

Just Like Me!

Lesson Overview

In this lesson, students will collaborate on an investigation of observable human traits to explore random sampling. They will use their understanding of proportional relationships to solve problems related to...

Alignment

Standard/Indicator Addressed

- SCCCR Math 7.RP.2 Identify and model proportional relationships given multiple representations, including tables, graphs, equations, diagrams, verbal descriptions, and real-world situations.
- a. Determine when two quantities are in a proportional relationship.
 - d. Use equations to model proportional relationships.
- SCCCR Math 7.RP.3 Solve real-world and mathematical problems involving ratios and percentages using proportional reasoning (e.g., multi-step dimensional analysis, percent increase/decrease/ tax).
- SCCCR Math 7.DSP.1 Investigate concepts of random sampling.
- a. Understand that a sample is a subset of a population and both possess the same characteristics.
 - b. Differentiate between random and non-random sampling.
 - c. Understand that generalizations from a sample are valid only if the sample is representative of the population.
 - d. Understand that random sampling is used to gather a representative sample and supports valid inferences about the population.
- SCCCR Math 7.DSP.2 Draw inferences about a population by collecting multiple random samples of the same size to investigate the variability in estimates of the characteristic of interest.

Standards for Mathematical Practice (as appropriate)

Standard 1: Make sense of problems and persevere in solving them.

- a. Relate a problem to prior knowledge.
- b. Recognize there may be multiple entry points to a problem and more than one path to a solution.

Standard 2: Reason both contextually and abstractly.

- a. Make sense of quantities and their relationships in mathematical and real-world situations.

Standard 3: Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.

- a. Construct and justify a solution to a problem.
- b. Compare and discuss the validity of various reasoning strategies.
- c. Make conjectures and explore their validity.
- d. Reflect on and provide thoughtful responses to the reasoning of others.

Standard 6: Communicate mathematically and approach mathematical situations with precision.

- a. Express numerical answers with the degree of precision appropriate for the context of a situation.
- b. Represent numbers in an appropriate form according to the context of the situation.
- c. Use appropriate and precise mathematical language

Science and Engineering Practices (as appropriate)

S.1A.4: Analyze and interpret data.

S.1A.5: Use mathematics and computational thinking.

S.1A.6: Construct explanations.

S.1A.8: Obtain, evaluate, and communicate information.

Connections

Active Learning Strategies (for Purposeful Reading, Meaningful Writing, and Productive Dialogue)

Graphic Organizers

Just Like Me

Four Corners

3 – 2 – 1 Exit Ticket

Content Connections

This lesson should be taught in the context of the Exploration of Genetics and Probability Unit. This lesson supports what students are studying in Science class (inherited human traits). It also develops their understanding of random sampling.

Lesson Plan

Time Required – Two 60-minute class periods

Disciplinary Vocabulary – ratio, percentage, random, non-random, sample (sampling), population, inference, representative sample

Materials Needed:

For Day One:

- Observing Human Traits Lab Cards, 1 for each pair of students (Handout 1)
- Observing Human Traits Lab Sheet, 1 for each student (Handout 2)
- 6 sheets of chart paper (see description in lesson)
- Teacher copy of Table 3: Class data for observable traits (Handout 3)
- 3-2-1 Exit Ticket (may be index cards or slips of paper)

For Day Two:

- Compiled data from multiple classes (Teacher Handout 4a and Student Handout 4b)
- Completed Lab Sheets from Day One (students will need these)
- Just Like Me Quick Read & Thinking Questions (Handout 5)
- 11 x 17 paper (2 pieces for each small group)
- Markers (2 for each small group)

Formative Assessment Strategies: Student dialogue, Human Observable Traits Lab Sheet, Exit Ticket

Computational Thinking:

- **Logically organizing and analyzing data:** Students use their graphic organizers (Lab Sheets) to collect data about observable human traits. They use that data to explore concepts of random and non-random sampling, representative samples, and making inferences about larger populations based on the data collected.
- **Confidence in dealing with complexity:** Students must organize sets of data that increase in size from a small sample to a much larger one. They must make sense of the data and use it draw inferences about a larger population.
- **Persistence in working with difficult problems:** Many students struggle with using fractions, ratios, and percentages. This lesson provides the context and opportunity for students to review and refine those skills.
- **The ability to communicate and work with others to achieve a common goal or solution:** Students must work together as partners and in small groups to complete the tasks outlined by their lab sheets, combine their data for a whole class snapshot of the traits being studied, and decide if their class is a representative sample of the larger population of their school.

