

# Inherited Traits

## *Inherited Traits of Humans*



### Objectives

1. Students will make a chart and collect data identifying various traits among their classmates.
2. Students will understand that they share many traits.
3. Students will be able to identify a trait as inherited from the parent.
4. Students will record data on specific traits.

### Materials

"An Inventory of My Traits" worksheets, one for each student  
Measuring Tape (fabric tapes work best, as students will be measuring wrist circumference and height)  
A plant, fish and bread mold (other "living" examples may be used from your classroom—depending on what is easily available)  
PTC (Phenylthiocarbamide) test papers, one strip for each student  
Hard, sweet candy, one piece for each student  
Paper adding machine tape or long strips of paper  
Post-It notes (3" x 3") cut in half, four for each student

### Background

Have you ever noticed that sisters look alike? Or have you even had difficulty telling them apart. Their inherited traits are what make their physical appearance so similar. An inherited trait is a particular genetically determined characteristic or quality that distinguishes somebody. The traits of children are determined by the traits passed on from their parents. This is why we often hear, "She has her mother's eyes," or, "He has his father's chin". People are noticing the inherited traits.

It is often easy to determine inherited traits in family members, but what about traits that are often unnoticed? You may even possess many of the same traits as your classmates although you are not directly related to those individuals.

Parent organisms pass traits to their offspring so there are often similar characteristics seen in both parent and offspring. Inherited human traits include:

- \* Ability to roll your tongue or not
- \* Attached or unattached earlobes
- \* Dimples or freckles
- \* Naturally curly or straight hair
- \* Hitchhiker's or straight thumb

**Time:** 1 Hour per activity

**Grade:** Fifth

### **Core Standard:**

**V-** Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.

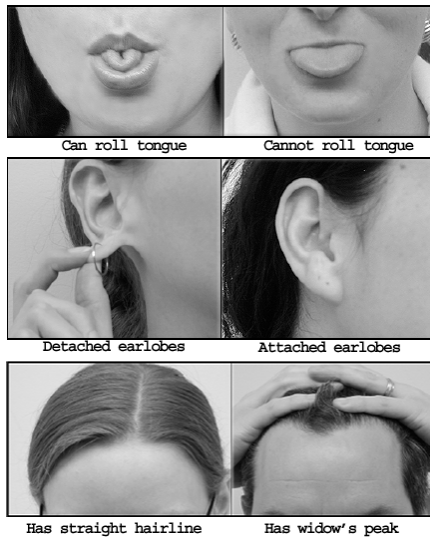
**Objective 1-** Using supporting evidence, show that traits are transferred from a parent organism.



Are they more alike than different?  
Or...more different than alike?

- \* Color-blindness or normal color vision
- \* Widow's peak or straight hairline
- \* Color of skin and hair
- \* Cleft or smooth chin

Humans have numerous traits, but some traits are more frequently seen. Between 70-90% of the population have free-hanging earlobes, can roll their tongue, are right-handed and can taste PTC (a bitter-tasting chemical that can be placed on the tongue). Because these traits occur most often within the population they are called high frequency traits. The **rate of frequency** is a statistical term that helps scientists determine how often an inherited trait occurs. Frequency is important in discovering how much of the population differs (or is similar) from the whole.



### Activity Procedures

1. Begin the activity by telling the class something like, "If a visitor from another planet walked into this classroom, he might easily conclude that humans all look very much alike." If students complain that this is not true, answer something like, "You are certainly more like one another than you are like this plant (point to the plant). Or this fish (point to the fish). And for sure, you are more alike than anyone of you is like the bread mold (hold up the baggie with the bread mold). Humans- *Homo sapiens*- have a set of traits that define us as a species, just like all other species have a set of traits that define them.
2. Continue the activity by determining just how similar the students are to each other. Pair each student with a partner. Distribute the "An Inventory of My Traits" activity sheet to each student. Have each student help their partner determine their specific traits.

### Activity 1

*Teaching Tip: While carrying out this activity, teachers need to be sensitive to the ethnic make-up of their class and to any individual traits that would stereotype any student in a negative way. It is **NOT** recommended that students be assigned to conduct surveys of their family members for heritable traits.*

1. Using the "Inventory of My Traits" worksheets, conduct the following game with several volunteers. Provide hard candies to counteract the bitter taste of the PTC paper. Have students use a partner to compare their traits.

### Questions for Investigation or Assessment:

1. Is there a pattern in the traits expressed in our classroom population?
2. Why do you think there are so many similarities or differences within our population?
3. Why would a scientist care whether populations were similar or different?
4. Can you think of any traits you may have inherited from your parents? From your grandparents? List those traits and predict which traits you may pass on to your children.

2. Choose a volunteer to determine his or her “uniqueness” as compared with the other students.
3. Ask all of the students to stand.
4. Invite the volunteer to begin to identify his or her inherited traits for each of the 15 human traits listed on their completed worksheet. Begin with the first trait and proceed sequentially. As the volunteer lists his or her traits, direct the students who share the volunteer’s similarities to remain standing. Direct all other students to sit.
5. Continue in this fashion until the volunteer is the only person still standing. Count how many traits the class had to consider to distinguish the volunteer from all other students in the class.
6. Repeat as desired with another volunteer.

