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| **Lesson Title :** Rearranging and Creating Equations | **Unit #: 1** | **Lesson #: 1** | **Activity #: 1** |
| **Activity Title:** Battery Usage Introduction |

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| **Estimated Lesson Duration:** | 3 days |
| **Estimated Activity Duration:** | 1 day |

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| **Setting:** | Classroom with MacBooks |

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| **Activity Objectives:** |

We will create and rearrange equations to solve for a variable and understand relationships.

I will be able to create and rearrange equations to solve problems.

We will work towards an essential question about MacBook battery usage.

I will be able to generate essential questions.

(can be measured/recorded for a formative grade by having students submit questions on Schoology or PollEverywhere)

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| **Activity Guiding Questions:** |

* How can equations be rearranged when only variables are present?
* What can an equation define about a relationship between the variables?
* If not all classes use MacBooks every day, then is conserving the MacBook battery worthwhile?
* What applications are permitted during testing?
  + (students will be introduced to the application during activity 2)
* Are we only testing MacBooks?
* How will graphing information about battery life help me to conserve my usage?
* Does the initial battery life (life cycles) of the MacBook affect battery consumption?
  + Students receive MacBooks at the beginning of the year and it is very likely their MacBooks were used the year before as MacBooks are updated in phases.
* What is the battery consumption of games versus movies?
* Can students use any movie website during testing? What movies are permitted? What games are permitted?

| **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):** |

A-CED Creating Equations-A: 1-4----Students will learn to create equations in one variable to solve problems, create equations in 2 or more variables to represent relationships between quantities, represent constraints in equations, and rearrange formulas to highlight a quantity of interest.

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

* Pre-test: see pre & post- test document
* Hook videos: to be created closer to unit implementation so videos are from current events (recent World Cup, football games, current world events, etc.)

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| **Teacher Advance Preparation:** |

Create Hook videos, ensure links/videos work with school WiFi.

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| **Activity Procedures:** |

**Activity 1: Day 1**

1. **Introduction of Big Idea.** This unit will be implemented after teaching a statistics unit and after reviewing 1 and multistep equations. Therefore, I will move into this unit about interpreting and creating functions by reviewing a few problems with a brief, interactive activity, such as board races or use individual dry erase and let them earn snacks or extra credit points. I will also have the students possible show me what they know about slope trends from geometry and algebra 1.
2. **Content being taught**: A-CED Creating Equations-A: 1-4----Students will learn to create equations in one variable to solve problems, create equations in 2 or more variables to represent relationships between quantities, represent constraints in equations, and rearrange formulas to highlight a quantity of interest. After introducing the Big Idea students will be refreshed with how to solve equations. Therefore, this standard will be taught through Physics equations applying the current charge data students obtain from their MacBooks. Students will also have the opportunity to create an equation or inequality, which integrates cycle life, relating the theoretical capacity with the actual capacity used. These numbers will be different for every MacBook which allows students to individually master this standard.

**Activity 1: Day 2**

1. **Hook-** Show numerous videos as if the MacBook battery had died. These videos will be less than 30 seconds each and will portray a climax of a sporting event (World Cup, NBA Finals, Superbowl…), a climax of a movie (will choose a popular movie such as Black Panther), and a climax from a current event. The goal from this hook is to have the students become interested in the fact that they don’t get to finish watching the video because the battery would have died.
2. **Generating Essential Questions-** Will prompt students and create a list of essential questions. This will be done using Schoology or PollEverywhere in order to record participation and to have a record of submitted questions. Using one of those two platforms will also allow me to show the students the questions being submitted. Teacher will then choose highlight similar essential questions and communicate the essential question which will be investigated.
3. **Challenge**- After highlighting similar essential questions, teacher will begin discussion about possible challenges that could be performed to better understand the MacBook batteries and how to use the batteries most efficiently. These challenge ideas can be brainstormed using think-pair-share. The teacher will then record their ideas and introduce the challenge of creating a set of criteria for optimal use of their MacBook batteries. Discuss how this criterion can go beyond their MacBooks and go beyond the classroom.
4. **Pre-test-** Administer pre-test via Schoology. If student does not have MacBook to take the pre-test on Schoology, I will supply a paper copy and remind student MacBook must be brought daily.
5. **Guiding** **Questions-** Allow students to self-generate guiding questions for information they want and/or need for the challenge. These questions can be written down on an anchor chart or a shared Google document to allow for students to see them whole group.

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

Generating Essential Questions. Generating the Guiding Questions.

Pre-test: See pre & post- test document

**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.

None

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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. |

Pre-test will be offered via Schoology platform but will also be offered as paper copies for the needs of the different learns. This pre-test will also be offered to the different learning students to be taken in the environment with the Special-Education co-lab teacher.

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson.  The Hook was exactly what I had planned. Students were emotionally annoyed as the games and movies continued to cut out. This engagement was channeled into the unit as they created their guiding questions, assigned roles, and began to devise a plan for battery testing. As the challenge was highlighted students began to ask “why in math class?” and this answer was easily answered as we looked at the daily handout and worked with Google Sheets plus showing my exemplar. This activity/day I would not alter. |