Title: Up Beat

Brief Overview:

This unit involves collecting, organizing, and comparing data. Students gather data to learn about how their pulmonary system functions in relationship to other students and under different conditions. Students use a line plot (histogram) to analyze and compare resting pulse rates and pulse rates after activity.

Links to Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to solve problems in mathematics including problems which are solved in a cooperative atmosphere.

- **Mathematics as Communication**
  Students will demonstrate their ability to communicate mathematically. They will read, interpret, and discuss mathematics.

- **Mathematics as Reasoning**
  Students will demonstrate their ability to reason mathematically. They will gather and compare data.

- **Mathematical Connections**
  Students will demonstrate their ability to connect mathematics to other disciplines.

- **Number Sense**
  Students will demonstrate their ability to estimate and determine the reasonableness of their answers.

- **Patterns and Relationships**
  Students will demonstrate their ability to recognize numeric relationships and will generalize a relationship from data.

Grade/Level:

Grades 3-4

Duration/Length:

This lesson takes approximately three forty-five minute class sessions.

Prerequisite Knowledge:

Students should have working knowledge of the following:

- Two-digit by one-digit multiplication
- The body's pulmonary system
- Telling time to the second

Objectives:

Students will:

- work cooperatively with partners and in groups.
- collect and display data.
- describe how exercise effects their pulse rate.
- create a line graph to organize and display data.
- write a paragraph that explains and compares the data.

Materials/Resources/Printed Materials:

- stopwatch or a watch with a second hand
- paper/pencil
- chalk board/ chalk
- two large number lines for the chalk board

Development/Procedures:

Day 1:

- Teacher reviews the pulmonary system. Teacher questions the students concerning heart function, size and location. Students respond orally to teacher questions.
- Teacher states lesson objectives and explains the lesson procedure. The teacher explains that students will locate and measure their pulse rate.
- Teacher models how to locate pulse rate. The teacher explains that they can find their pulse in their neck or in their wrist. Teacher models the finger position and exact location to place their fingers. The teacher explains that they will take their pulse for twenty seconds. Teacher gives the students five minutes to practice this skill.
- Teacher demonstrates how to multiply the results after twenty seconds by three to calculate the pulse rate for one minute.
- Teacher puts the students in pairs and explains that one student will time while the other students takes his/her pulse. The teacher tells students to write down pulse rate on a piece of paper. Then students switch and repeat the same procedure.
- Teacher directs students to return to their seats. Teacher reminds students to use the equation that involved multiplying their results by three.

- Teacher introduces the concept of line plots (histograms). Using a large number line posted to the chalk board, the teacher records heart rate data from the class on the chalk board graph. Teacher directs each student to set up a line graph based on her model (on the chalkboard) and copy classroom data onto their line plot (Student Resource 1).
- Teacher points out differences in pulse rates. Students discuss possible reasons why pulse rates vary. Teacher asks students if pulse rate could be affected by gender, size or fitness level. Teacher demonstrates how to find the median. Teacher focuses student attention to the cluster affect shown by the line plot.

Day 2:

- Teacher reviews previous lesson with class discussion and refers to the line plot that they constructed the previous session.
- Teacher questions students concerning how exercise might affect heart rate. Students discuss the possible effects.
- Teacher explains that we will conduct an experiment. Teacher states that the class will go outside to the track and run for ten minutes and then take pulse rate. Students will pair up and will run in two groups.
- After two groups have run and taken their pulse rates the students return to the classroom and use the formula to calculate their pulse rates for a minute.
- Using a line plot, the teacher constructs a second line plot (on the chalkboard) to display student data. Students construct a line plot using the teacher's as a model and graph class data (Student Resource 2). Teacher leads class discussion on how the pulse rates are different from the previous day. Students explain why they believe pulse rates are elevated.

Day 3:

- Students repeat activity from Day 1 and Day 2. Teacher writes class data on the board. In pairs, students construct a line plot for resting pulse rate and a line plot for active pulse. Students write a paragraph discussing differences between the two line plots.

Day 4:

- Teacher reviews the two line plots from the previous lessons.
- Teacher states that students will write a paragraph in order to explain what they have learned about pulse rates. The teacher reminds students that they need to include reasons to support their ideas about how variables such as exercise affect pulse rates.
- Teacher gives student volunteers a chance to read their paragraphs.

Performance Assessment:

Students will be evaluated on the two plots that they completed. Students will also be evaluated on two written paragraphs (four sentences each) that explains why they think pulse rates differ among students and how exercise affected their pulse rates.

Extension/Follow Up:

- This lesson can be a bridge to other topics concerning healthy life styles such as the importance of developing healthy habits like regular exercise and proper nutrition.
- Students can take the pulse rate of their parents; then the teacher can record the class data (parents' data) on the board and the students can independently construct the line plot to see if age affects pulse rate.
- Students could participate in an exercise program and continue to plot pulse rate to see if it changes as fitness improves.

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Resting Pulse Rate