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| **Lesson Title : Connecting physics to our lives** | **Unit #: 1** | **Lesson #:** **1** | **Activity #:****1** |
| **Activity Title: Making Connections with Physics** |

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| **Estimated Lesson Duration:** | **3 days of class time, over the course of 9 weeks** |
| **Estimated Activity Duration:** | **2 days, in the first 2 weeks** |

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| **Setting:** | **College classroom** |

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| **Activity Objectives:** |

Students will be able to:

1. Identify various aspects of their lives (job, home, sports/hobbies, the environment, or transportation) that may relate to physics.
2. Choose a topic to investigate from among the relationships they have identified between their lives and physics.
3. Construct guiding questions about how physics relates to their chosen topics.

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| **Activity Guiding Questions:** |

1. How does physics relate to my job / my home / the sports I enjoy / my hobbies / the environment / transportation?
2. What topic would I like to learn more about, related to physics and my own life?
3. We will be studying kinematics, dynamics, momentum, and energy. Which of these are related to the topic I have chosen?

| **Next Generation Science Standards (NGSS)**  |
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| **Science and Engineering Practices (Check all that apply)**  | **Crosscutting Concepts (Check all that apply)** |
| [x]  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):** |

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

1. Pre-class survey (1.1.1a)
2. PowerPoint with student ideas and associated images (1.1.1b)
3. Whiteboards and whiteboard markers (1 board for every 2 students)
4. 3x5 notecards
5. Rubric for final project (1.2.5g)

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| **Teacher Advance Preparation:** |

1. Have students complete a pre-class survey with questions about the ways physics impacts their lives.
2. Prepare PowerPoint presentation with survey results and corresponding images. Start the continuously scrolling slideshow before students enter.

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| **Activity Procedures:** |

Day 1: Students complete pre-class survey (see 1.1.1a for relevant questions).

NOTE: Answers are not discussed with students, but put into a PowerPoint slideshow with relevant images in preparation for Day 2 (see 1.1.1b as an example).

Day 2: NOTE: This is at least one week after “Day 1,” after students have been introduced to the basic physics concepts that will be covered over the course of the term.

1. Students watch slideshow as they are settling into class (watching for their own comments to appear).
2. Students work in pairs with whiteboards, brainstorming ideas of ways that physics relates to their everyday lives in any or all of the following areas: job, home, sports, hobbies, the environment, and/or transportation.
3. Pairs of students circle one or two of the topics on their whiteboards that they would most like to study.
4. Students place whiteboards on the blackboard rail so the whole class can see the things that are written.
5. Students choose from the circled items, writing their top 3 choices for the topics they would most like to learn.
6. Students form groups of 3-4 with others who have a common topic written on their card. These will be the groups and their topics for the final class project. If the students are unable to form appropriate groups, the teacher will change groups as needed.
7. Groups develop a list of 3-4 guiding questions that they would like me to address in class in order for them to be able to understand the physics related to their chosen topic. The questions should be specific: Not “How is momentum related to archery” but “How can we determine the momentum given to an arrow when it is fired from a bow?” This list is submitted electronically to the teacher through the online Learning Management System.
8. Group members decide together who will take on various roles in the group. The roles indicate the person who is responsible for making sure the group performs well in certain areas. The role does NOT indicate that the person is responsible for doing the work themselves. The roles are: Artist, Coach, Engineer, and Manager. If there are only three group members then the Manager role will not exist for that group. Students should have the final rubric available to them, because in the final presentation the person in each role will have the possibility of earning an extra point for each 4/4 their team gets in the role’s three areas of responsibility.

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

Pre-class survey (credit for completion only), walking around to different groups during the activity, guiding questions submitted electronically (rubric 1.0.0d).

**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.

The summative assessment will be the final presentation at the end of the 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. |

Differentiation was not done, though the activity itself encouraged the students to identify their own skills and preferences and to take on a role within the group that would give them the opportunity to use those skills.

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

This activity went remarkably well. There was complete participation by all students, they loved being able to have specific roles within the group, and they loved being able to choose their own groups based upon interests.

They came up with good ideas for projects, but over time two of them changed their projects because they felt they had chosen topics that were too difficult. This actually resulted in division in one of the groups because of disagreement about whether to switch topics, and in another group they chose a new topic based solely upon what they thought would be easy, and it turned out to be a topic that none of them actually cared about.