

## Data Visualization Best Practices Workshop Teacher Report

Name: **Mark J. Davis**

Area(s) of Teaching: **Computer Science, Digital Literacy**

Where You Teach: **Barrington Middle School**

Please describe your activity goal:

**Goal 1: Students will create a vehicle using best design practices for safe delivery of a fragile object.**

**Goal 2: Students will analyze controlled experiments to test their design.**

**Goal 3: Students will synthesize results as a data storyteller using data visualization technology.**

**NGSS Standards:**

**MS-ETS1-3 Engineering Design:** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. [Goals 2,3]

**MS-ETS1-4 Engineering Design:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. [Goals 1,2]

What is the intended visualization?

**Students will create an dynamic infographic that mimics a research poster presentation. The infographic will feature imagery of their prototypes for the egg delivery craft, graphics demonstrating the velocity of the drop and G-force of impact, and conclusions about how they improved their design. If students are unable to provide an interactive copy, a printable version can be prepared with the essential features highlighted for the reader.**

Please provide the activity wordings presented to the students:

**Essential question: How can we visualize the impact of data experimentation in multiple modes?**

**In this experiment, you will be completing the egg drop experiment discussed in class. However, you will be required to collect your data digitally, visualize the results, and produce an exploratory infographic.**

Please describe the nature of the activity (e.g. In class activity? Homework? Something else) and the rationale behind your choice.

**The students will be conducting an experiment to construct a durable delivery device for a falling egg. This classic experiment helps students to understand basic physics and the design process of iteration and problem-solving.**

What is/are the dataset(s) that will be used for the activity? How students will access the dataset(s)?

**Students created their own datasets using parameters set by the teacher. They collected time series (attempts), velocity (meters per second, squared), and impact (g-force). This data was captured by the microcontroller and stored as a CSV file. The file was downloaded to a Google Drive and imported into a spreadsheet.**

What tool(s) are students going to use? How will students have access to the tool(s)?

**Students will access the data from a microcontroller, the [Adafruit Circuit Playground Express](#) (CPX) or [Adafruit CLUE](#). The CPX has small storage that can record information from sensors, in this case, an accelerometer. The CLUE offers a simple LCD display, allowing for immediate results to be displayed. Either device will work with the hardware programming that students will make in the CS course. In addition, a three-volt battery pack is needed to power the controller. A [JST connected pack with three AAA batteries](#) or a [lithium-ion polymer \(Li-Poly\) rechargeable battery](#) are recommended.**

**The students have learned how to code the microcontroller using [Microsoft Makecode](#) blocks or [CircuitPython](#) to capture changes in velocity and direction every 100 milliseconds. This data will be captured as a simple row of numerical data and exported as a CSV file.**

**Students will take the raw into Infogram and produce an infographic report about how they prototyped, tested, and revised their design. The captured data will be illustrated and labeled to demonstrate how they used the information to improve their vehicle.**

How you are going to grade the activity? (e.g. Rubric)

**Students will complete their project by demonstrating their payload delivery in a live settings. Students will take turns with a raw egg (covered in loose plastic wrap) and drop their payload from a height of 25 feet. Students will be assessed using a checklist of the parameters. A reflection on the process will use a teacher-created, problem-solving process rubric, examining how well students brainstorm the problem, researched their prototype, tested their prototype, and reflected on the results via an infographic.**

Do you think you will keep incorporating data visualization in the future?

**Absolutely, as I believe data science and understanding visualization is an essential skill for all learners. My experience has shown that students and teachers are not only interested in visualization but have creative ideas about how they want to share what they have learned or experienced. By presenting their results as an infographic, designers are learning how to document their learning with an audience in mind. A**

**simple graphic is effective for examining raw data, but adding information visualization creates a storytelling experience.**

**Infographic for Egg Drop Experiment:**

<https://infogram.com/egg-drop-experiment-1hd12yxnqe77x6k?live>