Notes & Considerations:
- Feel free to adapt the timeline and materials to your individual course and student needs.
- You may edit all of the instruction sheets, activity sheets and project rubrics for your individual course and student needs
- Ideas for extensions are listed under applicable activities.
- Email Lee Cristofano cristofano.lee@bphawks.org or Emily Smoller smoller.emily@bphawks.org with any questions.

Need to Know Information for Teachers (in order to complete the module):
- Ability to uncover a research problem and formulate a research question
- Ability to locate the necessary data sets to answer the question
- Ability to download a dataset as a CSV, Google Sheets and Excel Spreadsheet file
- Ability to create a Pivot Table in Google Sheets and/or Excel
- Ability to manipulate a Pivot Table to analyze data and answer questions
- Ability to create a bar or pie chart in Google Sheets and/or Excel
- Ability to recommend potential policy to a party in order to help solve your research problem
- Ability to tell a story with data
- Ability to create presentation and present your findings to an audience

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Enduring Understanding: Solving problems using data

Big Question: How can you use data to solve a question?

Module Objective: To begin to solve problems with data.

Student Objectives:
- To uncover a problem
- To formulate a research question
- To find the necessary data to answer the question
- To manipulate a spreadsheet to help answer the question
- To create visualizations to help answer the question
- To create a visual aid and present the findings to the class

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PA Standards:
PA Standard Area: 2.4 Measurement, Data & Probability
- CC.2.4.HS.B.1 - Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.4.HS.B.2 - Summarize, represent, and interpret data on two categorical and quantitative variables.
- CC.2.4.HS.B.5 - Make inferences and justify conclusions based on sample surveys, experiments and observational studies.

PA Standard Area: Computer Science - 3A.DA Data Analysis
- 3A.DA.11 - Create interactive data visualizations using software tools to help others better understand real-world phenomena.

PA Standard Area: Computer Science - 3B.DA Data Analysis
- 3B.DA.06 - Select data collection tools and techniques to generate data sets that support a claim or communicate information.

PA Standard Area: 15.3 Communication
- 15.3.12.C - Create a research project based upon defined parameters.
- 15.3.12.G - Employ appropriate presentation skills to lead discussions and team activities.
- 15.3.12.W - Collaborate via electronic communication with peers, educators, and/or professionals to meet organizational goals.

PA Standard Area: English Language Arts
- CC.1.4.11-112.A - Write informative/ explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately.
- CC.1.4.11-12.D - Organize ideas, concepts, and information to make important connections and distinctions; use appropriate and varied transitions to link the major sections of the text; include formatting when useful to aiding comprehension; provide a concluding statement or section.
- CC.1.4.11-12.F - Demonstrate a grade-appropriate command of the conventions of standard English grammar, usage, capitalization, punctuation, and spelling.
- CC.1.4.11-12.G - Write arguments to support claims in an analysis of substantive topics.
- CC.1.4.11-12.J - Create organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence; Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims; provide a concluding statement or section that follows from and supports the argument presented.
- CC.1.4.11-12.U - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- CC.1.4.11-12.V - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- CC.1.4.11-12.W - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research.
- CC.1.5.11-12.A - Initiate and participate effectively in a range of collaborative discussions on grades level topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- CC.1.5.11-12.D - Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning; ensure that the presentation is appropriate to purpose, audience, and task.
- CC.1.5.11-12.F - Make strategic use of digital media in presentations to add interest and enhance understanding of findings, reasoning, and evidence.
- CC.1.5.11-2.G - Demonstrate command of the conventions of standard English when speaking based on grade 9-10 level and content.

Common Core Standards:
Summarize, represent, and interpret data on a single count or measurement variable
CCSS.MATH.CONTENT.HSS.ID.A.1

Represent data with plots on the real number line (dot plots, histograms, and box plots).
CCSS.MATH.CONTENT.HSS.ID.A.2
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
CCSS.MATH.CONTENT.HSS.ID.A.4
Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables
CCSS.MATH.CONTENT.HSS.ID.B.6
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Interpret linear models
CCSS.MATH.CONTENT.HSS.ID.C.9

Distinguish between correlation and causation.

Understand and evaluate random processes underlying statistical experiments
CCSS.MATH.CONTENT.HSS.IC.A.1

Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies
CCSS.MATH.CONTENT.HSS.IC.B.6
Evaluate reports based on data.

Materials:
- First Mini-Project Worksheet & Rubric:
    - With Points: Your First Mini-Big Data Project Worksheet & Rubric
    - Without Points: Your First Mini-Big Data Project (w/o Points)
- Your First Mini-Big Data Project Worksheet & Rubric
- Google Sheets or Microsoft Excel
- Google Slides, PowerPoint, Canva, Prezi or any other slide design software
- Western PA Data Center Website or any other data sources
- Google Slides template
- Past Student Example (we will continue to update in 2021)

Prerequisites:
- Successfully completed module #2

Activity 1:

- Discuss past research problems and projects
  - *Leading causes of car crashes in Allegheny County*
  - *Most common crimes in Allegheny County*
  - *Most common types of drug overdoses in Allegheny County*
  - *Most frequently used parking meters in the city of Pittsburgh*
  - *Most common 311 call requests in Pittsburgh*
- Students can use the Western PA Data Center Website for their data sets (unless they have their own idea). This would lead to a Pittsburgh/Allegheny County centric issue to solve.
- Distribute First Mini-Project Worksheet & Rubric:
  - With Points: Your First Mini-Big Data Project Worksheet & Rubric
  - Without Points: Your First Mini-Big Data Project (w/o Points)
- Review the worksheet and rubric with the class
- Have the students get started on the Data portion of the worksheet
- This is typically completed as an individual assignment; however, can be a group if you like

Activity 2:

- Complete the Problem section
- Approve students Research Problems before moving on to the analysis
- Begin the Analysis section

Activity 3:

- Continue on with this Analysis section
- Begin creating visualizations

Activity 4:

- Continue on with the Analysis & Visualization sections
- Begin creating your Slide Show presentation:
  - Google Slides template OR
  - Students can create their own slides!
- Past Student Example (we will continue to update in 2021)

Activity 5:

- Finalize your Slide Show presentation

Activity 6:

- Present your Slide Show to the class

Evaluation - see rubric on page 2 of Your First Mini-Big Data Project Worksheet & Rubric

<u>Possible Timeline:</u>

Day 1: Activity 1
Day 2: Activity 2
Day 3: Activity 3
Day 4: Activity 4
Day 5-6: Activity 5
Day 7-8: Activity 6