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| **Lesson Title :** Plant Adaptations and Human Influence | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **1** |
| **Activity Title: Grafting Activity Research** |

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| **Estimated Lesson Duration:** | **One week** |
| **Estimated Activity Duration:** | **Three days** |

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| **Setting:** |  |

The classroom or lab will be used for the activity. The computer lab will be used for research.

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| **Activity Objectives:** |

Students will learn about the big idea and will generate essential and guiding questions along with the challenge.

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| **Activity Guiding Questions:** |

**What are ways to propagate plants?**

**Can any species of plant be grafted?**

**What are the benefits of asexual reproduction?**

**Why would plants use sexual reproduction?**

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| ☒ Asking questions (for science) and defining problems (for engineering) | ☐ Patterns |
| ☐ Developing and using models | ☐ Cause and effect |
| ☒ Planning and carrying out investigations | ☐ Scale, proportion, and quantity |
| ☒ Analyzing and interpreting data | ☐ Systems and system models |
| ☐ Using mathematics and computational thinking | ☐ Energy and matter: Flows, cycles, and conservation |
| ☐ Constructing explanations (for science) and designing solutions (for engineering) | ☐ Structure and function. |
| ☐ Engaging in argument from evidence | ☐ Stability and change. |
| ☒ Obtaining, evaluating, and communicating information |  |

| **Ohio’s Learning Standards for Science (OLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| ☐ Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| ☒ Demonstrating Science Knowledge **(D)** |
| ☒ Interpreting and Communicating Science Concepts **(C)** |
| ☒ Recalling Accurate Science **(R)** |

| **Ohio’s Learning Standards for Math (OLS) and/or**  **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| ☐ Make sense of problems and persevere in solving them | ☐ Useappropriate tools strategically |
| ☐ Reason abstractly and quantitatively | ☐ Attendto precision |
| ☐ Construct viable arguments and critique the reasoning of others | ☐ Look for and make use of structure |
| ☐ Model with mathematics | ☐ Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, OLS and/or CCSS):** |

**MS-LS4-5.** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

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| **MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. |

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| **MS-LS1-4.** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. |

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

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| **Teacher Advance Preparation:** |

**Teacher Preparation:**

Do “Research on Plant Propagation” worksheet ahead of time. Modify it as needed to fit your students.

Print out the worksheet “Research on Plant Propagation”. One per student.

Students should be familiar with botany and horticulture by this point. This lesson and unit assumes that they have read much of the information on plants, but have not put any of it into practice.

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| **Activity Procedures:** |

When class begins, ask students about plant propagation. Write down answers on the board.

Students should be instructed that this lesson is intended to test their abilities at working the internet.

Give students tips such as:

1. Quotation marks around words means that the search will look for the words in quotations, exactly how they are written and in that order. The computer will ignore upper and lower case letters. For example: “grafting apple trees” will only show pages that say “grafting apple trees” in that order, but will not show “apple grafting trees”.
2. If a minus sign is placed before a word, it means that the computer will exclude any results with that word. This only works for the word directly after the minus sign. No space after the minus sign, for example –minecraft will exclude all references to minecraft.

Students may work with their lab partner. Both students must have this written down in their lab journals.

Pass out the worksheet. Instruct students to tape it into their lab journal.

After students have taped it in to their lab journal, remind students that they should ask their partner if they have any questions first, then ask the teacher. Have students go to the computer lab or use chrome books and begin research.

Once research is completed, have students come back and discuss what they have found.

Have students form the essential questions and challenge here.

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

The discussion at the end should also prove to be a formative assessment.

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

Check the student’s lab journal for accuracy with the questions. Test at the end of the unit will also be a summative assessment for this lesson.

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details. |

Group students based on what they can do, not their grades necessarily. I try to have a student who is great with hands on things, one that is good with math, one that is good with reasoning/science and one that is a reader. This allows for students to have an area they are ‘experts’ with and gives them a sense of being a part of a team, rather than a member of a group.

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson. |

Students did a good job with finding sources for their grafting activity. The variety of sources helped make each attempt unique. Students were instructed to find something on grafting and apply it to their cacti. Grafting is something that can be done with any plant therefore they had many sources and different techniques that could be used including things that were not intended for this type of plant.