Misconceptions:

- Students sometimes struggle with understanding what random means. Connect this to the probability simulations they did in earlier lessons. The outcomes were random, chance events.
- Students sometimes struggle with the idea of a representative sample as it relates to the larger population.

DAY ONE

Engage

- Remind students that they are studying genetics in their Science class. Let them know that they will be using math to connect with what they are learning about heredity and traits.
- Group students using the strategy Four Corners.
- Four Corners directions:
 - Designate four corners (or spaces) in the room by hair color (black, brown, blonde, red/other)
 - When students have grouped themselves by hair color, have them subdivide by eye color to make smaller groups of four or five.
 - Make adjustments as needed so that all groups have four or five members.

- Distribute a Human Traits Lab Card and Lab Sheet to each group of students.
- Give students time to study the Lab Card and record their observations for their individual data on PART 1 of the Lab Sheet.
- Circulate as students work to ask guiding questions and check student progress.
- When students have finished PART 1 of the lab sheet, bring them back together.
- Use the strategy Just Like Me to structure the discussion of PART 1.
- Just Like Me directions: The game begins with everyone standing up. The leader calls out a characteristic and everyone who shares that characteristic says: “Just like me!” Anyone who DOES NOT share that characteristic sits down. In this case, there will be six rounds – one for each of the traits: ear lobes, dimples, chin, hairline, finger hair, and thumb.
 - Ask all students to stand up.
 - Tell students whether your ear lobes are attached or free. Anyone with ear lobes like the teacher says: “Just like me!” and remains standing. Everyone else sits down. Note how many students are standing.
 - Next, tell the students whether you have dimples (present) or not (absent). Anyone with dimples like the teacher says: “Just like me!” and remains standing. Everyone else sits down. Note how many students are still standing.
 - Continue the process until all six traits are considered. Note how many students are standing (or not).
 - Play Just Like Me! with a student model and go through all six traits.
 - Revisit questions #2 and #3 on PART 1 of the Lab Sheet. Tell students to record whether their predictions were accurate or not without erasing the predictions.
 - Ask students to share their thinking about the process with their elbow partners.
 - Solicit comments to be shared with the whole group.

Explore

- Students continue to work in small groups of four or five on PART 2 of the Lab Sheet.
- Groups form and find space to work.
- Distribute PART 2 of the Lab Sheet (It may be printed on the back of PART 1).

- Students work with their small groups to complete **Table 2**.

Table 2: Small group data for observable traits

| Trait | Number of students with Form 1 | Ratio and % (Frequency) | Number of students with Form 2 | Ratio and % (Frequency) |
|----------------|--------------------------------|-------------------------|--------------------------------|-------------------------|
| A. Earlobe | | | | |
| B. Dimples | | | | |
| C. Chin | | | | |
| D. Hairline | | | | |
| E. Finger hair | | | | |
| F. Thumb | | | | |

- Circulate as students work to ask guiding questions and check student progress.
NOTE: Writing ratios is not a new concept, but it is likely students will be at varying levels of mastery. Try to guide them in the right direction without simply presenting a series of steps for them to follow. Students should also be familiar with making equal fractions as well as the concept that a percentage is a rate per 100. The size of the groups (four to five) will make “friendly fractions.” They may also remember that they can divide to find the decimal form and then rewrite it as a percentage. See what connections they’re able to make BEFORE PROVIDING ANY DIRECT INSTRUCTION.

- As students work, hang t-charts around the room. Make one for each trait.

| | |
|------------------|-------------------|
| TRAIT: ear lobes | |
| Form 1 (free) | Form 2 (attached) |
| | |

| | |
|-----------------|------------------|
| TRAIT: dimples | |
| Form 1 (absent) | Form 2 (present) |
| | |

| | |
|----------------|-------------------|
| TRAIT: chin | |
| Form 1 (cleft) | Form 2 (no cleft) |
| | |

| | |
|-----------------------|-------------------|
| TRAIT: hairline | |
| Form 1 (Widow's peak) | Form 2 (straight) |
| | |

| | |
|--------------------|-----------------|
| TRAIT: finger hair | |
| Form 1 (present) | Form 2 (absent) |
| | |

| | |
|-------------------------|-----------------------------|
| TRAIT: thumb | |
| Form 1 (straight thumb) | Form 2 (hitchhiker's thumb) |
| | |

- When students are finished compiling the data for their small groups, have one person from each group record their group's data on each of the t-charts.
- Direct students' attention to PART 3 of the Lab Sheet (Collecting class data).
- Students work in their small groups to complete Table 3.
- Students use the totals recorded on the t-charts for each Trait/Form and enter the number of students in the appropriate column for each trait.

