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| **Lesson Title :** TheAmazing Race | **Unit #:**  **1** | **Lesson #:**  **2** | **Activity #:**  **4** |
| **Activity Title:** Final revision plans |

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| **Estimated Lesson Duration:** | 3-4 Days (in class… 2-3 weeks overall) |
| **Estimated Activity Duration:** | 1 Day (in class… 2-3 weeks overall) |

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| **Setting:** | Room 1556 |

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| **Activity Objectives:** |

Have students submit ideas in writing for improving either their device or the device that they deemed “best” (of the ones they peer-assessed with rubrics the day before).

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| **Activity Guiding Questions:** |

1. Where did your car have the most trouble?
2. What was your limiting factor in time?
3. What could you do “the next time” to make an even better energy storage device?
4. How does that improve on the device?

| **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):** |

From *Course Outcomes for Regular Physics*, November 19, 2015.

4. Defend the use of 1st principles, assumptions, formulae, and graphs to accurately predict the outcome of a described physical phenomenon.

8. Analyze the current and future behavior of physical systems using the idea of kinetic and potential energy as well as the laws of conservation of energy and conservation of momentum.

10. Calculate the current, voltage and/or resistance in an electrical circuit.

11. Design and build electrical circuits using a single power source and resistors.

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

Online submission form in Canvas.

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| **Teacher Advance Preparation:** |

Make online submission form and open to classes. Make certain all classes had adequate access to devices and rubric.

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| **Activity Procedures:** |

Deliver the **Activity Guiding Questions.**

Have them take notes for approximately 5-10 mins. This is there draft.

Have them review rubrics that THEY SCORED from the day(s) before… for about 5-10 mins.

Have them go online to find and write answers to the Canvas worksheet (the **Summative Assessment**). I am allotting 20-30 mins for this.

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

Students will have to analyze rubrics they have used to judge other energy devices, in comparison with their own, too. They would have scored their classmates devices, and their own, in the previous lesson. Today, they will focus on making evaluative decisions based off of those rubrics. For **EDP**, this would be part of the **REFINE** step, even though there is no time left to implement the design refinements. Also, the students will **COMMUNICATE SOLUTION** to me, as the review. Given time, I may bring in a guest engineer to discuss best choices.

**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.

Short answer document will be scored based on reasonableness of answers to guiding questions. They should be crafting a short work where they:

1. Answer the Activity Guiding Questions.
2. Choose a device design they would modify (their own or their chosen “best” of their classmates).
3. Explain their choice of device with at least three supporting statements.
4. Explain at least three improvements they could make.

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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. |

All students will have an opportunity to discuss improvement methodologies, even if they do not appreciate their own car/storage unit systems. This means that students with weaker building skills can either focus on that aspect of their own for improvement or choose a stronger-built but theoretically weaker design. Similarly, a student who struggles with the math/theory may select that as their own weakness for improvement.

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson.  This was a minor portion of their portfolio, and was successful.  The students were reflective. They realized the weaknesses and strengths of their own cars and power supplies and at least one other. I do want to attempt a better method of getting more groups to watch each other in the future. Possibly, we will share videos and have everyone score every device. |