

Focused Learning Lesson
Science
Grades 9-12
SI-H-A3

Overview:

This lesson is to be used to help students incorporate math and graphing skills in a science lesson. Students will take their partner's pulse before and after exercise to determine if exercise has an effect on pulse rates. The students will use calculators to calculate pulse averages. Students will then graph data collected during the lab to determine if pulse rates are affected after exercise.

Approximate duration: 45 minutes

Benchmark:

SI-H-A3 using technology and math to improve investigations and communications

SI GLEs:

5. Utilize mathematics, organizational tools, and graphing skills to solve problems.
6. Use technology when appropriate to enhance laboratory investigations and presentations of findings.

Benchmark:

SI-H-A4 formulating and revising scientific explanations and models using logic and evidence

SI GLE: 4. Conduct an investigation that includes multiple trials and record, organize, and display data appropriately.

Objective: The learner will collect and analyze data to determine if exercise has an effect on pulse rate.

Teacher Preparation:

1. Place students into groups of three and provide one calculator for each group.
2. Copy lab sheets so that each student can receive a copy of the lab worksheet. (Attachment 1)
3. Prepare to explain to the students how to calculate a one-minute pulse when the pulse is only taken for 30 seconds. (Multiply the 30-second rate by two.)
4. Prepare to explain and point out the location of the carotid and radial artery. (Carotid in the neck and radial in the wrist)
5. Prepare to explain how to graph and find an average of three numbers.

Materials/Equipment/Resources:

- Clock with second hand
- Lab worksheet
- Calculator
- Colored pencils

Lesson Procedures:*Set or Opener:*

Students should be asked if they believe exercise has an effect on their pulse. Accept all reasonable replies. Tell students that pulse is the number of times the heart beats per minute. Explain that in this lesson, they will determine if exercise has an effect on their pulse rate.

Body of the Lesson:

1. Teacher should handout the lab worksheets. (Attachment 1)
2. Teacher should read the handout to the students for clarity of instructions.
3. As instructions are read, teacher should demonstrate and explain how to take a pulse, calculate an average, fill in the data table, and criteria for the graph. (Attachment 1, Figure 1)
4. Teacher should then assign students into groups of three, allowing only 30 seconds for this to be done.
5. As students work on this lab, teacher should walk around and monitor students for work done correctly, providing guiding questions as needed, and periodically reminding them of the time.

Closure:

Teacher should ask the class “Based on your data, does exercise effect your pulse?” Students should reply, “Yes.” Explain that the more you exercise, the faster the heart pumps blood in the body causing the pulse to increase. Have the students look at their graphs, and ask individual groups, “Compared to the resting pulse, how much faster was the pulse after exercise?” Depending on the answers, then explain that by looking at the graph, they can see all the data in one place and develop their answer without having to go back and read the text or the data table.

Attachments:

Attachment 1: Pulse Rate Lab

Attachment 2: Lab Rubric

Assessment Items: Lab Rubric (Attachment 2) for the lab worksheet will be used to assess performance.

Reference Links and Technology Connections:

Bernstein, Leonard. (1999). *Globe Biology* (p.404). New Jersey: Globe Fearon.

Pulse Rate Lab: Attachment 1

Objective: The learner will collect and analyze data to determine what effect exercise has on pulse rate.

Directions:

1. Work in groups of three.
2. The question that you will attempt to answer is: What effect will exercise have on your pulse rate?
3. To find the pulse rate, have your group member sit quietly in the desk. Put your fingers on your partner's wrist or on the side of their esophagus. You will feel soft beats.
4. To find the resting heart rate, have your group member sit quietly in the desk and count the number of beats in a 30-second period. Multiply the number of beats by two. This will give you the total number of beats per minute. This is the resting pulse rate. Record the number of beats on data table one. Repeat this step two more times.
5. Average your three resting pulse rates and record your average on your data table. Repeat steps four and five for each group member.
6. To find the exercise pulse rate, have one group member jog in place for one minute. Immediately take his pulse rate for 30 seconds. Multiply the total number of beats by two. This will give you the total number of beats per minute. This number is the exercise pulse rate. Record the number of beats on data table two. Following a two to three minute rest, repeat step six two more times.
7. Average your three exercise pulse rates and record the average on your data table. Repeat steps six and seven for all group members.
8. Using your colored pencils, make a legend; use one color for resting pulse rate and another color for exercise pulse rate.
9. Use Figure 1 to graph your group members' resting and exercise rate averages.