**Activity 2 (Mathematics Integration)**

1. Using the “Inventory of My Traits” worksheets, have the students determine the frequency of the traits within the classroom population. *A master copy of an overhead is included with this lesson on page 6.*
2. List each observed trait and the number of times it was observed on the board and create a frequency table like the one shown. Ask: How many in the class have this trait? (Use tally marks to emphasize math skills)

**Example:**

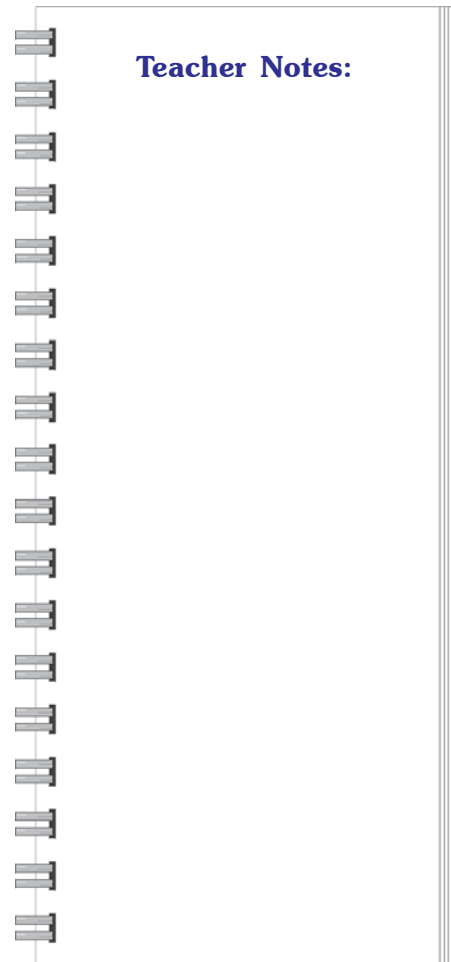
<u>Observed Trait</u>	<u>Number Observed</u>
Brown Eyes	//// // //
Blue Eyes	///
Green Eyes	//// /
Total Population = 30	

Show students how to determine percentages for the frequency:

$$\frac{\text{Number Observed} \times 100}{\text{Total Population}} = \text{Percentage}$$

For Example: Brown Eyes would be  $15 \times 100 / 30 = 50\%$   
 50% of the class population has brown eyes

- \* *Wrist circumference and hand span will need to be shown in a graph format to see the similarities. The instructor should model the procedure to calculate the average for these statistics.*
5. Ask the students if the majority of their population had high frequency traits. Remember that because of variation in populations it is quite possible that a low frequency trait will be observed in the majority of the students in your classroom. Determine which traits had the highest rate of frequency.
  6. Compare your results of these class traits to known frequencies for the general population. *Frequency Chart shown on page 4.*
  7. Create a Wall Graph for the last four traits: hand span, wrist



circumference, foot length and finger length. Discuss the amount of variation present in the class for these traits.

To Make a Wall Graph:

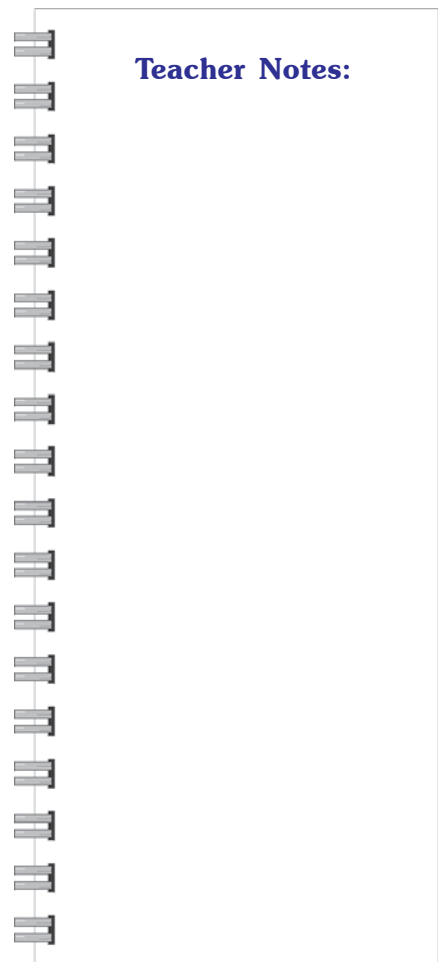
- a. Use adding machine tape or long strips of paper to create the X and Y axes for the graph. Mark centimeter place ments for each bar of the graph on the X axis and label it “Number of Centimeters”. Mark 3-inch placements for each Post-It note on the Y axis and label it “Number of Students”.
- b. Tape the axes on the wall.
- c. Have each students add their data to the graph using a Post-It note, creating a bar graph.

