Title: Fingerprints
Subject Area: Life Science – Human Body
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Level: 7-8
Activity Time: 45-50 minutes

Device:
TI-73 Explorer™

Materials
Hand lenses – one for each pair of students
Ample supply of scratch paper
8.5 x 11 sheets of typing paper – two per student
#2 Lead pencils
Cellophane tape – one for each pair of students

Activity Overview

In this activity students will investigate their fingerprint patterns and arrangements. They will extend the investigation to collect similar data on at least three other family members.

Objectives

Upon successful completion of this activity, students will be able to:

- Differentiate between arch, loop, whorl fingerprints
- "Lift, " record, and identify prints from all ten digits
- Infer patterns of fingerprints within families.
- Utilize TI 73 to create and analyze categorical lists.

Activity

Part 1 – Fingerprint Investigation

1. Explain a basic fingerprint; have student use a magnifying glass to examine the print on their dominate index finger. Encourage students to record words which would describe the prints. Share results and introduce the terms arch, loop and whorl. Provide basic diagrams of each. Have students identify the print they just observed. Be sure to provide a context for the investigation e.g. why would we study fingerprints? What are some practical applications of this information? Discuss the history of fingerprints and how they have been used by law enforcement over time.

2. Provide two sheets of typing paper (8.5 x 11) for each student. Have students trace both hands while the fingers are spread apart. Students may need to help each other hold the paper and trace. Label "L" for left hand and "R" for right hand; be sure the name and date are on the paper, for future reference.

3. Demonstrate how to "lift," record, and identify finger prints. Use a piece of scratch paper to create a print pad. Lay the pencil on its side and move the pencil back and forth, creating a build-up of pencil lead; this creates a print pad. Touch the pad with a finger and lift straight up; do not rub the pad.

Preserve and record the print by applying a piece of cellophane tape over the print on the finger. Gently remove the tape and apply it to the correct digit on the paper. Label the print: arch, loop, or whorl. Repeat the process with all ten digits.

Management tip: have students pre-tear the strips of tape for ease of collection of data. Students may struggle with tearing strips of tape after they have lead on their fingers. Group work and aid is advised.

Part II – Data Collection & Analysis

1. Use the TI 73 to graphically display frequency of each print (as a class). Analyze the frequency; what patterns are noted? Anomalies?

2. Pose the question: "What factors may contribute to the fingerprint pattern distribution for individual students? Is there a relationship between your fingerprint pattern and those of your family members? In what ways could we find out?

3. Encourage students to collect the fingerprint patterns of at least three, genetically-linked family members. Ideally, the patterns should come from genetically related family members, although this may not be possible; use teacher discretion per individual family situations.

4. After data is collected, use the TI 73 to create a categorical list entitled "print." Enter sub-titles arch, loop, and whorl.

5. In L1, enter student data; under L2, enter first family member; Under L3, enter 2nd family member, etc.

6. Under 2nd y, create a box plot using the categorical list created above.

7. Use Zoom 7 to display box plots.

8. Analyze box plots for patterns and possible answers to questions posed in Step 1 (see above).

Assessment

To what extent were students able to:

- Differentiate between arch, loop, whorl fingerprints
- "Lift, " record, and identify prints from all ten digits
- Infer patterns of fingerprints within families.
- Utilize TI 73 to create and analyze categorical lists.

Assessment Questions – Fingerprints

1. What is your fingerprint pattern and how was it alike/different from your family members?

2. Based upon your findings and the class data, do you think that fingerprints are a genetic trait? Explain.

3. In what ways are fingerprints useful to law enforcement?

4. Provide a brief description of how to create a categorical list using the TI 73.

5. Explain one other real-life situation in which you might consider using a categorical list to display and analyze data in science and/or math.