

Lab Framework

Text: CORD Unit 4, 9, 11, 16, 17

Unit number and title:

Short Description: In this investigation, students will graph class data to see what kind of relationship exists between Height and Shoe Length. The desired conclusion should lead students to the idea that the taller the person is, the bigger the person's feet.

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An Investigation on Height Compared to Shoe Length

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**

Students will collaborate and share data about themselves in order to generate a class data table. Information to be collected will be each student's height in centimeters, and each student's shoe length in centimeters. Students will then graph the class data and see if a trend appears.

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

Unit 1: Learning problem-Solving Techniques

Unit 2: Estimating Answers

Unit 3: Measuring in English and Metric Units

- **Vocabulary**

Trend, Origin, Axis, Graph, Outliers, $y=mx + b$, y-intercept, Scale, and Graph Units

- **Materials List**

10-12 Meter Sticks

Lab Sheet

Pencil

Ruler

- **State Standards addressed**

Math: M 2.2.1 – Apply strategies, concepts, and procedures to devise a plan to solve the problem.

M 4.1.1 – Understand how to develop r apply an efficient system for collecting mathematical information for a given purpose.

Communication: C 2.2.2 – Applies skills and strategies to contribute responsibly in a group setting.

- **Leadership Skills**

Students work together to collect measurements and must communicate in order to obtain all necessary data. Once grouped, each team will collect height and shoe length data and report it to the front of the class. Each group is required to verify that all data is correct and legible.

- **SCAN Skills/Workplace Skills**

Writing

B. Records information completely and accurately.

Arithmetic

A. Performs basic computations

D. And uses tables, graphs, diagrams, and charts to obtain or convey quantities

- Information **Set-up information**
 - Have sets of 2-meter sticks (one on top of the other with 100cm mark oriented towards the top) taped to the wall in various locations around the classroom.
 - Have 3-5 meter sticks available for students to measure shoe length.
 - Write a Class Data Chart on the front board so students can report their group's data, so that data can be shared and plotted.
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)
 - Students are to work in groups, no longer than 3 individuals.
 - Data collection is collaborative and reported to the front board in the classroom.
 - Students are expected to work together helping each other make measurements.
 - Students are expected to use polite classroom conduct and take turns with the measuring stations.
- **Teacher Assessment of student learning** (scoring guide, rubric)
 - ✓ Each student will turn in a completed lab sheet, with data chart completed.
 - ✓ Each student will also turn in a graph with student data plotted.
 - ✓ Each graph is to also have a trend line drawn in to show how the data is related.
 - ✓ From the trend line, students are expected to do a linear regression to determine the equation of the line in " $y = mx + b$ " format.
- **Summary of learning**
 - Real World Applications
 - Clothing availability
 - Sizing requirements for events such as weddings, or prom
 - Shows proportion in physical structure
 - Opportunity for students to share/present learning
 - Students may find "Outliers". Discussion may result in talking about diversity in organisms. The main point, although a trend may exist, it does not mean it will be followed.
- **Optional activities**

Students could extend the data collection outside the immediate classroom, design an alternate feature to measure on the human body to see if a correlation exists (e.g. measure foot length and forearm length from inside the elbow to the wrist to see if they are indeed identical for most individuals)
- **Career Applications**
 - ✓ Home Economics – Fitting proportions and making of clothing.
 - ✓ Agriculture – Predicting growth in an animal based on physical features.
Example: Will a Puppy with larger than average feet, grow to larger proportions?

LAB TITLE: Comparing Height and Shoe Length

STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**

What relationship exists between height and shoe length?

Does having large feet, absolutely mean that you will be tall?

How close does human data follow a trend line?

- **Grouping instructions and roles**

3 individuals to a group, each taking a turn with each role

- Recorder – Student records data on sheet, sharing the data with group members.

- Measurer – Student takes measurement data on a group member and relays the data to the recorder.

- Subject – Student that is measured

- **Procedures** – steps to follow/instructions

1. Pass out Lab Sheet

2. Go through Pre-Lab Expectations

3. Group students

4. Work Time for Students

- a. Students are to take the measurements in their own groups and then report their data to the front board.

- b. To take height, each student is to stand with their back to the wall, with their shoes off. The Measurer will then use a ruler, place it on top of the student's head and measure the student's height in centimeters and relate it to the recorder.

- c. To measure shoe length, each student will stand on a meter stick with their heel even with the "0" reading. The measurer will then measure the student's shoe length in centimeters relating the data to the recorder.

- d. After data is collected for the first student, group members are to rotate group rolls so that each student has a chance to record data, be measured, and take measurements.

- **Outcome instructions**

1. After all students have reported data to the board, students are to return to their seats with their group members to record the class data on their data chart.

2. Students are to then work in their groups and plot the data on the graph paper.

3. After plotting the data, students are to draw a trend line through the center of their data plot to see if a trend is present.

4. If necessary, the teacher can guide students through adding a trend line to the data plot.

- **Assessment instructions** (peer-teacher)

Each student is to turn in a completed lab sheet with graph completed and all required information.

trend line through the center of your data to see if a pattern appears. Once you have your trend line, perform a linear regression to calculate the equation for the line in “ $y = mx + b$ ” format.

Washington Applied Math Council

What relationship exists between Height and Shoe Length?

Are there any Data Points that don't fit the trend line? If so, which ones?

Could the data that does not fit the trend line be a result of errors in data collection? If so, how could you reduce those errors?

Where in life and business could the trends of human proportion be used?

Using your data, calculate the projected heights of the following shoe lengths:

1. 44cm =
2. 67cm =

Using your data, calculate the projected shoe length of the following heights:

1. 178cm =
2. 152cm =

<https://wa-appliedmath.org/>