

Lesson Title:	So Many Ways to Grow. Choose One!
Grade Level	Sixth Grade
Nature of the Investigation:	Plant Reproduction
NGSS Performance Expectation(s) Next Generation Science Standards	MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions.]
NGSS Dimension 1 component (Scientific and Engineering Practices)	Developing and Using Models Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. <ul style="list-style-type: none"> Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)
NGSS Dimension 2 component (Crosscutting Concepts)	Cause and Effect <ul style="list-style-type: none"> Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MS-LS1-5) Scale, Proportion, and Quantity <ul style="list-style-type: none"> Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) Systems and System Models <ul style="list-style-type: none"> Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) Structure and Function <ul style="list-style-type: none"> Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex

	<p>natural and designed structures/systems can be analyzed to determine how they function. (MS-LS1-2)</p>
<p>NGSS Dimension 3 component (Disciplinary Core Ideas)</p>	<p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> ▪ All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) ▪ Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) ▪ Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) ▪ Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) <p>LS1.B: Growth and Development of Organisms</p> <ul style="list-style-type: none"> ▪ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) <p>LS3.A: Inheritance of Traits</p> <ul style="list-style-type: none"> ▪ Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) <p>LS3.B: Variation of Traits</p> <p>In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring.</p>

Engage
<p>PURPOSE:</p> <ul style="list-style-type: none"> • to convey the context of the lesson(s)/unit by conveying an important Key Question • to engage students in investigations that reveal their thinking to themselves and the teacher • to record the initial ideas of students • to engage their interest
<p>What is the teacher doing? What are the students doing?</p> <ol style="list-style-type: none"> 1. Asking students to explain their knowledge as to how plants reproduce. 2. Students will write on their whiteboards what they think. 3. A few different examples will be presented to engage them further and to raise their curiosity.
Explore
<p>PURPOSE:</p> <ul style="list-style-type: none"> • to test ideas and develop knowledge using explorations, investigations, experiments • to modify and record ideas as they change due to activities • to develop new questions and testable hypotheses

Activities (list)	Driving Question
<p>Students will have an opportunity to research, on their iPad's, different possible methods of plant reproduction. They will then have an opportunity to visit the 13 gardens on campus to find real examples of their research findings.</p>	<p>Can you find different examples of plant reproduction in our gardens?</p>
<p>Student Communication Product: Individual students will be given an opportunity to orally present their example of a method that plants can reproduce. Once students are given an opportunity to share their findings, they will get in their Success Groups to develop a written report to turn in to me. A poster and the knowledge provided on the report will be shared as a group presentation. Students will be asked to choose key words that someone new to the topic would need to know to understand this concept. They are essentially developing a key vocabulary list. All Success Groups will provide a list for the class to finalize and choose what the whole class deems necessary.</p>	
<p>Explain</p>	
<p><i>PURPOSE:</i></p> <ul style="list-style-type: none"> • to answer the Key Question through student explanations • to provide students with relevant vocabulary, formal definitions and explanations of concepts 	
<p>Content Media: Students will answer the key question in their group presentations. For their presentation they may record a video, create a comic, or do any formal or informal presentation that will engage the audience while providing relevant information of the key concept. The teacher will serve as a facilitator in assisting students to direct their own instruction. The students will essentially become the teachers.</p> <p>Student Communication Product: Formal and informal assessments will be given throughout the lesson. Informal assessments will include level of student engagement and participation. Formal assessments will include presentation quality and understanding of content knowledge presented. An exam with required knowledge showing NGSS component knowledge will also be given.</p>	
<p>Elaborate</p>	
<p><i>PURPOSE:</i></p> <ul style="list-style-type: none"> • to extend students' conceptual understanding through application or practice in new settings 	
<p>Activities: Students will be given time to research plant reproduction and the many ways possible for them to reproduce. Students will be given a brief overview regarding sexual and asexual plant reproduction for clarification purposes and then be allowed to visit the other success groups to view their specimens and what they found in the gardens. This opportunity will allow students to see differences and similarities to what they had found. They will be asked to fill out a two-sided list with sexual and asexual examples of what was found by their classmates.</p>	

Extending/Application Questions for Whole/Small Group Discourse:

Once students have an opportunity to view all other groups, they will be asked to revise their previous report and presentation to include new knowledge they deem pertinent to the greater understanding for themselves and their classmates. Once all groups complete this task, they will be given time to rotate group to group presenting their information. A new presenter will be asked to take over and present the newly given information in their own words. Students will be allowed to use the poster and information provided to assist them in summarizing the information they just learned. (This is a method commonly used in my class to ensure students are being held accountable.)

Evaluate

To ensure true understanding of the concept being taught. Informal assessments throughout the lesson are invaluable to my understanding of the learning taking place.

Formal written assessments will allow me an understanding of required knowledge that has been retained.

I will provide an assessment with key words and concepts, in addition to a personal essay that students will write on how this new-found knowledge can affect their everyday lives.