4565: Computing Foundations for a Digital Age

Unit 4: Data Detectives - Exploring, Cleaning, and Analyzing Data Unit Length: 9 days

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Unit Introduction

What can data tell us—and how do we make sure we can trust it? In this unit, students become data detectives. They'll explore types of data, learn how to clean and analyze it, and use computational tools to make meaning from messy information. Through hands-on challenges and a mini project, students will build real-world skills in data literacy.

Unit Objective

Students will collect, organize, clean, and analyze different types of data to discover patterns and make informed decisions.

Standards Covered

4565.D2.1 – Compare data types and represent data in different formats.
4565.D2.2 – Explain how data is stored and organized.
4565.D3.1 – Collect, clean, and transform data for analysis.
4565.D3.2 – Use computational tools to analyze and visualize data.
4565.D3.3 – Interpret patterns and make data-driven claims.

Word Bytes (Vocabulary)

- String – A sequence of characters (like letters, numbers, or symbols) used to represent text in a program.
- Boolean – A data type that can only be true or false, often used in decision-making in programs.
- JSON – Short for JavaScript Object Notation, a way to store and share data using a structured, easy-to-read format.
- Schema – A blueprint that shows how data is organized in a database or file, like a map of where everything belongs.

- Table – A structured format for organizing data in rows and columns, often used in spreadsheets or databases.
- Metadata – Information about data—like when a photo was taken, who created a file, or what size it is.
- Attributes – Specific details or features of a data item, like a student's name, grade, or ID number.
- Data Collection – The process of gathering information from different sources to use or analyze.
- Sensors – Tools that collect data from the real world, such as temperature, motion, or light sensors.
- Dataset – A group of related pieces of data that are organized for study or analysis.
- Data Cleaning – Fixing problems in a dataset by removing errors, filling in missing info, or making everything consistent.
- Normalization – Making data consistent and standardized so it's easier to compare and use.
- Data Visualization – Turning data into charts, graphs, or maps to help people understand it quickly and clearly.
- Analysis – Looking closely at data to find patterns, trends, or answers to questions.
- Pattern Recognition – The skill of noticing repeated trends or behaviors in data that help us predict what might happen next.
- Data Query – A request to search and pull specific information from a dataset or database.
- Measurement – A data value based on observation, such as time, distance, or temperature.
- Observation – A recorded fact or occurrence, such as what's seen, heard, or measured.

Daily Breakdown

Day 1: Data Scavenger Hunt or Kahoot Game
Objective: Students will identify basic data types and explain how different data formats are used in computing.
Materials Needed: Printed scavenger list or devices for Kahoot, student Word Bytes journals
Activities:

- Complete a classroom data scavenger hunt identifying examples of different data types (e.g., string, numeric, Boolean).
- Participate in a Kahoot or quiz game on data formats (e.g., tables, JSON, schema).
- Students add "string," "Boolean," and "JSON" to their Word Bytes dictionaries with examples.

Day 2: Data Escape Room
Objective: Students will use metadata to find meaning in data and identify problems in messy datasets.
Materials Needed: Breakout-style puzzles, sample datasets with errors
Activities:

- Station 1: Match photo metadata to locations.
- Station 2: Fix a flawed spreadsheet (missing values, duplicates).
- Group challenge: Teams must unlock all puzzles to "escape."
- Wrap-Up Discussion: What strategies helped your team the most?

Day 3–4: The Candy Data Challenge
Objective: Students will collect, analyze, and visualize real-world data to make predictions.
Materials Needed: Candy samples, scales, data collection sheets, Google Sheets or Excel
Activities:

- Weigh, count, and categorize candy by type, color, weight, etc.
- Record results in tables and create bar/pie charts.
- Discuss trends and patterns; make predictions based on findings.
- Extension: Use spreadsheet tools to visualize data and test predictions.

Day 5: Spy Mission – Data Cleaning
Objective: Students will clean corrupted data to make it usable for analysis.
Materials Needed: "Spy mission" data packets with messy records, access to spreadsheet software, video introduction to data cleaning
Activities:

- Students act as data agents tasked with saving a compromised database.
- Identify and fix inconsistent formats, missing values, and duplicates.
- Submit cleaned file as a “mission report.”
- Optional twist: Add a timed or challenge round.
- Reflection discussion: Why is clean data important in real-world applications?

Day 6: Classroom Internet Speed Test
Objective: Students will use digital tools to collect data and explain variation in results.
Materials Needed: Internet-connected devices, access to Speedtest.net or Fast.com, data table template
Activities:

- Conduct internet speed tests in different school locations.
- Record upload/download speeds and analyze variation.
- Discuss what factors might affect network performance.

Day 7: Showcase + Reflection
Objective: Students will explain how they collected, cleaned, and analyzed data in a real-world scenario.
Materials Needed: Poster paper, slides software, Flipgrid or other video tool
Activities:

- Students choose one previous activity to present (poster, slideshow, or video).
- Include what data was collected, how it was cleaned, and what it showed.
- Exit reflection prompt: "How has your understanding of data changed over the last two weeks?"

Day 8–9: "Data in the Wild" Mini Project
Objective: Students will collect, clean, and analyze real-world data to answer a question or solve a problem.
Materials Needed: Teacher planning guide, presentation templates, data collection tools
Activities:

- Brainstorm and choose a real-world question (e.g., best school snack, busiest hallway, favorite music genre).
- Collect, clean, and analyze data.
- Present findings using a slide deck, podcast, infographic, or creative option like a skit.

Note: This unit is designed for flexibility. Teachers may select as many lessons as time permits. Covering all lessons—including the optional extension—provides the most comprehensive experience.