Table 3: Class data for observable traits:

| Trait | Number of students with Form 1 | Ratio and % (Frequency) | Number of students with Form 2 | Ratio and % (Frequency) |
|----------------|--------------------------------|-------------------------|--------------------------------|-------------------------|
| G. Earlobe | | | | |
| H. Dimples | | | | |
| I. Chin | | | | |
| J. Hairline | | | | |
| K. Finger hair | | | | |
| L. Thumb | | | | |

- Circulate as students work to ask guiding questions and check student progress.
Note: Again, writing ratios is not a new skill. However, for this table, the ratios may not be "friendly." Students can still use what they know about making equal fractions to experiment

with finding the correct percentages. They may also remember that they can divide to find the decimal form and then rewrite it as a percentage. See what connections they're able to make BEFORE PROVIDING ANY DIRECT INSTRUCTION.

- Display a blank copy of Table 3.
- Ask students to help complete the table so that everyone can check their work. Have students who could find the ratio and percentage (frequency) for each trait to explain how they calculated their answer.
- Share the prompt for the exit ticket. Collect tickets as students leave for the day.

Exit Ticket for **DAY ONE**

3 – 2 – 1

- 3 ideas from today's work that were new to me that I think I understand now.
- 2 ideas from today's work that were a review of something I already knew.
- 1 question I have about the work we did today.

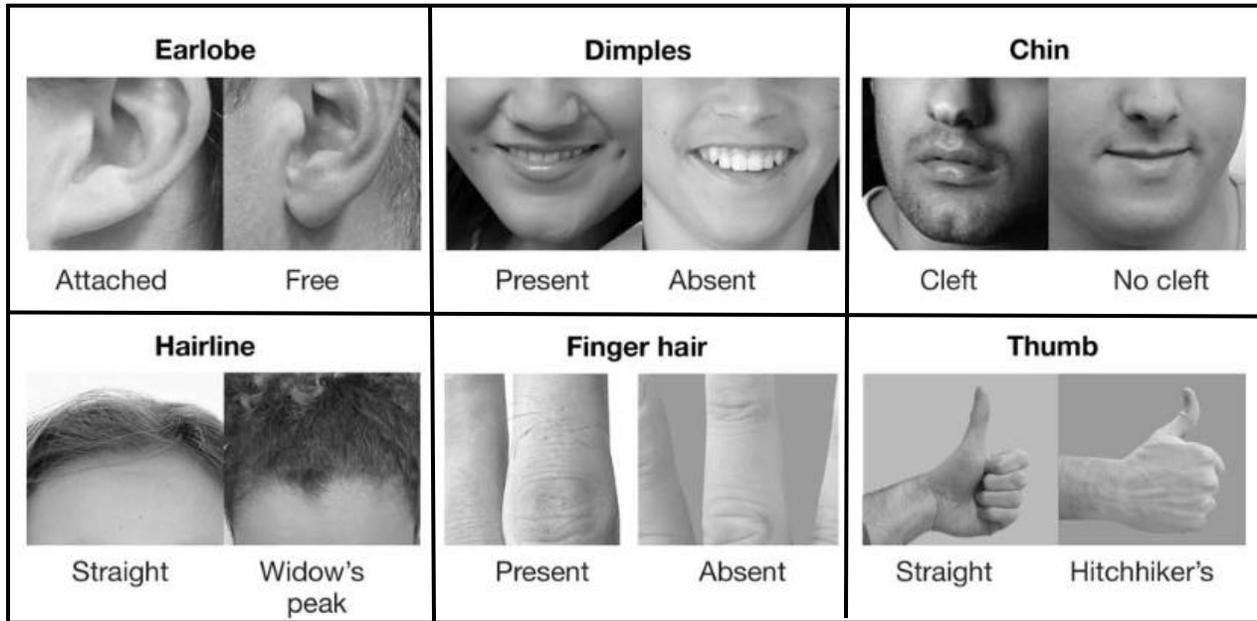
END DAY ONE

- Students use the information from their Lab Sheets, the compiled class data sheet, and the descriptions in the Quick Read to complete the Thinking Questions at bottom of the handout.

