

**Focused Learning Lesson**  
**Science**  
**Grades 9-12**  
**SI-H-A6**

**Overview:**

This lesson helps students learn to write and defend a conclusion based on logical analysis of experimental data. Students use rulers to determine if reflex ability is determined by gender. Students use calculators to calculate averages of the data collected. Students graph all averages to determine if gender affects reflex ability. Using the data, students will write and defend a conclusion based on the outcome of the lab.

**Approximate duration:** 45 minutes. The lesson may be extended to a second class period if needed.

**Benchmark:**

**SI-H-A6** communicating and defending a scientific argument

**SI GLE:** 9. Write and defend a conclusion based on logical analysis of experimental data.

**Benchmark:**

**SI-H-A2** designing and conducting scientific investigations

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

**Benchmark:**

**SI-H-A3** using technology and mathematics to improve investigations and communications.

**SI GLE:** 5. Utilize mathematics, organizational tools, and graphing skills to solve problems.

**Objective:**

The learner will collect and analyze data to determine if reflex ability is determined by gender.

**Teacher Preparation:**

1. Copy lab sheets so that each student can receive a copy of the lab worksheet. (Attachment 1)
2. Copy class data table (Attachment 3), one for every student and a transparency copy.
3. Put students into groups of two. In the event of an odd number, arrange one or two groups of three.
4. Prepare to have one 12-inch ruler and calculator for each group.
5. Prepare to explain how to find an average of 10 numbers and demonstrate construction of a line graph.
6. Prepare to demonstrate how the ruler is to be dropped. One arm should be fully extended, unbent and shoulder height. The thumb and index fingers hold the ruler on the 12-inch end of the ruler. The ruler will be held vertically.

7. Prepare to explain how the ruler is caught. The group member who is catching the ruler must have his hand at least six inches from the bottom of the ruler. When the ruler is dropped, he is to catch it as fast as he can.

**Materials/Equipment/Resources:**

- One 12-inch ruler for each group
- Lab worksheets (Attachment 1)
- Calculator for each group
- Class data table (Handouts and transparency)(Attachment 2)

**Lesson Procedures:**

*Set or Opener:*

Explain to students that reflex ability is how fast you react to something, or your reaction time. Students should then be asked if they believe gender determines reflex ability. Accept all reasonable replies. Explain that in this lesson, they will determine if gender, meaning girls or boys, affects reflex ability.

*Body of the Lesson:*

1. Teacher should handout the lab worksheets and class data table. (Attachments 1 and 3)
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 drop and catch the ruler, calculate an average, fill in a data table and make a line graph.
4. It is important that the teacher explain how the conclusion should be written. Answer the conclusion questions completely and then take your answers and put them into paragraph form.
5. Teacher should then assign students into groups of two, allowing only 30 seconds for this to be done.
6. 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. Ten minutes should be allowed for this part of the lesson.
7. As each group finishes, one person from each group will walk to the overhead projector and record every group member's average on the class data table.
8. Students will record all entries from the class data table transparency to their own copy in numerical order for each column.
9. Once all entries are made, students will produce a line graph using data from the class data table.
10. Once work is complete, have each group briefly present their findings and cite evidence to support their conclusion. They must demonstrate that their answer is backed up with facts from the lab. Warn student to make no changes in their data or conclusions at this time.
11. Instruct students to turn in both worksheets.

*Closure:*

*After lab worksheets are picked up, the teacher should ask the class, “Based on the data, does gender have anything to do with reflex ability?” Accept all reasonable responses. The teacher should go over each conclusion question on the lab worksheet verbally with the class and discuss possible answers so that all students understand the correct responses based on data acquired.*

**Attachments:**

- Attachment 1: Reflex Ability Lab
- Attachment 2: Reflex Ability Class Data Sheet
- Attachment 3: Reflex Ability Lab Rubric

