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| **Lesson Title : Data Day** | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **2** |
| **Activity Title: Guzzling Gas** |

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| **Estimated Lesson Duration:** | **240 minutes** |
| **Estimated Activity Duration:** | **80 minutes** |

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| **Setting:** | **Science Lab or classroom** |

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| **Activity Objectives:** |

Students will be able to:

1. Examine the data and data analysis from the previous lesson.
2. With this and additional research, discuss and decide what will be the best questions to ask in a parent survey about gas consumption.
3. Practice organizing data into data tables
4. Design a survey, distribute it, and collect the data.
5. Tabulating measures of central tendency.
6. Analyze the data.
7. Present an awareness campaign of their findings.

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| **Activity Guiding Questions:** |

1. How can we compare this data?
2. Where does gasoline come from? What is gas consumption?  
    Why is the topic of gas consumption important?
3. – 6) How can we compare this data? How can we graph this data?
4. What are ways drivers can reduce gas consumption?

How will reducing gas consumption help our community? How will it help our world?

| **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):** |

Understanding Sampling 7.SP.1, 7.SP.2

Using Mean and Mean Absolute Deviation 7.SP.3, 7.SP.4

Making Comparative Inferences about Two Populations 7.SP.3, 7.SP.4

Simulations 7.SP.8.c

Investigate patterns of association in bivariate data 8.SP.A.1, 8.SP.A.2, 8.SP.A.3, 8.SP.A.4

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| **Materials**: |

Previous lesson’s basket of index cards and materials

ipads

rulers

posters

markers

neon yellow, pink, and blue notecards

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| **Teacher Advance Preparation:** |

Teacher will reserve ipads for classroom use.

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| **Activity Procedures:** |

**Teacher Instructions: Guiding Activity**

1. The teacher will remind the students how to use the stop signs they constructed the other day. Students will get back into their groups and bring their materials basket to the group table. (2 minutes)
2. The teacher will distribute the ipads and explain that the students’ task will be two-fold: First they need to find websites that will help them collect data (refer to guiding questions) and second the group will need to compile written research on the notecards. Neon index cards will be used for this activity. (3 minutes)
3. Students will work individually on the ipads and write down facts about gasoline (neon yellow), gas consumption (neon pink), and its environmental impact (neon blue). (10 minutes)
4. Students will then share the information they collected within their group, and put aside duplicate and unnecessary notecards. (5 minutes)
5. As a whole class, the teacher will ask each group to share one fact, writing down the facts on the board. The other groups will put aside duplicate notecards. Once all of the notecards are exhausted, the teacher will ask the students to look at the board. The teacher will reintroduce the Big Idea which was presented as the Hook: Forces, Motion, and Math all have an impact on traffic management. Students will respond to this idea and discuss, while referring to their notecards, review the essential question -- What is the most efficient, and optimal route for cars to travel in a congested area? The students will then share what they feel are the essential questions concerning the guiding question, “How can we understand how families use gas? How can we share what we just learned with people in this school? The teacher will guide students to design a survey asking parents in the school about gas consumption and ultimately designing an awareness campaign to disseminate information they learned from their survey and recent research (10 minutes)
6. Students will raise their hands and contribute a possible question for the survey. The teacher will write down the questions. When done, the students will put their heads down on their desks and do a silent vote for each question (students can vote on their favorite 5). (10 minutes)
7. The teacher will erase the least popular questions and show the students questions for the survey. (1 minute) Students will save their calculations and notecards in a designated team basket. This survey will be typed up by the teacher and students will distribute it to parents afterschool.
8. On the following day, students will view the collected surveys. (10 minutes)
9. Each group will be in charge of determining one or two of the following: mean, median, mode, min, max, outliers, mean average deviation, percent increase and decrease (if applicable), sampling size, and the populations surveyed. (10 minutes)
10. Back as a whole class, the students will share their data facts. Keeping in mind the important research facts they gathered yesterday, students will brainstorm aloud what message they should convey to parents on a poster board. They can also brainstorm different methods of campaigning (tasks) – coming up with a flyer, email, brochure, slogan and logo, a chant or rhyme, a song, a short speech, etc. Students should also consider which graph -- a scatterplot, line graph, line plot, line graph, or bar graph might be helpful to use in the campaign.(15 minutes)
11. Students will volunteer for various awareness campaign tasks. These tasks will be completed for homework. (5 minutes)
12. On the following day, the students will share tasks completed for homework and organize how best they should present this, and when, to parents, students, and teachers of the school. They will also practice their presentations. (40 minutes)
13. Upon principal approval, students will present their campaigns either before school, afterschool, or during a PTO evening meeting.

* **Key Vocabulary** to be learned:
  + Measures of central tendency, mean, median, mode, min, max, outliers, mean average deviation, scatterplot, line plot, bar graph, percent increase, percent decrease, sampling size, populations, associations in bivariate data

**Student Instructions**

All student instructions will be oral and the following key reminders can be written on the

blackboard: Red = I need help immediately, Yellow = I am having trouble and need advice, Green = I have no problem

Neon yellow = data on gasoline facts, Neon pink= gas consumption, Neon blue = gas and its environmental impact

**Formative Assessments:**

The utilization of the traffic lights will allow the teacher to assess which students need assistance with the content or tasks required. The teacher will walk around and check each student’s individually written index cards to assess that he/she is on the right track for gathering facts.

Data facts on notecards.

Tasks completed as homework assignment.

**Summative Assessments:**

Half of the questions on the post-test will assess the above math objectives.

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| **Differentiation:** |

Students with ADHD will be allowed to stand up, take water breaks, and squeeze a stress ball throughout the activity. The teacher will repeat the directions slowly to ESL students and ask if there are any questions they might have. The teacher will write key vocabulary words and their definitions on large colored cards and hang them on the wall for the students to refer to. Students with physical disabilities will be assisted with writing on the board or calculating the mean. Advanced students will be asked to find the mean average deviation for each data set (boys and girls reaction times) and share their conclusions with the class.

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| **Reflection:** |

This was an amazing activity and I feel that the students benefited so much from it. Prior to having students come up with survey questions, I guided them a little bit by showing some youtube videos and websites on the topic of how people can save gas (for example, <http://www.consumerenergycenter.org/transportation/consumer_tips/>). This gave the students solid ideas to base their questions off. The students tended to have a lot of duplicate or similar questions when they raised their hands. Using a projector with all of their ideas allowed the students to see how they could rephrase the questions to incorporate two or three previously stated questions.