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| **Lesson Title :** Exploring Minimally Invasive Surgery | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **1** |
| **Activity Title:** Basics of Surgery |

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| **Estimated Lesson Duration:** | 4 days (45 min) |
| **Estimated Activity Duration:** | 2 days (45 min) |

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| **Setting:** | Computer lab or classroom with a laptop cart |

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| **Activity Objectives:** |

* Students will use resources to determine the following about minimally invasive surgery:
  + benefits
  + drawbacks
  + difficulties
  + costs
* Students will use resources to compare minimally invasive surgery to conventional surgery using the following criteria:
  + benefits
  + drawbacks
  + difficulties
  + costs

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| **Activity Guiding Questions:** |

* What is the average cost of surgery on animals?
* What actions might a surgeon have to perform inside the body?
* What are the reasons for pets to need surgery?
* What is minimally invasive surgery?
* What are the benefits of minimally invasive surgery?
* What are the difficulties with using minimally invasive surgery?

| **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 New Learning Standards for Science (ONLS)** |
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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)** |

| **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, ONLS and/or CCSS):** |

Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

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| **Materials**: |

Computers

Dog Spay Surgery: <https://www.youtube.com/watch?v=RAi03t4J14c>

Animal Fun Facts Worksheet

Activity 1 Worksheet

White Boards & Markers (1 per student)

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| **Teacher Advance Preparation:** |

Print worksheets

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| **Activity Procedures:** |

**Day 1 – Get Them Hooked**

Begin by passing out animal fun facts worksheet and giving students 2 or 3 minutes to label each statement as true or false. Once students have finished, have them exchange papers with each other and go over the correct answers.

Following this warm-up, students are given the big idea and should write the big idea on the provided worksheet. Following this, students are given 10 minutes to use computers to research and list as many facts as possible about either animal surgery or minimally invasive surgery.

Next, group students in pairs or groups of 3 and give them 5 minutes to share their research with their peers, adding to their list if necessary. Then working in the same groups, ask students to develop *at least* five essential questions relating to the big idea. Give students at least 5 minutes to develop these questions.

Finally, ask students to look at their list of essential questions and pick one question they deem as the most important (per worksheet). After writing this question on their worksheets, have each student write their question on a small white board. Then, go around the room sharing questions. After each student shares his/her question, have them place the whiteboard in a visible part of the classroom (possibly chalk/marker tray).

**Day 2 – Learning More & Introducing the Challenge**

Continuing with yesterday’s worksheet, have students work in pairs to brainstorm some challenges present in today’s society that are related to the big idea. After 5-10 minutes of brainstorming time, have students share one or two of these challenges.

Show students Dog Spay Surgery video. Lead a short discussion on how this surgery could be improved upon to reduce pain, recovery time, and/or cost.

Present students with the challenge, which they should fill in on their worksheets.

Once again in pairs, allow students to fill in the KWL chart on the worksheet.

**Formative Assessments:**

Activity 1 Worksheet

**Summative Assessments:**

None

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| **Differentiation:** |

No modification needed due to the small, homogeneous nature of the group of students (which includes no students with individualized education plans).

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| **Reflection:** |

Unfortunately, the first day of this lesson was modified due to a snow day. The two day description of activity procedures written above was modified to fit into one class period in the following way: As homework during the snow day students were required to research 10-15 facts about animal surgery or minimally invasive surgery. Only 3 of the 9 students completed this assignment, making discussion about these facts difficult the following day. As a result of taking two days worth of material and attempting to fit it into one, the big idea 🡪 essential questions 🡪 challenge process was rushed and poorly executed. I found that when I asked students to come up with essential questions, they focused more on the ‘ethical’ portion of the big idea rather than focusing on what needs, especially surgical, humans and animals may need. This leads me to believe that the big idea is a bit too big and in the future I hope to find a statement that will more accurately lead students to questions about animal surgery. Unfortunately students felt little ownership with this challenge.