**Assessment items:** Lab Rubric, Attachment 3, for the lab worksheet will be used to assess performance.

**Reference Links and Technology Connections:**

LaSIP 2001, Nicholls State University

## **Attachment 1**

### **Reflex Ability Lab**

**Objective:** The learner will collect and analyze data to determine if reflex ability is determined by gender.

**Directions:**

1. Work in groups of two or three.
2. The question you will attempt to answer is, “Does gender determine a person’s reflex ability?”
3. One member in the group will stand and extend one arm out in front at shoulder level of the body without bending the elbow. The standing student will hold the ruler between the thumb and index finger on the 12-inch end of the ruler.
4. The other group member will sit in the desk and put one hand approximately six inches under the ruler, with the thumb side of the hand up.
5. The standing student will say “Ready” and drop the ruler.
6. The sitting student will attempt to catch the ruler. The measurement will be taken in inches where the thumb side of the palm is on the ruler when it is caught. Record this measurement on the data table. If the ruler was not caught, record 13 inches.
7. Each group member will attempt to catch the ruler 10 times and record each attempt on the data table.
8. Once all data is recorded, use the calculator to find the average of each group member’s ten attempts.
9. One member from each group will go to the overhead projector and record the averages on the class data sheet for each member in the group; girls are posted in the *girls* column, and boys are posted in the *boys* column.
10. Every student will copy the class data sheet from the overhead projector onto their copy at their desk. The numbers will be recorded in numerical order, smallest number to the largest number.
11. Once the class data sheet is completed, students will complete a line graph using the data from the class data sheet. Remind students to label the x-axis and y-axis.
12. Have students answer the Interpreting Data Questions in complete sentences.

**DATA TABLE 1: Reflex Ability (in inches)**

NAME	NAME	NAME
TRIALS/INCHES	TRIALS/INCHES	TRIALS/INCHES
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
Average	Average	Average

**Record Averages on Class Data Sheet, Attachment 2.**

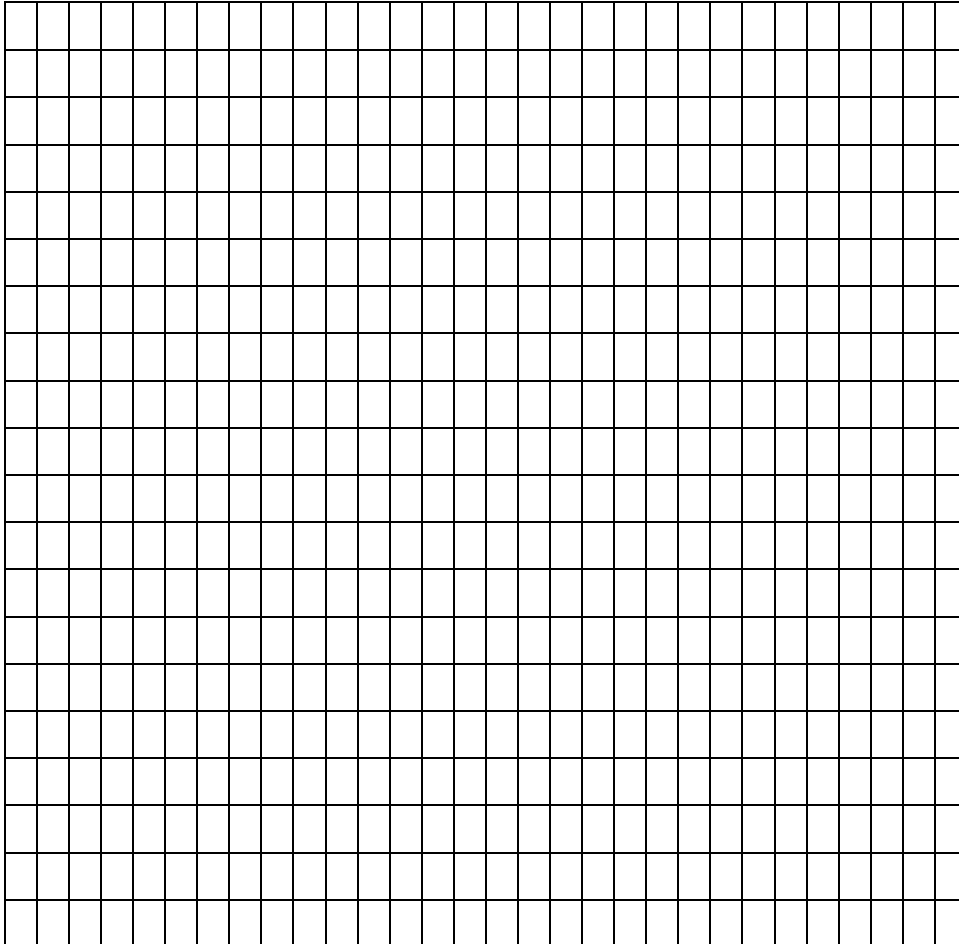
Students should record the data from the class data sheet, Attachment 2, in numerical order, smallest number to largest number. Each column, *boys* and *girls*, will be written in numerical order. This will allow for a linear pattern and data will be easier to compare.

