

**NIH SEPA Environmental Health Investigators
Measuring Skills and Tools Curriculum: Lesson 5
Grade Level: Middle School
Duration: 1 hour**

What are Data?

Next Generation Science Standards

Science and Engineering Practices:

- Asking Questions and Defining Problems
- Analyzing and Interpreting Data
- Planning and Carrying Out Investigations
- Engaging in Arguments from Evidence

Crosscutting Concepts:

- Science Addresses Questions about the Natural and Material World
- Scale, proportion, and quantity

Objectives

1. Students will define what data are.
2. Students will demonstrate how to collect measures (data) to answer questions.
3. Students will discuss quantitative and qualitative data.

Materials

- Clipboards
- Measuring tapes (cloth or metal, at least 2 m)
- “Door Opening Data Collection” sheet
- “Sumo Suit Questions” sheet
- [“What is Data”](#) video:
- Multi Colored post-it notes (for extension only)
- Giant post-it note pad (for extension only)

Activities



Opening Questions: What do you know about data? What are data? Have you ever collected data? Have you ever used data to answer a question? (2 minutes)

Bell Ringer: Watch the “What is Data?” video and follow it with review of key points and ask comprehension questions.

Review: Data are information we can collect that tells us something about the world. We as scientists use data to understand how the world works. Explain that data as a word is plural, not singular. Data are more than one datum.

Ask: What are the differences between quantitative and qualitative data? (Remind students that they have collected data when they used the sound meter in previous activities.)

What are examples of questions you might have that you could collect data to answer? Could you address these questions with quantitative data, qualitative data, or both? How would you go about collecting these data? Where does data fit in the **claim, evidence, reasoning** model of scientific investigations?
(8 minutes)

Activity (Scenario): The students will now work in groups to conduct a brief research project using data collected around their school. Share the following Sumo Suit Friday Scenario with the students: The principal of your school has decided to implement Sumo Suit Fridays where all students will be given inflatable sumo suits and will have to wear their sumo suits every Friday. Some of the teachers are concerned that students will not be able to easily fit through the doors when wearing their sumo suits. Your task is to answer the question: Can students easily fit through the doors in your school when they are dressed in their sumo suits? When the suit is inflated, it measures 115 cm wide with a depth of 65 cm. (5 minutes)

Activity (Data Collection): Ask students what types of data they should collect to determine if they are going to be able to fit through doors when wearing their sumo suits. Make sure they are aware that not all door openings in the school are going to be the same width. Have students break into groups. Provide each group with the door opening data collection sheet and a measuring tape. Have students measure various widths of door openings around the school (make sure to do multiple openings like bathrooms, classrooms, metal detector, cafeteria, etc.). Talk to the students about what they should be measuring: doors, openings, door frames, etc. Provide students with 15 minutes to collect data. Have all students work in centimeters. (30 minutes)

Discussion: Have students share their measurements (quantitative data) when the class returns. Make a table on the board and write down some of the measurements.



Point out the minimum, maximum, range etc. of the data. What is the mean door opening in the school? Use these data to answer the question: Will students be able to move through the doors when wearing the sumo suits on Sumo Suit Friday? If not, what are possible solutions that can occur to allow students to be able to move through the doors while wearing sumo suits? (15 minutes)

Extension

Activity 2 (Student Perspectives): Sumo Suit Fridays Scenario Continued: Some of the teachers are concerned that students might not enjoy wearing sumo suits all day long, while others think it will be a fun experience for the students. The teachers feel it is important to understand how students might feel when wearing sumo suits and what their concerns might be. Ask students what kind of data they would want to collect to answer this question. Ask students to list some questions they might have for their fellow students to understand how students feel about Sumo Suit Fridays. (5 minutes)

Activity 2 (Student Perspective Data Collection): Have students break up into their original groups. They will ask each other questions about their ideas for Sumo Suit Friday. Have students write down the questions they ask each other. Students should write down the answers to questions they come up with on post-it notes. You can also ask the students if they can think of tools that would make the data collection process easier for them (audio/video recordings). Make sure as students discuss and ask each other questions, they discuss their concerns in terms of how it would make them feel and what concerns they would have (do they have to wear their Sumo Suits during PE?, How easy is it to get the sumo suit on and off to use the bathroom? Will there be enough space between desks to move around?, etc.). If the students do think it is a good idea to implement Sumo Suit Fridays at their school, have them write down those positive aspects on the post-it notes as well. (15 minutes)

Activity 2 (Student Perspective Data Analysis): Have the students come back together and review what they talked about in their groups. Have students organize their post-it notes to group like themes such as positive and negative aspects of Sumo Suit Fridays. Highlight these themes on the board. Have the students decide what recommendations they would make to the principal about student concerns of Sumo Suit Fridays. Emphasize to the students that they have just collected qualitative data to answer a question.

Resources

The sections [*Contrasting Student and Scientific Views and Critical Teaching Ideas*](#) considers the importance of scientific investigation and distinguishes the difference of data and evidence:



Names:

Door Opening Data Collection Sheet

Record the measurements (in centimeters) of at least 5 doorway openings in your school.

Location	Width (cm)

