Unit 2: Computational Foundations of Data Science

Lesson 2.6: Unit 2 - Manipulating Data

In this lesson, students will complete a full, small-scale data science investigation on the NBA dataset.

Duration: 90 minutes

Objective: By the end of this lesson, students will know how to use EduBlocks to access API data using their RapidAPI account and filter and print it using EduBlocks code. Students will also address some advanced concepts like data nesting in APIs and conditional work with data.

Lesson Walkthrough: **Unit 2 Lesson 6 - Teacher Walkthrough**

CSTA Standards in this Lesson

Identifier	Concept	Subconcept	Standards
3A-AP-13	Algorithms & Programming	Algorithms	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.
3A-AP-14	Algorithms & Programming	Variables	Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.
3A-AP-15	Algorithms & Programming	Control	Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.
3A-AP-16	Algorithms & Programming	Control	Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.
3A-AP-19	Algorithms & Programming	Modularity	Systematically design and develop programs for broad audiences by incorporating feedback from users.
3A-AP-23	Algorithms & Programming	Program Development	Translate between different bit representations of real-world phenomena, such as characters, numbers, and images.
3A-DA-09	Data & Analysis	Storage	Create interactive data visualizations using software tools to help others better understand real-world phenomena.

3A-DA-10	Data & Analysis	Storage	Evaluate the tradeoffs in how data elements are organized and where data is stored.
3A-IC-24	Impacts of Computing	Culture	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
3A-IC-27	Impacts of Computing	Social Interactions	Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.

Lesson Activities

Who could use the NBA API data? (5 min)
(CSTA standards in this activity: 3A-IC-24, 3A-IC-27)

- Discuss stakeholders that might do data science with the NBA API dataset, including:
  - **Websites** like NBA stats databases, sports betting, and fantasy basketball
  - **Coaches and players** who might analyze game-to-game or season-to-season performance on how to improve
  - **Fans** to track the stats of their favorite players and teams

Connecting to the NBA Dataset (15 min)
(CSTA standards in this activity: 3A-DA-10, 3A-AP-14)

- Go to the NBA API FREE DATA.
- Students should use the "**Players/All List**" endpoint and click "Subscribe to Test" if necessary.
- Once subscribed, students should click back to "Endpoints" and look for "Code Snippets."
  - Switch the button that currently reads "(Node.js) Axios" to "(Python) Requests" to see example code for this API.
- Understanding the Response:
  - Students should click "Test Endpoint."
  - Look at the results: "200" indicates that the request succeeded.
  - **Nesting:** Note that the outermost "layer" of the data has 2 keys, and all the data is under 'response' > 'PlayerList'. This will cause an issue that our code will resolve on the next slide!
  - **Teacher's note:** This data nesting is present in many APIs, both on RapidAPI and OpenDataDC. Here, we offer a suggested method of dealing with it in the EduBlocks code.
- Data Nesting:
  - **Teacher's note:** Review data nesting across the next slide. It refers to the previous IMDB dataset. This is important cause in our case, the actual data is

nested under 'response' > 'Events'. If they won't pay attention to the nesting, their code might result in an error.

Building a Request in EduBlocks (15 min)

(CSTA standards in this activity: 3A-AP-13, 3A-AP-16)

- Students open, clone, save, and rename this program.
  - **Teacher's note on nesting:**
    Note the line that says "**data=myJSON['response']['PlayerList']**". This creates a new object called "data" that is ONLY the actual data itself, not the outer layer keys. In other words, we went into the JSON, grabbed just the part that contains actual player data, and saved that as a new object.
  - Students need to enter their X-RapidAP-Key, shown in the example code from RapidAPI, as well as the URL for the "**Players/All List**" endpoint shown in RapidAPI.
- Preview the data - Students run their completed program.
  - View the output. What variables are presented? What kind of data is stored?
  - What questions do you have about the data?

Explore the Data - Players (20 min)

(CSTA standards in this activity: 3A-DA-09, 3A-AP-15)

- Modify the code so that it prints out only the **full name** for each player.
- **Teacher's note:** Remember that it is case sensitive. To print the full name, students need to change the 'print' statement to: **i['fullName']**.
- Modify the code to print the full name, age, and salary for each player.
- **Teacher's note:** The students need to change the 'print' statement to **i['fullName'], ",", i['age'], ",", i['salary']**.
- Change the 'querystring' to pull data about a different team by changing the "**teamid**". (Switch the teamid and search for players you recognize.)
- **Teacher's Answer Key:** An example for these tasks can be found here: https://app.edublocks.org/project/8JY7TXFqQeUQuBxdAD5zmu2sclw1/8HU24K1muQN GGKWwxDhw

Explore the Data & Calculate (15 min)

(CSTA standards in this activity: 3A-AP-16, 3A-AP-19)

- Modify the program so that it prints out the full name of each player with their salary, and then, calculate and print the average salary of all the players in the team.
- **Hint:** Create two variables to hold the number of players and the average, and update their values on each iteration of the for loop. Use the Custom block under Statements.
- **Teacher's Answer Key:** An example for this challenge can be found here: https://app.edublocks.org/project/ewWF1QoTs1a0zrAWCCUuhqIlWDt1/1wbIuYhxnm0Q 0PXfstmv

Investigate the Data (15 min)

(CSTA standards in this activity: 3A-AP-14, 3A-AP-16)

- Go back to the NBA API Free Data, choose an endpoint that interest you and try to pull data about your favorite team/player/etc.

Exit Ticket (5 min)

(CSTA standards in this activity: 3A-AP-23)

- Submit a link to your final investigation program on today's exit ticket.

Assessment:

Assess student understanding through participation in class discussions and class activities.