As People Get Older, They Get Taller

Comparing Heights to Explore Linear Measurement

Students often view linear measurement as a procedure in which a number is simply read off a ruler. The goal of this lesson is to have students gain experience in linear measurement by using a variety of measuring instruments to measure the heights of classmates, to discover the error inherent in measurement, and to search for patterns in data that are represented on a table. In this lesson, students compare results of measuring the same height using different methods, and discuss measurement error. They measure the heights of classmates and the heights of older students in their school, and construct a table of height and age data. The lesson is also designed to serve as a springboard for a second lesson in which students relate measurement to algebra and data analysis concepts.

⊟ Learning Objectives

Students will:

- measure another student using a variety of nonstandard and standard measuring instruments
- recognize the errors inherent in the use of different methods of obtaining measurements
- represent data collected on two variables in a tabular format

⊟ Materials

"If I Were One Inch Tall," by Shel Silverstein (optional)
Measuring tape
Yardstick
One piece of yarn for each student in the class, about 6 feet in length
One pair of scissors for each student in the class
How Old Are We? How Tall Are We? Activity Sheet

Instructional Plan

Attach a measuring tape to the wall, beginning at the floor, starting at 0 and going up to 6 feet. The wall should be free of obstructions so that students can later stand against the measuring tape to have their heights measured.

Read aloud to the students the poem "If I Were One Inch Tall" by Shel Silverstein

(1996). After reading the poem, ask each student to think about one thing that would be different if he/she was only one inch tall, and then go around the room and have students share their ideas. You can record these ideas on a large sheet of paper or the blackboard. This simple activity helps students get oriented to and interested in the activities that follow, which involve the measurement of classmates' heights.

Select two students who you estimate to be close in height and have them sit in chairs at the front of the classroom. Alternatively, the teacher and another adult, if available, could do this instead. Ask the class who they think is taller, and then take a vote. Ask students to generate different ways to figure out the answer to this problem. Examples of responses include measuring each person's height with a tape measure/yardstick/ruler and then comparing the measurements; measuring the heights using a piece of string and then measuring the string with a measuring instrument and again comparing the measurements for the two individuals; having the two individuals stand back to back. If students only come up with one way, ask them to try to think of different ways to figure out the answer to the question.

Measure the two students' heights using the different methods that the students have suggested. Typically, there will be differences in the heights obtained from the different methods, and this can serve as a springboard to discuss the fact that with any method of measuring, there will always be some degree of error.

Ask the students to identify which person is closer to the average, or most common, height for their peer group. This discussion will prepare students later for thinking about data that are highly discrepant from the average (that is, students who are very short or very tall for their respective ages).

Pair students and give each student the How Old Are We? How Tall Are We? activity sheet. Have students measure each other by standing against the tape measure that you attached to the wall. Ask each student to record his or her own height, birthday, and age on the recording sheet.

How Old Are We? How Tall Are We? Activity Sheet

The next day, have your students visit the class of an older grade. Give each child in your class a piece of yarn or string approximately 6 feet long, a pair of scissors, and their recording sheet on which they have already written their own age and height information. Before meeting the other students, show your students how to measure someone's height using a piece of string, cutting it so that it is equivalent to the height of the person they are measuring. Instruct students to write down on the recording sheet their partner's birthday and age. Students then measure the height of their partner using the piece of yarn.

When your students return to their classroom, have them measure the yarn that represents the height of their partner by holding it up to the tape measure you have attached to the wall. They should now record the height of their partner on their partner's recording sheet.

Collect the recording sheets and during a break or that evening, add the number of months to students' ages on their recording sheets, by using their birthdates.

Create a large table on a blackboard or whiteboard labeled "Table of Ages and Heights." Write the name of each student in your class in the left-hand column. Divide the table into four additional columns, with headings such as: Grade 2 Age, Grade 2 Height, Grade 4 Age, and Grade 4 Height. (Note: The first two grade levels should be those of your students, and the last two grade levels should be those of the other class.) Then, collect the student activity sheets. Use them to fill in the table as students watch; or, fill in the table on your own during a break.

Ask students to look at the table and to identify any patterns they see in the ages or heights. Students should notice that there is more variability in the height data than in the age data.

⊟ Questions for Students

What are some different ways that you could figure out who is taller?

[Suggested responses may include: have students stand next to each other and visually compare their heights; measure each person's height with a piece of yarn; measure each person's height with a yard stick or meter stick.]

Which method do you think is more accurate? Why?

[Students may suggest that using some sort of ruler, such as a meter or yard stick, is more accurate.]

Is there always some error when you measure? Explain why or why not.

[Students should recognize that some error is always possible when measuring.]

Which individual who you measured do you think is closer to the average height for students that age? (If you have not yet introduced the term "average," you can talk about the "majority of students that age")

[Answers will depend upon the class data.]

What patterns do you notice in the ages of the students in your grade level, for example, what is similar about the ages? Older students?

[Students may notice that all students are about the same age in their grade level.]

What patterns do you notice in the heights of the students in your grade? An older grade level?

[Students may notice that younger students tend to be shorter than older students.]

⊟ Extensions

1. To help students develop referents for measurements, invite the older students back and have students visually examine pairs of younger (your class) and older students (another class). Similarly, all the younger students could line up in order of their heights and all the older students could do likewise.
2. To further explore the relationship of age and height, students within one class could line up according to their ages in years and months to see if there is a pattern in their heights.

⊟ Teacher Reflection

- Were all students able to measure accurately using a variety of measuring tools?
- What gaps in students' knowledge of measuring procedures were revealed when they measured their partners?
- What remediation activities would remedy gaps in students' knowledge of measuring or data interpretation?
- What experiences or activities would challenge students who are already familiar with the concepts covered in this lesson?

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