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| **Lesson Title : Optimizing Organ Donation** | **Unit #:**  **1** | **Lesson #:**  **2** | **Activity #:**  **6** |
| **Activity Title: The Challenge** |

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| **Estimated Lesson Duration:** | **6 days** |
| **Estimated Activity Duration:** | **2 days** |

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| **Setting:** | **Rm 2610, Scott High School** |

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| **Activity Objectives:** |

Students will be able to:

1. Highlight the important concepts in the organ donation process,
2. construct a plan to optimize the organ donation process,
3. compare and contrast different plans to determine which plan works the best, and
4. communicate the results of their plan to the class.

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| **Activity Guiding Questions:** |

* Why do some donors/recipients match and some don’t?
* How is who gets an organ or not decided?
* Can there be living donors?
* What makes a “good” candidate to be an organ donor?
* What makes a “good” candidate to be an organ recipient?
* How many people can a donor help?

| **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):** |

LS 1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

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

Trifold brochure google doc, full page brochure google doc, computers

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| **Teacher Advance Preparation:** |

Prepare google docs, prepare rubric for grading

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| **Activity Procedures:** |

Day 1:

1. **Enter Slip:** Identify ***at least*** 4 constraints (limitations) that you will have to work with when creating your plan
2. Optimize organ donation plan
   1. Identify the essential question again
   2. Make sure students have all the research out and with their group
   3. Pass out the donor/recipient pool worksheets
   4. Goal: Get the most recipients to receive the necessary organs (at least 12!) using the least amount of donors - make a flowchart
      1. What will be your limiting factors?
      2. What will be factors to consider when creating the flowchart
      3. Should be able to apply your chart and get the same answer
      4. Find your “flow”, create a chart
   5. Student work time (20 minutes)
   6. Evaluate - Switch plans with another group, do they come up with the same answer? (15 minutes)
      1. After test, have groups do a Q&A with each other
      2. What worked? What didn’t? What was difficult about the plan?
   7. Look at EDP - now we refine
      1. How can you make it better?
      2. How many iPhones are there? Why are there so many?
      3. Time to refine plan (10 minutes)
   8. Evaluate - Switch plans with another group, do they come up with the same answer? (15 minutes)
      1. After test, have groups do a Q&A with each other
      2. What worked? What didn’t? What was difficult about the plan?
3. **Exit Slip:** In your notebook, write one sentence about what you did today. Write one sentence explaining why it was important (relate this back to your essential questions!). Write one sentence about where you could use what you did today again. Write one sentence about how well you worked today in class. Write one sentence about what you think the next step should be.

Day 2:

1. **Enter Slip:** Imagine you are invited to a news program to discuss your flowchart. In one paragraph, explain to the audience watching the news why the project you worked on yesterday is important.
2. Note: If needed, students can do one more iteration of their flowcharts
3. Presenting your findings
   1. Your group will be creating a brochure to promote the product you have created.
   2. What are good concepts to include in your brochure? (Clear, easy to read, graphics, good colors, not too busy…)
   3. Brochure is submitted electronically to Ms. Lafin at the end of class. (put timer on board)
   4. Brochure is shared on google docs, each group member must be working on one part of it.
   5. DO NOT PUT NAMES ON YOUR BROCHURE - only team name.
4. If time permits, have students do a brochure gallery walk
   1. Students set up brochures around the room
   2. Do a pro/con walk - write down 2 thoughts about each brochure
   3. Share out with class (good to remind them of these thoughts for future projects)
5. **Exit Slip:**Take 5 minutes to reflect in your notebook on what we learned in this unit. Make a t-chart. On one side, write ideas we discussed today that you are very comfortable with. On the other side, write questions you still have or something you don’t understand. Your t-chart should not look like anyone else’s t-chart!

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

Periodic check-ins with groups during challenge

**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.

Unit test at the completion of this unit and the subsequent unit.

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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. |

Two different brochures – lower-level groups may use the full-page brochure instead of the tri-fold

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

Cons: students do not know how to use google docs very well, and I will have to provide much more instruction to them for them to be able to utilize google docs well.

Pros: the students liked having a real-world challenge where there is no correct answer for them to find. There were many good class discussions about what was happening in the challenge, and how they could take all the different pieces they had learned about and apply them to an optimization scheme to make the system better. I need much more time for this though – to get them to really analyze where their flowcharts have errors, correct those errors, and then re-work their systems, this could actually take 2-3 days. Next time, I think I will have them starting to prep their unit 1 work while working on this, so that I am not concerned about students having “nothing’ to do while they wait for other groups.