Teaching Tip: At the end of the activity, remove the axes from the wall, roll them up and save them for re-use the following year.

8. After making the Wall Graphs, model how to calculate the class average for these four traits.
9. Ask the students:
  - a. Is there a pattern in the traits expressed in our classroom population?
  - b. Why do you think there are so many similarities or differences within our population?
  - c. Why would a scientist care whether populations were similar or different?

### Frequency Chart

Trait	Frequency Form 1	Frequency Form 2
Gender	Female – approximately 50%	Male – approximately 50%
Earlobes	Unattached (free) – more frequent	Attached – less frequent
Thumb extension	Straight thumb – 64-75%	Hitchhiker’s thumb – 25-36%
Tongue rolling	Can roll tongue – 65%	Cannot roll tongue – 35%
Cheek dimples	Dimples – more frequent	No dimples – less frequent
Handedness	Right handed – more frequent	Left handed – less frequent
Hand clasping	Left over right – 55%	Right over left – 44%
Hair curl	Curly hair – more frequent	Straight hair – less frequent
PTC Tasting	Can taste PTC – 70%	Cannot taste PTC – 30%
Hairline	Widow’s peak – more frequent	Straight hairline – less frequent
Color vision	Normal color vision – females 100%; males 92%	Color blind – males 8%



### Activity 3 (Homework Connection)

1. Have your students make predictions based upon the frequency of inherited traits for another population. In pairs of students, have them form their own population survey. Have them administer their survey to their chosen population (it could be another class or a group of students who were reading in the library during lunch). Have them report their discovered frequencies and answer the following questions in their scientific report.
  1. Why did you select your particular population?
  2. Which frequency was the most surprising to you?
  3. Why are your results significant? (describe why a

- scientist might care about your results)
4. Were your high frequency traits really the highest in your population, or was it determined that they were low frequency traits in your population.
  5. What other inherited traits do you think scientists should look for? Why?
  6. If you were to compare your population with a different population do you think that the results would be the same? Why or why not?

### **Extensions/Adaptations/Integration**

1. Have your students examine why America is called a “melting pot of race and culture”. Relate this to what they have been learning about inherited traits and the great immigrations of populations to North America in the 1800s.
2. Have your students visit “The Gene Scene” web site. This site is a virtual way to give them more understanding about what makes them unique. Or order “The Gene Scence” student readers, one classroom set of 30 is \$25.00. Visit the American Museum of Natural History at [www.amnh.org](http://www.amnh.org) for activities on-line, or email Eric Hamilton at [center@amnh.org](mailto:center@amnh.org) to order your student readers.

### **Additional Resources**

Order PTC and Control paper from Carolina Biological:

[www.carolina.com](http://www.carolina.com) or 1-800-334-5551

PTC paper- RG-17-4010, \$3.60/pack of 100

Control paper- RG-17-4000, \$3.60/pack of 100

Make your own classroom poster of inherited traits. Visit [www.agclassroom.org/ut](http://www.agclassroom.org/ut), and look for the “Comparing Inherited Traits” link. The files may be downloaded for photocopying or making overheads.

# Rate of Frequency

Total Population \_\_\_\_\_

Observed Traits	Number Observed	Percentage of Population with Trait
Tongue rollers Non-tongue rollers		
Detached earlobes Attached earlobes		
Hitchhikers thumb Regular thumb		
Males Females		
Dimples No dimples		
Right-handed Left-handed		
Cross left thumb over right Cross right thumb over left		
Freckles No freckles		
Curly hair Straight hair		
Wrist circumference average		
Allergies No allergies		
Can taste PTC Cannot taste PTC		
Color blind Can see all colors		
Widow's Peak No Widow's Peak		
Hand span average		

# An Inventory of My Traits

How similar are you and your partner? Complete this inventory and compare it with your partner's inventory.

- |   |   |                                 |
|---|---|---------------------------------|
| 1. I am a:  | <input type="checkbox"/> Male             | <input type="checkbox"/> Female |
| 2. I have detached earlobes.                            | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 3. I have a hitchhiker's thumb.                         | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 4. I can roll my tongue.                                | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 5. I have dimples.                                      | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 6. I am righthanded.                                    | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 7. I cross my left thumb over my right.                 | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 8. I have freckles.                                     | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 9. I have naturally curly hair.                         | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 10. I have a cleft chin.                                | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 11. I have allergies.                                   | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 12. I can taste PTC.                                    | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 13. I can see the colors red & green (color blindness). | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 14. I have a widow's peak.                              | <input type="checkbox"/> YES              | <input type="checkbox"/> NO     |
| 15. The length of my left index finger is:              | _____ centimeters (to nearest centimeter) |                                 |
| 16. The length of my left foot is:                      | _____ centimeters (to nearest centimeter) |                                 |
| 17. My hand span is:                                    | _____ centimeters (to nearest centimeter) |                                 |
| 18. My wrist circumference is:                          | _____ centimeters (to nearest centimeter) |                                 |