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| **Lesson Title :** Manager of the Water | **Unit #:**  1 | **Lesson #:**  2 | **Activity #:**  3 |
| **Activity Title:** Research other School / Community Gardens |

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| **Estimated Lesson Duration:** | 7 Class Periods |
| **Estimated Activity Duration:** | 2 Class Periods |

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| **Setting:** | Classroom (with laptop cart or personal student devices) and / or Computer Lab |

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| **Activity Objectives:** |

1. I can calculate the cost of implementing different sustainable water transportation systems on our school community garden.
2. I can research different ways to decrease the cost of both implementation and upkeep on these different sustainable water transportation systems.
3. I can determine the different components needed to transport water and suggest realistic possibilities for the different parts in relation to the school community garden.
4. I can identify different water transportation systems / designs currently being used by other schools / communities, and determine the pros and cons of each.

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| **Activity Guiding Questions:** |

1. What water resources are located nearby and how can they be utilized as sources of water?
2. How much do different sources of water cost?
3. What are the components of transporting water / what is needed?
4. What water transportation systems / designs are currently being used by other schools / communities?

| **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):** |

**Ohio Learning Standards**

* Scientific Inquiry and Application
  + Identify question and concepts that guide scientific investigations;
  + Design and conduct scientific investigations;
  + Use technology and mathematics to improve investigations and communications;
  + Formulate and revise explanations and models using logic and evidence (critical thinking);
  + Recognize and analyze explanations and models; and
  + Communicate and support a scientific argument.
* **Global Environmental Problems and Issues** 
  + Sustainability
  + Food production and availability
* **Soil and Land** 
  + Land use and land management (including food production, agriculture and zoning)

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

1. [Garden Sharing Worksheet](file:///E:\My%20Unit%20(in%20progress)\Final%20Unit\1.%202.%203e%20How%20Does%20Your%20Garden%20Grow_Research_AParker_072216.docx) (Student Research handout); enough for each student
2. Computers (at least 1 for every 2 students)

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| **Teacher Advance Preparation:** |

1. Copy student research handouts (each student needs their own, although each group may be researching together and getting a lot of the same information. Requiring each student to collect and record the data themselves holds all members of the group more accountable).
2. Acquire a laptop cart for the room and check to make sure that all computers work / log onto the internet.

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| **Activity Procedures:** |

1. One major goal of this exercise is to have the students research to gather their own data relating to possible water resources for water transportation systems, different components of water transportation systems, and the costs of each. At the beginning of the class, remind the students of the Big Idea and Challenge, to remind them of the focus and big picture (context) for this activity.

Pass out the student laptops from the laptop cart (if no laptop cart is available, move the class to a nearby computer lab. Pass out the Garden Sharing Worksheet (one per student). In their Challenge groups, have the students begin to research the garden data, using the Garden Sharing Worksheet as a guide.

Be sure to circulate around the room as the students work in pairs to ensure that all are actively contributing. Ask open-ended, broad questions to help guide the students or to help get them back on track if they seem to have hit a wall.

Instruct the Challenge groups to compile all of their group’s data onto one sheet of paper, in an organized fashion and to discuss their conclusion. Give the students about 5 minutes.

Have a brief class discussion about the findings of different groups, using the Garden Sharing Worksheet as a guide.

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

1. [Garden Sharing Worksheet](file:///E:\My%20Unit%20(in%20progress)\Final%20Unit\1.%202.%203e%20How%20Does%20Your%20Garden%20Grow_Research_AParker_072216.docx) (Student Research Handouts)
2. Observations during student group work

**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.

No summative assessments for this activity.

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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. |

* Student ability levels were taken into account when grouping students (I paired highs with mediums, and mediums with lows), which successfully allowed the higher of the two in each group to help guide and bring the lower to a higher level of understanding and mastery.
* Although not listed in the needed materials, calculators were provided for groups with lower math abilities. However, students were encouraged to calculate the projected cost by hand first, then double check their work using a calculator.
* An engineering college student from a local university was specially designated to assist the lower-achieving students and provide leading questions and redirection, as needed.
* Two students in the class are classified as Alternatively Assessed and are legally required to have shorter or partially verbal assessments. These two students discussed most of their answers and either relied on an additional member of their group to record them on the group sheets or had the teacher sign off on their completion of that specific section of this activity.

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

* Successes:
  + Grouping my students by academic ability level and social / behavioral tendencies successfully allowed the higher of the two in each group to help guide and bring the lower to a higher level of understanding and mastery. I intentionally provided more assistance for medium / low groups, to additionally scaffold the learning.
  + The student Garden Sharing Worksheets were a huge help for the students with providing a structured way for them to record their findings relating to gardens.
  + Providing the students with some suggested resources for them to use to locate the required information really assisted the lower students. By also allowing room for students to list the sites they actually used for their research, the higher, more self-motivated students were still able to push themselves.
* Shortcomings:
  + Some of the lower-achieving students put a lot of their effort into getting their “research” from nearby groups (through overhearing their conversations) rather than through researching the material for themselves. This was difficult to prevent, due to limited space and a large number of students. In the future, I might assign each group a different topic from the Garden Sharing Worksheet (each topic would then have 2-3 groups assigned to it), then have the students jigsaw the information with other groups at the end of the research period.
  + Most of the groups also felt the need to copy information from the different websites word-for-word, rather than just summarizing their findings. In future implementations, I will likely require all data recorded on their worksheets to be in their own words and model some examples of how information can easily be summarized so that plagiarism is not occurring.