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| **Lesson Title :** Plant Adaptations and Human Influence | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **2** |
| **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 be able to construct an argument based on scientific evidence as to how specialized structures of a plant can be used to influence the growth of an organism.

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| **Activity Guiding Questions:** |

**What are glochids?**

**What do cacti fruit taste like?**

**Do all cacti produce fruit?**

**How can one cacti be grafted onto another?**

| **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**: (Per student or pair) |

1 Dissection tray

1 *Elodea spp*

1 set of Dissection tools

Tweezers

Scissors

Scalpel

Prods

1 *Tradescantia Zebrina*

1 Lily *(Lilium spp)*

Methylene Blue

Isopropyl alcohol

1 Spider plant (*Chlorophytum comosum)*

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| **Teacher Advance Preparation:** |

Clean the dissection trays and dissection tools ahead of time. Remove any tools that you feel may be misused during the procedure. Regular scissors will work. Buy the lilies the day of or the day before you intend to do the activity. Lilies tend to have a lot of pollen, check records to make sure nobody is seriously allergic to pollen. Do this activity by yourself to get acclimated with the procedure and modify as needed to fit your class.

Print out the Rubric and Activity worksheets for this. One per student plus one for the teacher.

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| **Activity Procedures:** [**Dissection Activity**](https://docs.google.com/a/stspp.com/viewer?a=v&pid=sites&srcid=c3RzcHAuY29tfG1yLWJydW5uZXItMjAxNnxneDo0YjIwY2M4M2JiYjI1NThl) |

As students walk into the room, have them do any daily activities. If you have the supplies on the desks beforehand, remind them not to touch anything until instructed.

After the beginning activity, have students take out their lab journals.

Get the spider plant and ask students to make steps on how to remove the plant without harming it. Walk around the classroom and read what they are writing down. After most students are close to the end, have students stop working and trade with their lab partner. Tell students to read over their lab partners work and discuss anything that may be missing.

Once students have gone over their partners work, ask students what the first step would be. Write this on the board. After each step, ask students if there is anything else that should be before the current step.

Follow the steps that the students have laid out, assuming that there will not be any major harm to the plant. Demonstrate the proper way to remove a plant with minimal damage to the plant. Keep this plant out for yourself, students may have questions and use this plant to assist in answering their question.

Pass out the rubric and activities sheet. Instruct students to tape the rubric into their lab journal. Have students do the activities.

After the activities are complete. Ask students which parts were most difficult and which they have learned the most from.

**Formative Assessments:**

Questions asked during post lab.

**Summative Assessments:**

Read over the students lab journals and follow the rubric in grading their lab. The test will also go over this information.

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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 need to be well versed in how to use a microscope and how to treat the slides. Students should know how to focus a microscope. Students did well with drawing what they saw and coloring it appropriately.