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| **Lesson Title : Bioremediation** | **Unit #:**  **1** | **Lesson #:**  **2** | **Activity #:**  **4** |
| **Activity Title: Investigating Reproductive Strategies** |

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| **Estimated Lesson Duration:** | **8-9 days (70 minutes)** |
| **Estimated Activity Duration:** | **2 days (70 minutes)** |

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| **Setting:** | **8th grade classroom** |

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| **Activity Objectives:** |

Students will…

* Identify the general characteristics of organisms that reproduce sexually, asexually, and both.
* Identify the advantages and disadvantages of sexual and asexual reproduction.

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| **Activity Guiding Questions:** |

* What are the two modes of reproduction?
* What are the advantages and disadvantages of sexual and asexual reproduction?

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| **Next Generation Science Standards (NGSS)** | |
| **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 |  |

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| **Ohio’s New Learning Standards for Science (ONLS)** |
| **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)** |

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| **Common Core State Standards -- Mathematics (CCSS)** | |
| **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, ONLS and/or CCSS):** |

Topic: Species and Reproduction

Standard: This topic focuses on continuation of the species.

Content Statements:

* 8.LS.1: Diversity of species occurs through gradual processes over many generations. Fossil records provide evidence that changes have occurred in number and types of species.
* 8.LS.2: Reproduction is necessary for the continuation of every species.

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

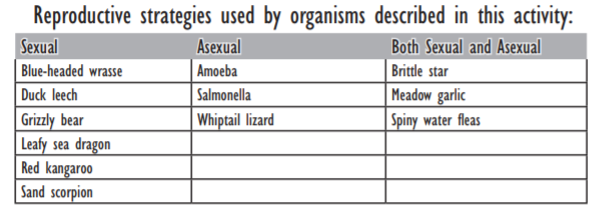
* This activity was adapted from Investigating Reproductive Strategies (<https://teach.genetics.utah.edu/content/evolution/files/ReproductiveStrategies.pdf>)
* Activity 4 handout: 1.2.4a Investigating Reproductive Strategies
  + contains
    - teacher directions
    - student pages (graphic organizers)
    - reading passages

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| **Teacher Advance Preparation:** |

* Print 1.2.4a Investigating Reproductive Strategies
  + Reading passages
    - Print each passage in a different color
    - Print a couple of copies of each reading passage so everyone in the group can have access to it.
    - Eliminate the reading passages or place them in a sleeve protector so they will last.
  + Student pages
    - one per student

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| **Activity Procedures:** |

1. Introduce the concept to students that organisms reproduce in two ways: sexually and asexually. In today’s activity, they will determine the general characteristics for each mode of reproduction, as well as discuss the advantages and disadvantages of both.
2. Divide students into pairs.
3. Hand each pair
   1. 1.2.4a The Investigating Reproductive Strategies worksheet (page S-1)
   2. Two organism descriptions - one for an organism that reproduces sexually and one for an organism that reproduces either asexually or using both strategies - (see chart below).



1. Instruct each pair to read about their assigned organisms and complete the comparison table on the Investigating Reproductive Strategies worksheet.
2. When all pairs have completed the comparison table, have them post their tables around the room.
3. Students will need to create a table to record how each organism reproduces.
4. Ask students to walk around the room and read the comparison tables with the goal of creating a list of general characteristics for organisms that reproduce sexually and one for organisms that reproduce asexually. They will need to record the reproductive strategy for each organism as well.
5. As a class, compile lists of general characteristics for organisms that reproduce sexually and asexually on the board. Learning objectives and discussion points for each category on the Investigating Reproductive Strategies worksheet are listed on pages 2-4 to help you guide the discussion.
   1. Tip: You may wish to have students record their ideas on a sheet of paper while they read the comparison tables.
6. Ask students to discuss the advantages and disadvantages of each mode of reproduction in their pairs. Have them prepared to support their reasoning.
7. Add advantages and disadvantages to the list of general characteristics for each mode of reproduction.
8. Lead a discussion on the types of situations or conditions in which each mode of reproduction would be most advantageous or disadvantageous. Do students think one reproductive mode is generally better? Why?

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

* 1.2.4a Investigating Reproductive Strategies
  + student pages
  + class discussion

**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.

Given at the end of the unit:

* Post-Assessment (1.1.1a)
* Group Presentations with rubric (1.2.5b)
* Cooperative Learning Self Evaluation & Peer Evaluation Form (1.2.5c)

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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. |

* Place students in small heterogeneous groups (3-4) if possible or groups based on their leadership skills.
* Encourage students to ask their peers before asking a teacher.
* Read alouds
* Provide one reading passage at a time
* Provide struggling students with an organism that reproduces sexually and one that reproduces asexually. For students that are able to make better inferences, provide them with an organism that reproduces both sexually and asexually.

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

Successes

* Printing each passage on a different color sheet of paper allowed me to group students easier as well as clean up much faster. Another technique I used was to shade one corner of the passage for organisms that reproduced asexually, two corners for organisms that reproduced sexually, and three corners for organisms that reproduced sexually and asexually. This allowed me to make sure students received two passages with different modes of reproduction as well as making sure they recorded the correct reproductive strategy on their handout.
* You could also print the passages in color and place them into different colored folders for each group. This will help keep it organized as well.
* For the students that struggle with reading and making inferences, I provided them with one organism to analyze. When they finished that one, I gave them another organism that reproduced using the opposite mode. I felt giving them one passage to read at a time reduced the changes of them feeling overwhelmed.

Shortcomings

* Many of the images on the handout were hard to see; for example, sand scorpion, red kangaroo, and the leafy sea dragon. Students were so interested in looking at the images and could not move past not being able to see them clearly. During our group discussions, I had them bring up each of the organisms and make observations. This was too time consuming but I did not want to lose their interests especially due to the amount of reading they had to complete. If time permits, create a slide show that displays each of the organisms to the students.
* Although students recorded how each organism reproduced, many of them missed that question on the summative assessment. I feel this is because they did not interact more with the other organisms’ passages. Maybe provide an opportunity for each student to pick at least one more organism they are interesting in learning about and have them read that passage. Another suggestion is to them create a matching game of each organism and have them place it into the correct mode of reproduction. This would be a great study tool for the assessment.