Exit Ticket:

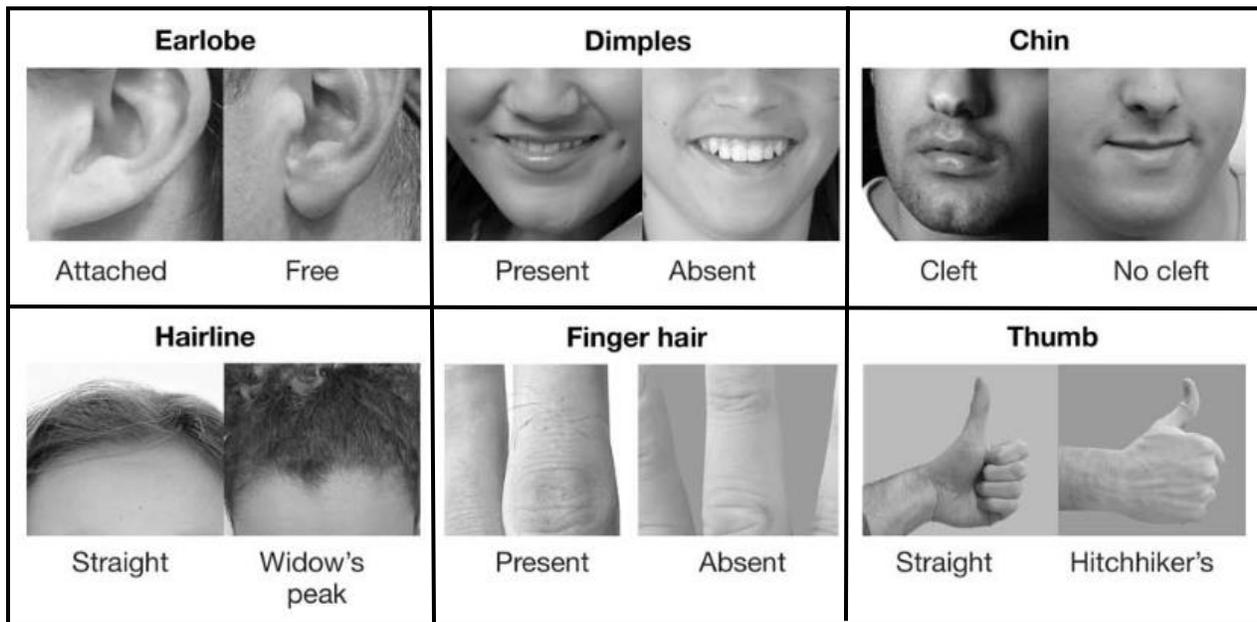
How could we use this class data to make inferences about our school population?

Observing Human Traits Lab Card



Adapted from *Observing Human Traits Lab*
<http://www2.mbusd.org/staff/pware/labs/HumanTraits.pdf>

Observing Human Traits Lab Card



Adapted from *Observing Human Traits Lab*
<http://www2.mbusd.org/staff/pware/labs/HumanTraits.pdf>

Observing Human Traits Lab

Traits are physical characteristics you inherit from your parents. In this investigation, you will take an inventory of your observable traits and compare these to the observable traits of your classmates. Then, you will use some math to organize and communicate data about those traits.

PART 1: Inventory of traits (collecting individual data)

The Observing Human Traits Lab card shows six different human traits. Each trait has two different forms. Study the pictures on the card and follow the directions.

1. Work with your small group and observe which form you have for trait A through F. **Circle** YOUR FORM of each trait in the table below (Table 1). **Note:** For finger hair, even if you have only one hair on any of your mid-digits, you have finger hair.

Table 1: Inventory of traits

| Trait | Form 1 | Form 2 |
|----------------|----------------|--------------------|
| A. Earlobe | Free | Attached |
| B. Dimples | Absent | Present |
| C. Chin | Cleft | No cleft |
| D. Hairline | Widow's Peak | Straight |
| E. Finger hair | Present | Absent |
| F. Thumb | Straight thumb | Hitchhiker's thumb |

Stop and think. You should discuss the questions with members of your group. Think about what you're learning in your Science class as well.

2. For earlobes, only: How many students in your class do you think will share the same form (free or attached) as you? Explain your reasoning.

3. Make a prediction about how many of your classmates will have the same form of all six traits as you. Explain your reasoning.

Adapted from *Observing Human Traits Lab*
<http://www2.mbusd.org/staff/pware/labs/HumanTraits.pdf>

PART 2: Collecting group data

Number of Students in the Group = _____

Enter the information regarding Form 1 and Form 2 for each of the traits.

