

Coding Camp Implementation Plan for Teacher Hat work

During your “Teacher Hat” time, we would like you to:

1. Create a notebook that you can use with your students. This can be a series of scaffolded notebooks to get to a culminating activity or one longer, *highly differentiated* notebook that includes scaffolding along the way to assist students as needed as well as extensions for those who move through the task with ease.
2. Write a brief companion document (1-2 pages) that explains the scope, sequence and (formative or summative) assessments in a lesson - or series of lessons - that will incorporate the notebook(s).

Characteristics of a finished notebook/series of notebooks:

- clearly defined student learning objectives
- targeted to a specific class/grade
- a task that is worthy of coding
 - handles/generates/displays large data sets OR iteratively generates simulated data
- is designed for students to engage in collaborative work
- considers access and equity for ALL students
- includes planning for continuous formative assessment by teacher (Zoom poll, Socrative, etc.)
- encourages the use of real data sets
- explicitly states the role of testing, debugging and validating code
- should lead students to create a graphical representation of the data
- includes a plan for students to present the data and completed notebook to peers

As for the companion document, pretend that the person reading it knows nothing about writing code, and needs to know how this “notebook thingy” is going to fit well into your curriculum.

See Also the following report:

[AAPT recommendations for computation \(2016\)](#)

As students enter the workforce, they may start a career that had not even been dreamed of ten years ago. The markets, tools, equipment, materials, and products that they will work with evolve and improve each year so much that a field may look totally different in the time it takes to receive a degree in that field. However, within these hyper-evolving careers, it is certain that a good conceptual foundation in Science, Engineering, and Computer Science will position any student to be successful. One of the most ubiquitous skills to have is the ability to use code to manipulate large data sets into a more meaningful form. If they are to be successful in these future industries, current Engineering students should have a good foundational understanding of the principles and procedures of code, big data, AI, machine learning, and quantum computing.

This lesson will introduce students to current tools and procedures that data scientists use to work with large data. A sub goal of this lesson is to inspire students to take the Computer Science course. The lesson is for PLTW Principles of Engineering after the Energy Sources unit. Students should have previous knowledge of energy sources and distribution in the nation, state and local areas. They should know about the pros and cons of each energy source and have had discussions related to current issues in energy distribution. The EIA website has been used to research information about several topics in energy and a special note has been made each time that the data presentation is limited in that only one set of data can be presented in the graph at a time. Now students will focus on how data science and coders can take multiple sets of data and combine them for more meaningful graphical representation.

Students will be given a pretest to both set a baseline for understanding and to adjust the lesson. The first example that is given is the national CO₂ emissions dropped dramatically during the 2020 COVID pandemic. The EIA website only allows presentation of that singular data. The students' challenge is to display both the CO₂ emissions and another data set like price or GDP in the same graph using Google Colaboratory. To do that, they will learn how to trim and sort the real-world data.

The students are given a Google colaboratory or Jupyter Notebook with a step by step method on how to generate a simple line graph. Then they will use the given resources to add another data to the graph and make more inferences from the new graph. They will trim, sort, code and test to make the final product. The final deliverable will be the Notebook presentation. These skills and tools will later be used in the programming unit to give a wider sampling of Computer Science and Data Science Engineering including an exploration on how AI, Big-Data, and Machine Learning will be utilized in industry by the time they enter the workforce.