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| **Lesson Title :** Interpreting and creating equations using tables and graphs | **Unit #:** 1 | **Lesson #:** 2 | **Activity #:** 3 |
| **Activity Title:** MacBook Testing Round 1 |

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| **Estimated Lesson Duration:** | 6 days |
| **Estimated Activity Duration:** | 3 days |

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

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| **Activity Objectives:** |

We will begin testing our MacBook batteries using System Information and Activity Monitor.

I will participate in my group to collect data in Google Sheets and fulfill my assigned group role.

We will continue testing our MacBook batteries.

I will participate in my group to collect data in Google Sheets and fulfill my assigned group role.

We will finish our 1st round of MacBook battery testing.

I will interpret the data collected from round 1 and project adjustments for round 2 of testing.

(this can be measured/recorded by students being able to create a Google Spreadsheet and write in their MacBook’s individual theoretical, initial capacity. These Google Spreadsheets will be shared with the teacher to allow for formative checks.)

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| **Activity Guiding Questions:** |

* What if the MacBooks being tested finish (batteries die) at different times?
* Does every MacBook in the group need to watch the same movie? Play the same game?
* Should the MacBooks be set to the same volume level and same brightness?
* How many data points should be collected to observe a trend?
* Will 3 days of testing provide accurate data? Does the same movie or game need played on the subsequent days to accurately observe a trend?

| **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):** |

F-IF Interpreting Functions-B:4-6--- Students will interpret functions including interpreting key features of graphs and tables, relate the domain of a function to its graph and describe the relationship, and calculate and interpret the average rate of change of a function. This content will be taught and practiced once students have results to compile and interpret.

F-IF Interpreting Functions-C:7,9---- Students will analyze functions using different representations by graphing functions expressed symbolically and showing key features of the graph and students will compare properties of 2 functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal description). This content will be taught and practiced as students analyze the functions they created with cycle life in addition to analyzing the amperage and voltage equations in combination with analyzing the graphs they created using their data from the testing.

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

PowerPoint: Created to mirror handout to assist with understanding of applications

Remind students of group roles to ensure full participation.

PowerPoint will also provide Google Sheets hints and additional instructions (as needed).

Handout: *To be used for entirety of Unit.*

 Data will be recorded into Google Sheets. Handout will show instructions to ease the use of Google Sheets and clearly outline data to be collected.

Participation rubric: to be completed by reflector (see roles below in activity procedures) and turned in daily.

Resources:

Applications to be used: System information and Activity Monitor

Applications to be downloaded: Battery Health 1 & Battery Health 2

Applications to be used via internet: Coconut Battery, Google Sheets

Supplies: School supplied MacBooks (students are assigned MacBooks at the start of the school year)

Will use Apple TV to screen mirror teacher MacBook and mirror applications as students become accustomed to information supplied in these applications.

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| **Teacher Advance Preparation:** |

* Create/modify PowerPoint as described above.
* Check all groups have shared their Google Spreadsheet with teacher. Identify groups that have not and advise of this before beginning round 1 of testing.

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| **Activity Procedures:** |

Testing round 1 of MacBook usage. During this round of testing students will be working in their assigned groups and will begin monitoring and recording the data about their MacBooks’ batteries while constantly playing the determined usage. The above described applications will be used to obtain data.

Day 1:

1. Based upon the group’s assigned MacBook usage (movie, game, Netflix…) the students will begin monitoring and recording the data about their groups’ MacBooks’ batteries while using the applications previously introduced.
2. Teacher will remind students of group roles by using PowerPoint to display each role’s duties.
3. Direct Instruction: Teacher will answer any questions about Round 1 of testing or about how to record in Google Sheets This will be completed using Apple TV screen mirroring to display Google Sheets and actively show students in real time how to fix any issues or demonstrate how to create graphs and insert trend lines and so forth. This can also be completed answering questions group by group.
4. Circulate throughout testing to ensure students are properly recording data as their MacBook batteries are being used and depleted.

Day 2:

1. Teacher will remind students of group roles by using PowerPoint to display each role’s duties.
2. Direct Instruction: Teacher will answer any questions about Round 1 of testing or about how to record in Google Sheets This will be completed using Apple TV screen mirroring to display Google Sheets and actively show students in real time how to fix any issues or demonstrate how to create graphs and insert trend lines and so forth. This can also be completed answering questions group by group.
3. Teacher will prompt students to begin thinking about their data as they collect day 2 data. During this prompting the teacher will ensure students are following the handout for decreasing confusion about using Google Sheets. Additionally, the teacher can spark conversations as students begin to see trends in their data.
4. Teacher will answer any questions that arise while circulating. These questions should be communicated to the teacher from the student designated as the runner, but while circulating other students may have questions as well.
5. Begin testing. Same instruction as Day 1. See #1 above.

Day 3:

1. Remind of group roles. All roles can begin assisting, in their own capacity, with interpreting and analyzing data as described per handout.
2. Direct instruction: Troubleshoot prior to beginning testing on Day 3.
3. Teacher will prompt students to begin thinking about their data as they collect day 3 data. During this prompting the teacher will ensure students are following the handout for decreasing confusion about using Google Sheets. Additionally, the teacher can spark conversations as students begin to see trends in their data. Their handout will outline how to begin plotting the data points collected during the previous 2 days of testing.
4. Teacher will answer any questions that arise while circulating. These questions should be communicated to the teacher from the student designated as the runner, but while circulating other students may have questions as well.
5. Begin testing. Same instruction as Day 1. See #1 from Day 1 above.
6. After testing has completed, students will be prompted by teacher and handout to review data, interpret results using Google Sheets, collaborate with group members and brainstorm ways to improve the batteries’ performance for the second round of testing, such as decreasing audio volume or reducing brightness. These ideas/criteria for improved battery performance will be recorded into Google Sheets.

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

Participation Rubric

Formative points for completion of round 1 of testing (3 days). This will be graded for completion as teacher will have access to each group’s Google Spreadsheet of data.

**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.

Completion of creating criteria for improved battery performance for round 2 of testing. This will be checked by teacher and graded for completion. The participation rubric will be considered while reviewing this summative grade.

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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. |

Videos showing how to record data in Google Sheets plus screen shots will be present on the Handout.

Teacher will constantly circulate throughout testing to assist with monitoring, recording, and beginning interpretation of data.

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson.Similar to the other lesson/activity prior, this one went well and as planned. Students actively tested MacBooks and used the daily handout to assist with recording and organizing their data. I would better adhere to the roles specific duties to help with circulating more smoothly during the activity/lesson. Otherwise the daily handout was nicely implemented and students remembered to bring MacBooks for effective use.  |