**Analyzing Data:**

Using colored pencils, create a legend for the data found on the class data sheet, Attachment 2. Use one pencil color for girls and one color for boys. Construct a line graph using reflex ability averages for each student in the class from the class data sheet. Be sure to label your x-axis with the student number and the y-axis with the student average in inches. Set your intervals on the y-axis in increments of one, starting with zero and ending with 13. Add a title for the x-axis and y-axis. When points are plotted, draw a line connecting the same colored points together. All girls should have the same color points and be even numbers on the x-axis, and boys should have the same colored points and the odd numbers on the x-axis.

### Class Data Graph

**Figure 1: Average Reflex Ability Averages for Boys and Girls in Class**



**Interpreting Data:** Read each question carefully. Answer the question in complete sentences.

1. Do you think you have collected enough data to prove your conclusion? Explain.



**Attachment 2**  
**REFLEX ABILITY LAB CLASS DATA SHEET**

<b>GIRLS</b>	<b>BOYS</b>
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.
11.	11.
12.	12.
13.	13.
14.	14.
15.	15.
16.	16.

**REFLEX ABILITY CLASS DATA SHEET**

<b><u>GIRLS</u></b>	<b><u>BOYS</u></b>
17.	17.
18.	18.
19.	19.
20.	20.
21.	21.
22.	22.
23.	23.
24.	24.
25.	25.

### Attachment 3 REFLEX ABILITY LAB RUBRIC

<u>Criteria</u>	<b>4 points</b>	<b>3 points</b>	<b>2 points</b>	<b>1 point</b>	<b>0 point</b>	<u>SCORE</u>
Data Table	All components completed math accurate	All components completed 1 math error	Not all components completed 2 math errors	Not all components completed 3 or more math errors	Blank	
Graph	Graph constructed correctly	Graph constructed with only 1 error	Graph constructed with only 2 errors	Graph constructed with 1 or 2 major errors	Blank	
Interpreting Data	All correct: supported by data from lab complete sentences	Correct but not supported by data 1 incomplete sentence	Demonstrates only adequate understanding of concept 2 incomplete sentences	Demonstrates minimal understanding of concept 3 or more incomplete sentences	Blank	
Conclusion	All correct: supported by data from lab complete sentences	Correct but not supported by data 1 incomplete sentence	Demonstrates only adequate understanding of concept 2 incomplete sentences	Demonstrates minimal understanding of concept 3 or more incomplete sentences	Blank	
Lab Performance	All directions followed and proper conduct in lab	All directions followed  Unsafe conduct (minor)	Not all directions followed  Unsafe conduct (minor)	Not all directions followed  Unsafe conduct (major)	Refused to participate	

*Total Lab Score:* \_\_\_\_\_

Evaluation Scale:

19 – 20 = Way to go!

18 = Keep it up.

16 – 17 = OK

14 – 15 = Needs Improvement

13 - = Not good enough