and letting it out slowly through their mouths. Now that students have an understanding of the process and the needs of a seed to germinate, they are led through a yoga sequence for each step of the process.
6. As you go through the slides, have the students reproduce the moves on screen. With a calm voice, narrate the movements as you go through each step.
7. Students will then label a diagram and explain the process in their own words as closure.
8. Last slide: What observations did you make about the process of germination? What questions do you have about the process that can be investigated through experimentation?

Resources:

[Presentation in Near Pod](#)

[Germination Video](#)

[Yoga Video](#)

Elaborate

Objective: Students will be asked to decipher proper scientific questions to prepare them to conduct research about various phenomena observed during the germination process in order to develop a testable question for their own science investigation.

Vocabulary	Materials
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Community & School
Garden Program



Germination, germinate Scientific Method Observation Question Variables Independent variable Dependent variable Constants Data Data table Qualitative Quantitative Conclusions	Game Cups Cotton balls Soil Seeds Vinegar
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Lesson Sequence:

1. As students begin the lesson, by answering the question : What makes a good scientific question? Have them share out their answers as a collaboration board or create a record on the board.
2. Students will then play a game that has them sort through questions to categorize a “testable question”
3. Define what a testable question contains.
4. Have the students explore the different slideshows on the scientific phenomena in germination.
5. The students will then be led through the same process of scientific investigation as they had done before in the exploration portion of the experiment, however, they will not be creating their own scientific study on germination based on the observations they made in their research.
6. Students will then conduct their experiments, gather data and draw conclusions on their study

Resources:

[Presentation in Nearpod](#)
[Game](#)

Evaluate-

[Post Exam](#)

Objective: Students will present the results of their experiment as a poster or presentation that explains their experiment, shows the data in a clear manner, and draws conclusions based on their results.

Vocabulary	Materials
Seed Cotyledon Seed coat Embryo Germination, germinate Scientific Method Observation Question Variables Independent variable Dependent variable Constants Data Data table Qualitative Quantitative Conclusions	Poster Template



Roots Stem True leaves Graph	
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Lesson Sequence:

1. Students will complete the quiz again to see what they learned.
2. Students will create a poster explaining the results of their experiment the requirements for the poster are as follows:

Diagram:

- Select one of your germinated seeds to draw.
- Label at least 6 parts of its anatomy using vocabulary.

Paragraphs (Topic sentence, 3 or more supporting details, closing sentence):

- 1: Explain how your experiment and how you designed your investigation
 - Use your own observations as well as information you learned from the Articles.
 - Use at least 4 vocabulary words from the unit.
- 2: Explain your results and how you got them.
 - Use your own observations as well as information you learned from the Articles.
 - Use at least 4 vocabulary words from your packet.

Resources:

[Presentation in Nearpod](#)
[Worksheet](#)

Extend-

Objective: Students will use their plants to create botanical drawings that represent the silhouette of their various experimental groups.

Vocabulary	Materials
Seed	Sketch pad
Cotyledon	Pencil
Seed coat	Eraser
Embryo	Paint
Germination, germinate	Markers
Roots	Crayons
Stem	
True leaves	

Lesson Sequence:

1. Students are asked to gather their supplies and prepare to sketch their shadows.
2. They watch the first portion of the video and follow along to create their outline.
3. Then students are asked to examine their plants and analyze their colors to create a color palette. Have them share.
4. Students then area allowed to paint their drawing. Allow them to make several variations using the suggestions in the video.
5. Have students share their art work with the class.

Resources:

[Presentation in Nearpod](#)
[Video](#)



Instructor Feedback Survey

