

Mathematics: The Language of STEM
“Nobody’s Gonna Break My Stride” – Measures of Central Tendency
Sandy McClellan

CONTENT AND TASK DECISIONS

Grade Level(s): 6th grade/pre-algebra

Description of the Task: Students will use a pedometer to measure steps across a specified distance. They will use this data to find the mean, median, mode, and range of their steps and the time it took them to walk the specified distance. (Day 1) * This lesson prepares students for discussion in the task for Day 2.

Indiana Mathematics Content Standards: 6.DS.4 Students will summarize numerical data sets in relation to their context in multiple ways and determine quantitative measures (mean, median, mode, range.)

Indiana Mathematics Process Standards:

PS.4 Students will understand how to model with mathematics. Students will create charts/tables to organize their data.

PS.5 Students will understand how to use appropriate tools strategically. Students will use measuring devices and pedometers to measure distance and steps.

PS.6 Students will understand that it is important to attend to precision. Students will notice that counting accurately, being consistent, and checking their calculations affects their data.

Mathematics Content Goals: Students will understand that mean, median, and mode are examples of central tendency and be able to choose the measure of central tendency that best represents the data.

Language Objectives:

- ❖ Students will find specific information; mean, median, mode, and range and display the data in a chart/table.
- ❖ Students will verbally defend their choice of Measure of Central Tendency to their teammates.

Materials:

Paper/pencils

Pedometers

Available hallways

Various items for measuring (string, paper, yardsticks...)

“Don’t Break My Stride” handout (adapted from mathprojects.com)

THE LESSON

Before:

- **Activate prior knowledge:** (Students will be working in groups of 4) Teams will be asked a series of questions to get them thinking. Discuss using turn and talk, then whole group.
 - How long does it (or would it) take you to walk from your home to school?
 - How many steps do you think it would take?
 - How long do you think it would take you to walk to Ft. Wayne?
 - How many steps do you think it would take?
 - If you and each member of your team walked the same distance, would you each take the

- same amount of time? Why or why not?
 - Would you have the same amount of steps? Why or why not?
 - How could you measure to find the answers to these questions?
 - Would you each need to walk to Ft. Wayne to find out how many steps it would take you? Explain your reasoning.
 - How could you find out your steps and time without walking the actual distance? (Give teams time to **brainstorm** ways they could possibly do this)
- **Be sure the problem is understood:** Teacher will monitor groups as they brainstorm and ask questions to clarify or prompt student thinking.
- **Establish clear expectations:** Student teams will write their ideas in their math journals, list possible materials they might need, and any questions they have.

During: Students will pick one of their brainstorm ideas to try and will attempt to figure out how many steps it might take them to walk a certain distance. (Students will not yet know that pedometers are available, so their first attempt will be without pedometers.)

- After a short time of struggle, inform the students there is a new tool available. Give each team a pedometer. Have the students make a plan using the pedometer to complete their task. They will need to create a chart for their data. (A handout with graph already created can be given to students who need extra support with the task of making a chart, i.e. ELL, IEP...)
- **Listen actively:** Monitor groups and check that their conversations are moving forward to solving the task.
- **Provide appropriate support:** As students work, check for understanding. Ask teams how they are implementing their ideas, how might the mean, median, or mode help to determine how long it might take to walk a certain distance, which measure of central tendency seems to best represent their data?
- **Provide worthwhile extensions:** Compare the averages of your teammates. What can you predict? What variables might influence the results of your data? What conclusions can you make about your data? How could this data be used in a meaningful way? Redo the activity using a different distance. What do you notice? Do the measures of central tendency stay the same? Why do you think this is? How did the use of a pedometer influence your data?

After: Each team will report out their findings to the whole group. Together, the whole group will compare results and discuss which measure of central tendency seems to work best for this activity and why that is.

Promote a mathematical community of learners: Each team will create a chart with their findings and conclusions to share with the class. Teams will discuss as a whole class the similarities and differences in their data. They will discuss possible reasons for the similarities and differences. They will discuss which central tendency seems most valid for this activity. Together, the class will draw conclusions for their data, discuss ways the data could be used in real-world situations, and determine the importance of using measures of central tendency to determine large amounts of data.

Listen actively without evaluation: This will be a student led discussion. The teacher will facilitate and ask probing questions to keep the discussion moving forward.

Make connections: Do your conclusions make sense? Do you see any patterns in your data? Can you make predictions about what a classmate's data might look like? What if you did this activity with a kindergartener, would your conclusions change? Why/why not? What if you ran instead of walked? How might that affect your data? Explain your reasoning.

What were the key points of this activity? What did you learn today?

ASSESSMENT

Observe: The teacher will monitor groups as they work, watching and listening for evidence that students understand the task and are able to use the specific math skills needed to complete the task accurately (the chart/table and math journals will show their level of understanding of the math skills needed for the task).

Ask: What do mean, median, mode, and range mean? How can using measures of central tendency be helpful? How do you find each of these measures? Teacher gives a small assignment or exit ticket using a real-world problem for each individual student to show their mastery of the math skill. Students will choose the best Measure of Central Tendency, complete the problem, and explain why the Measure of Central Tendency they choose best fits the task.