DATA TABLE 1: Resting Pulse Rates (in beats per minute)

Group member #/Name	Resting b/m	Resting b/m	Resting b/m	Avg. Rest. b/m
#1				
#2				
#3				

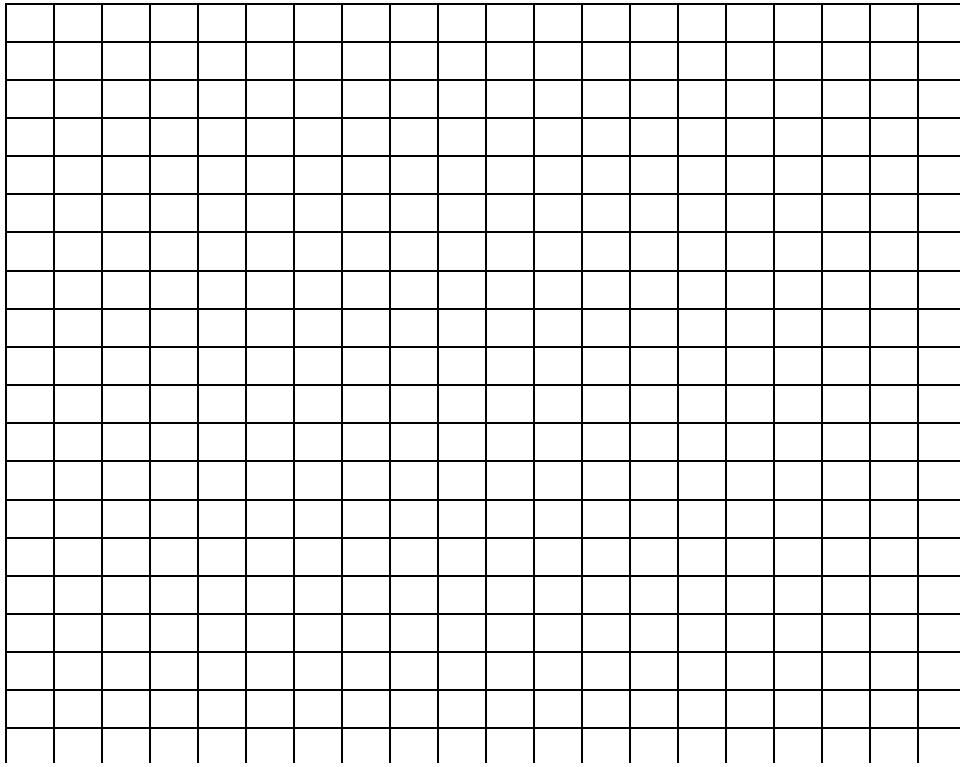
DATA TABLE 2: Exercising Pulse Rates (in beats per minute)

Group member #/Name	Exercise b/m	Exercise b/m	Exercise b/m	Avg. Ex. b/m
#1				
#2				
#3				

Analyzing Data:

Using colored pencils, create a legend for the resting pulse averages and exercising pulse averages; use one color for resting pulse averages and another color for exercise pulse averages. Construct a line graph using group member numbers found on the data tables and Avg. resting and exercise pulse rates per minute found on the data tables. Be sure to label your x-axis with the group member numbers and y-axis with the pulse rates. Set your intervals on the y-axis in increments of five starting with 40. Each group member should have two different colored points plotted on the graph. When all points are plotted, draw a line connecting the same colored points together.

Figure 1: Average Resting & Exercise Pulse Rates per Minute vs. Group Member



Interpreting Data – Using the data above, explain if exercise affects pulse rate and if so, how it affects it.

Attachment 2
PULSE RATE LAB RUBRIC

SCORE	DESCRIPTION
4	<ul style="list-style-type: none"> • Data tables neat and completed correctly and calculated accurately • Graph constructed correctly and neatly (criteria below) <ul style="list-style-type: none"> - <i>x and y axis labeled correctly,</i> - <i>intervals numbered evenly on both axes</i> - <i>data accurately plotted</i> • Response to question demonstrates in depth understanding of content and communicates clearly
3	<ul style="list-style-type: none"> • Data tables are completed with one math error • Graph constructed with only one minor error • Response to question demonstrates understanding although some details are over looked
2	<ul style="list-style-type: none"> • Data tables are lacking one or two entries with two math errors • Graph constructed with two minor errors • Response to question demonstrates a lack in conceptual understanding
1	<ul style="list-style-type: none"> • Data tables lack more than two entries and three or more math errors • Graph constructed with 1 or two major errors • Response to question show minimal or no understanding of the concept
0	<ul style="list-style-type: none"> • Data table is incomplete and math computations are not completed • Graph is totally incorrect • Response to question is incorrect or there is no response

