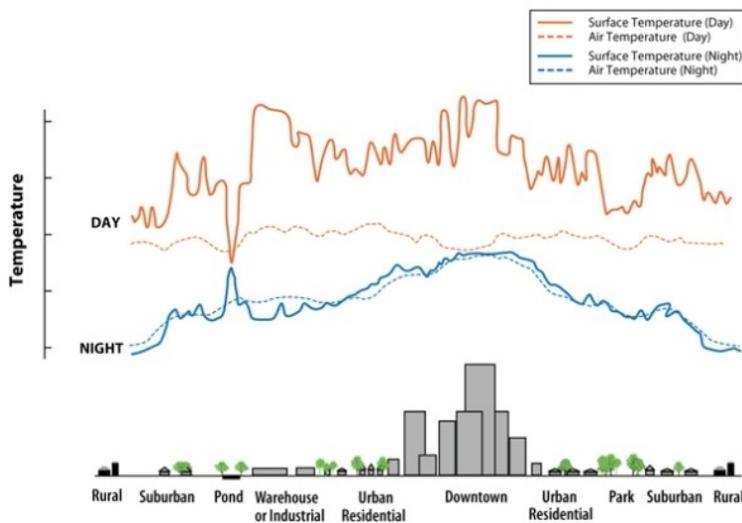# Mandatory 3: Data...and Math are Everywhere

MATH CONNECTIONS IN THE STEM CLASSROOM
WEINBERG, AMY S.

Mandatory 3: Data…and Math Are Everywhere

DATA:

Credit: EPA

From https://mynasadata.larc.nasa.gov/mini-lesson/surface-and-air-temperatures-throughout-day

ENGAGING CONTEXT: Students will collect, graph, interpret and analyze data to represent real-world mathematical problems.

MEASURABLE OBJECTIVES:

Formative:
- Students will create questions and answers based on data in Engage activity.
- Students will develop a system to determine temperature differences using the data chart given to them.
- Student will create a test to determine how sunlight affects the temperature of different locations.

Summative:
- Student will collect and graph data.
- Student will use formulas to determine the area of the playground and the cost of covering the playground.
- Student will develop a proposal with evidence to persuade administration to use what they consider to be the best choice of ground cover for the playground.

STANDARDS:

CCMS

5.OA.3-Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

5.G.1-Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond.

5.G.2-Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

CCSS.ELA-LITERACY

W.5.1-Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

NGSS

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-ETS1-1 Define a simple design problem reflecting a need or a want tat includes specified criteria for success and constraints on materials, time, or cost.

5E Lesson Plan	
Engage	https://mynasadata.larc.nasa.gov/mini-lesson/surface-and-air-temperatures-throughout-day Students will view the data on the chart and develop 3 questions that could be answered using this data. They will then switch questions with their partner and try to answer the questions only using the data. Then students will share the questions and how they used the data to answer them with the class.
Explore	Students will use the data to compare the daytime surface and air temperatures in different areas (rural, suburban, urban, park, etc). They will create a system to determine which areas had the greatest difference in surface and air temperature and will create a hypothesis to explain their data.
Explain	Students will present their systems for comparing data along with their results. Then, students will develop a hypothesis and a test to explain how sunlight affects the temperature of various surfaces around the school. After developing the test, students will collect data sets from locations around the school (on the PE court, under the PE shed, in the field, and on the current playground) and will create a graph to display this data.
Elaborate/ Extend	The students will analyze and interpret the data to determine which would be the best type of surface material for reducing the amount of heat in our new school playground. Students will measure the length and width of the current playground and determine the area. Then, they will do research to determine the cost of covering the playground with their chosen material. They will create a proposal which uses data to support their suggested groundcover.
Evaluate	Formative: • Student questions and answers based on data in Engage activity. • System to determine temperature differences. • Student created test to determine how sunlight affects locations. Summative: • Student collected data and graph.

5E Lesson Plan	
	• Student determination of area and cost of playground ground covering • Student proposal with evidence and explanation of determining best choice.

EVIDENCE:

Since we are no longer in school, I was not able to try this activity with my class. Next year, I plan to do this activity toward the beginning of the year, when we teach about weather. I will be able to monitor student understanding of data analysis through the questions and answers students produce when looking at the NASA data set. I will be able to assess their quantitative reasoning through their development of a system to determine the differences in temperatures, and I will be able to assess their understanding of the scientific method, temperature, and heat absorption through the tests they create to prove their hypotheses. I will also be able to collect evidence of their understanding of data collection, graphing, area, cost analysis and persuasive writing through their summative proposals. I feel that this real-world project-based learning activity will enhance the students' understanding of both the mathematical and scientific concepts. By having my students collect their own authentic data to analyze, I will create a greater investment in the material and this will lead to a deeper understanding of the concepts.

REFERENCES:

My NASA Data. (n.d.). Retrieved from https://mynasadata.larc.nasa.gov/mini-lesson/surface-and-air-temperatures-throughout-day

Weber, E., Ellis, A., Kulow, T., & Ozgur, Z. (2014). Six Principles for Quantitative Reasoning and Modeling. *The Mathematics Teacher*, *108*(1), 24. doi: 10.5951/mathteacher.108.1.0024