Table 2: Small group data for observable traits

| Trait | Number of students with Form 1 | Ratio and % (Frequency) | Number of students with Form 2 | Ratio and % (Frequency) |
|----------------|--------------------------------|-------------------------|--------------------------------|-------------------------|
| A. Earlobe | | | | |
| B. Dimples | | | | |
| C. Chin | | | | |
| D. Hairline | | | | |
| E. Finger hair | | | | |
| F. Thumb | | | | |

PART 3: Collecting class data

Number of Students in the Class = _____

Use the information on the t-charts to enter the information regarding Form 1 and Form 2 for each of the traits.

Table 3: Class data for observable traits

| Trait | Number of students with Form 1 | Ratio and % (Frequency) | Number of students with Form 2 | Ratio and % (Frequency) |
|----------------|--------------------------------|-------------------------|--------------------------------|-------------------------|
| A. Earlobe | | | | |
| B. Dimples | | | | |
| C. Chin | | | | |
| D. Hairline | | | | |
| E. Finger hair | | | | |
| F. Thumb | | | | |

Adapted from *Observing Human Traits Lab*
<http://www2.mbusd.org/staff/pware/labs/HumanTraits.pdf>

Teacher copy of Table 2

Table 3: Class data for observable traits

| Trait | Number of students with Form 1 | Ratio / % (Frequency) | Number of students with Form 2 | Ratio / % (Frequency) |
|----------------|--------------------------------|-----------------------|--------------------------------|-----------------------|
| A. Earlobe | | | | |
| A. Dimples | | | | |
| B. Chin | | | | |
| C. Hairline | | | | |
| D. Finger hair | | | | |
| E. Thumb | | | | |

Class Data for Mr./Mrs./Ms. _____ Math classes

Number of classes:

Total number of students:

| Trait | Number of students with Form 1 | Ratio / % (Frequency) | Number of students with Form 2 | Ratio / % (Frequency) |
|----------------|--------------------------------|-----------------------|--------------------------------|-----------------------|
| A. Ear lobe | | | | |
| A. Dimples | | | | |
| B. Chin | | | | |
| C. Hairline | | | | |
| D. Finger hair | | | | |
| E. Thumb | | | | |

You should fill in the information in this table. The goal of this part of the lesson is to develop learner understanding of random sampling and making inferences about a larger population.

Suggestion: Quickly review how you used the total number of students in all classes to write the ratios for each form, as well as how to convert the ratio to a percentage.

Class Data for Mr./Mrs./Ms. _____ Math classes

Number of classes:

Total number of students:

| Trait | Number of students with Form 1 | Ratio / % (Frequency) | Number of students with Form 2 | Ratio / % (Frequency) |
|----------------|--------------------------------|-----------------------|--------------------------------|-----------------------|
| A. Ear lobe | | | | |
| A. Dimples | | | | |
| B. Chin | | | | |
| C. Hairline | | | | |
| D. Finger hair | | | | |
| E. Thumb | | | | |

Adapted from *Observing Human Traits Lab*
<http://www2.mbusd.org/staff/pware/labs/HumanTraits.pdf>

Class Data for Mr./Mrs./Ms. _____ Math classes

Number of classes:

Total number of students:

| Trait | Number of students with Form 1 | Ratio / % (Frequency) | Number of students with Form 2 | Ratio / % (Frequency) |
|----------------|--------------------------------|-----------------------|--------------------------------|-----------------------|
| A. Ear lobe | | | | |
| F. Dimples | | | | |
| G. Chin | | | | |
| H. Hairline | | | | |
| I. Finger hair | | | | |
| J. Thumb | | | | |

Just Like Me! Quick Read

- A *sample* is part of a larger group of objects or people. The larger group is called a *population*.
- A population can be any group that is appropriate for a particular situation. For example, a population might be defined as all the students in our school, or as the 1,657 residents of our town (Gaston, SC), or even the whole population of the United States. In a factory, the population might be the number of items produced in any one day, or the number of items produced in a year.
- A sample must be selected randomly from the population to ensure that there is no bias toward one sector of the population or toward any particular result. In a random sample, every member of a population is equally likely to be selected.
- Samples can be used to generalize about a population. A larger sample will give more confidence in the inferences about the population being considered.

Thinking Questions

Use the information above to consider the data about observable human traits.

- If the compiled class data is a sample, what might the population be?
- Consider the description of *random* in the third bullet. Do you think the sample (all the math classes taught by your math teacher) is truly random? If not, how might you obtain a sample that better represents the population?
- Is the size of our sample sufficient to make adequate inferences about observable traits? Why or why not?

Some questions to ponder.

- ❖ What percentage of our entire student body is represented by our sample?
- ❖ How might we strengthen the ability to make more accurate inferences?