(http://csmatters.org) 6 - 3

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Dataquest

Unit 6. Data Visualization

Revision Date: Jan 04, 2020
Duration: 15 50-minute sessions

Lesson Summary

Summary

Continuing the focus on data analysis from Unit Five, students will use the browser-based Dataquest learning environment (http://www.dataquest.io (http://www.dataquest.io)) and supplementary materials to explore more ways in which Python can be used to analyze data. For the first week, students will explore Dataquest through the browser-based "missions" on the website. Each lesson begins with a warm-up/journal entry, and students then spend the rest of the time working through the missions at their own pace. For the second part of the lesson, students will design and implement their own data analysis project in order to prepare them to complete a data-focused Create Performance task.

Outcomes

- Students will understand how to design a data analysis project
- Students will have the tools to analyze data in Python
- Students will have practice reading and understanding datasets

Overview

Week One: Learning Dataquest

1. Getting Started (5 - 10 min)
2. Independent Study (40 - 45 min)

Week Two: Data Analysis Project

1. Students Plan and Implement Data Analysis Program

Learning Objectives

CSP Objectives

- *EU CRD-2 - Developers create and innovate using an iterative design process that is user-focused, that incorporates implementation/feedback cycles, and that leaves ample room for experimentation and risk-taking.*
    - LO CRD-2.B - Explain how a program or code segment functions.
    - LO CRD-2.C - Identify input(s) to a program.
    - LO CRD-2.I - For errors in an algorithm or program: a. Identify the error. b. Correct the error.
- *EU DAT-2 - Programs can be used to process data, which allows users to discover information and create new knowledge.*
    - LO DAT-2.A - Describe what information can be extracted from data.
    - LO DAT-2.D - Extract information from data using a program.
- *EU AAP-1 - To find specific solutions to generalizable problems, programmers represent and organize data in multiple ways.*
    - LO AAP-1.A - Represent a value with a variable.
    - LO AAP-1.B - Determine the value of a variable as a result of an assignment.
- *EU AAP-2 - The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.*
    - LO AAP-2.G - Express an algorithm that uses selection without using a programming language.
    - LO AAP-2.H - For selection: a. Write conditional statements. b. Determine the result of conditional statements.
    - LO AAP-2.I - For nested selection: a. Write nested conditional statements. b. Determine the result of nested conditional statements.
    - LO AAP-2.N - For list operations: a. Write expressions that use list indexing and list procedures. b. Evaluate expressions that use list indexing and list procedures.
    - LO AAP-2.O - For algorithms involving elements of a list: a. Write iteration statements to traverse a list. b. Determine the result of an algorithm that includes list traversals.
- *EU AAP-3 - Programmers break down problems into smaller and more manageable pieces. By creating procedures and leveraging parameters, programmers generalize processes that can be reused. Procedures allow programmers to draw upon existing code that has already been tested, allowing them to write programs more quickly and with more confidence.*
    - LO AAP-3.D - Select appropriate libraries or existing code segments to use in creating new programs.

Teacher Resources

Student computer usage for this lesson is: **required**

DataQuest.io website: https://www.dataquest.io/learn (https://www.dataquest.io/learn)

Week One Materials: **Unit 6 Resources -> DataQuest.io -> Week One Lesson Materials -> Mission #**

Week Two Materials:

Datasets: **Unit 6 Resources -> Dataquest.io - > Week Two Project Datasets and Materials -> Datasets**

Sample Project: **Unit 6 Resources -> Dataquest.io - > Week Two Project Datasets and Materials -> Sample Project**

Project Rubric: **Unit 6 Resources -> Dataquest.io - > Week Two Project Datasets and Materials -> "Data Analysis Project Rubric"**

(Quizzes for Week One and Week Two are in the corresponding teacher-only resource folders)

Lesson Plan

Week One: Learning Dataquest

Note: all worksheets and quizzes can be found in the teacher-only resource folder, Unit Six -> DataQuest.io -> Week One Lesson Materials -> Mission #

Directions for working in Dataquest.io

1. Each student will first need to create an account on Dataquest.io. This is free, and will help them to keep track of their progress.
2. Each mission comes with a worksheet with required sections to complete. Students are encouraged to fill out as much as possible. The non-required sections are introductions to basic coding tools. Some students may want to do these if they need a refresher on the concepts.
    - **Note:** As of now, sections cannot be skipped on the website. This limitation may change in the future.
3. Once they have completed the worksheet for the mission, students will use the notes on their worksheets to complete:
    a. A **concept quiz** to test their understanding of the data science concepts.
    b. A **coding quiz** to test their understanding of the Python concepts.

Quizzes should be done in class, and should take a minimum of 10-20 minutes to complete. It is advisable to not give a quiz out in the last ten minutes of class. If there are only a few minutes left, the student can use the time to add to their notes.

If a student fails one of the quizzes, they may be given the chance to go back and add to their worksheet before attempting the quiz again. (Multiple versions of all coding quizzes are available.)

There are four Missions for the Data Analyst In Python Path. Students are only required to do the first three to review and prepare for the create task they should do the first six missions.

The fourth Mission has worksheets/quizzes for those students who get to it, and can be counted as extra credit/normal grade at the teacher's discretion. Additional useful courses include data visulization, data cleaning and introductory statisitics.

Getting Started (5 - 10 min)

Day 1

Show the first two minutes of the introductory video in Mission 1 on the Dataquest.io website. Students will discuss their reactions and thoughts about Data Science.

Day 2

Pull up d3js.org (http://d3js.org) on the projector. This is the webpage for a data visualization library in Javascript that has many great examples of ways to make connections from data. You can explore by clicking on one of the tiles on the front page. Explore the D3 front page with the class and discuss reactions.

Day 3

This warm-up time is used for class discussion on progress through the missions. You can use this time to gauge the students' comfort with Python concepts by having students vote with their heads down. If enough students are having trouble, you may want to have a separate review session during the class.

Day 4

This warm-up time can be used for reviewing a Python concept (such as Dictionaries) or looking at a current news article involving data analysis (any article about a topic of interest to the students that uses statistics would be appropriate). Students should think-pair-share on additional ways in which data could be used.

Day 5

Students should do a show of hands to see where everyone is in the missions. The class should have a general discussion about progress.

Week Two: Data Analysis Project

Note: All materials for this section can be found in Unit 6 Resources -> Dataquest.io - > Week Two Project Datasets and Materials

Directions:

For this week, students will be pairing up to create and implement a data analysis program of their own design.

- Teachers start out the first day by presenting the PowerPoint "Project Introduction," which goes through the steps to creating a data analysis project. Teachers then review the "Data Analysis Project Directions" document.
- The class splits up into groups of two (with up to one group of three) and each group chooses a dataset to work with. It is preferable if each group chooses a different dataset.

For the rest of the week, students should work on their projects in their groups. At the end, teachers can optionally have them present their PowerPoints to the class, exchange presentations in pairs, or merely turn everything in.

Evidence of Learning

Formative Assessment

- Week One quizzes
- Check for understanding at the beginning of each day of week one.

Summative Assessment

Week two project.

(http://www.umbc.edu/)


(http://www.umd.edu/)


(http://www.nsf.gov/)

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