

A Tree of Genetic Traits

Abstract

Students mark their traits for tongue rolling, PTC tasting (a harmless, bitter chemical), and earlobe attachment on tree leaf cut-outs. They then place their leaves on a large tree whose branches each represent a different combination of traits. When completed, the tree forms a visual representation of the frequency of trait combinations within the class.

Logistics

Time Required

- ▶ **Class Time:**
30 minutes
- ▶ **Prep Time:**
30 minutes to review activity, make copies of tree leaf cut-outs, and prepare traits tree

Materials

PTC paper, hard candies, leaf cut-outs, tape, scissors, transparencies or large butcher paper

Prior Knowledge Needed

None

Appropriate For:

Ages: 10 - 13
USA grades: 5 - 7

Learning Objectives

- ▶ Traits are observable characteristics that are passed down from parent to child.
- ▶ An individual will have many traits they share in common with others.
- ▶ An individual's overall combination of traits makes them unique.
- ▶ Some traits are more common in a population than others.

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Classroom Implementation

Activity Instructions:

- Copy the *Genetic Traits Tree* graphic provided on page 4 onto an overhead transparency. For Spanish speaking students, create a transparency of page 6. Use an overhead projector to project the transparency large onto a blank wall. For a mixed language classroom, swap out the page 4 and page 6 transparencies as needed during the activity. Alternatively, draw a large tree on butcher paper based on page 4. Post it in an easily accessible and visible area of the room. Provide each student with a leaf and instruct them to cut it out.
- Explain that traits are observable characteristics we inherit from our parents. Demonstrate the tongue rolling and earlobe attachment traits. Have students mark “yes” or “no” on their leaf for these traits as appropriate.
- Hand out PTC paper. Instruct students to place a piece of PTC paper on the tip of their tongue to see if they can taste anything. The chemical tastes bitter to those who can taste it. For those who cannot taste PTC, the paper has no taste.
 - *Note:* PTC paper is inexpensive and can be purchased from Sargent Welch (www.sargentwelch.com), Carolina Math and Science (www.carolina.com) or Ward’s Natural Science (<http://www.wardsci.com>).
- Instruct students to check “yes” or “no” on their leaves for PTC tasting. Hand out a hard candy to each student to neutralize the taste of the PTC.
- Demonstrate how to determine where to place the leaves on the Trait Tree starting at the base of the branches and working your way out toward the tips.
- Call students up in groups to place their leaves on the appropriate branches. The leaves will be clustered around the branch representing the most common combination of traits in the class. Some branches of the tree will remain relatively sparse.
- *Optional:* Make leaf cut-outs in two different colors, one for boys and one for girls, to track combinations of traits within the different genders.
- *Optional:* Increase your data pool by including other classes in the exercise, taping all leaves to one tree.

Quantities

Per Student _____

- ▶ One leaf cut-out, hard candy

Per Group of 2 _____

- ▶ PTC paper, scissors, tape

Common Misconceptions

A widespread misconception is that all traits exhibit either a dominant or recessive pattern of inheritance. But these terms only apply to single gene traits. The traits included in this activity are part of the small number that may be due to only one or two genes. However, most human genetic traits are influenced by several genes as well as interactions with the environment. The inheritance of complex traits is difficult to predict, and does not follow typical dominant or recessive patterns.

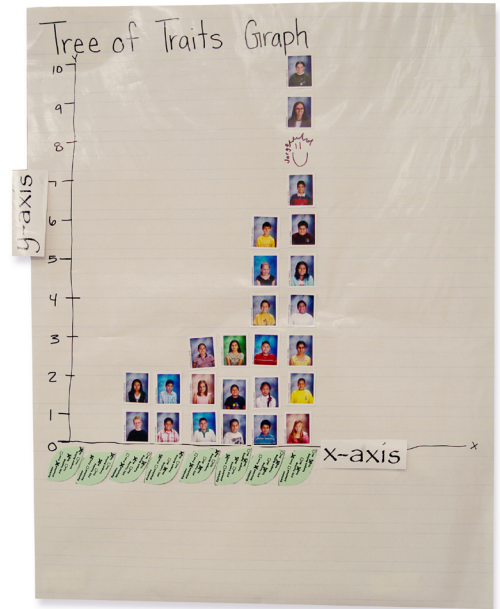
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Discussion Points:

- Some traits are more common in a population than others. What is the most common combination of traits in the class? What is the least common combination of traits in the class? How does this compare to the most and least common individual traits in the class?
- Every person has a unique combination of traits. If we were to look at more traits than three, we would eventually need a branch on the Trait Tree for each person in the class.

Math extension:

Create a bar graph of the class data (see example at right). Use the graph to discuss mean, median, mode and range.



Standards

U.S. National Science Education Standards

Grades 5-8:

Content Standard C: Life Science - Reproduction and Heredity

- Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another.
- The characteristics of an organism can be described in terms of a combination of traits.

AAAS Benchmarks for Science Literacy

Grades 3-5:

The Living Environment: Heredity - Some likenesses between children and parents, such as eye color in human beings, or fruit or flower color in plants, are inherited. Other likenesses, such as people's table manners or carpentry skills, are learned.

For offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next.

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Credits

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This activity was adapted from “State Your Traits - Genetic Traits Tree”, The GENETICS Project, University of Washington (2001).

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Additional Resources

Visit the [Learn.Genetics](http://learn.genetics.utah.edu) website to get links to great resources like these! Just log-in as a teacher and click on *The Basics and Beyond*.

- **Tour of the Basics:** An animated tutorial that contains background information on DNA, genes, patterns of inheritance and more!
- **Inherited Human Traits: A Quick Reference:** A pictorial reference and description of inheritance, and inheritance patterns (dominant, recessive, sex-linked, polygenic) for several human traits, including those described in this activity.

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Leaf Cut-outs

Adapted from "State Your Traits - Genetic Traits Tree", the GENETICS Project, University of Washington (2001).

Earlobes
Attached Free

PTC Tasting
Yes No

Tongue Rolling
Yes No

Earlobes
Attached Free

PTC Tasting
Yes No

Tongue Rolling
Yes No

Earlobes
Attached Free

PTC Tasting
Yes No

Tongue Rolling
Yes No

Earlobes
Attached Free

PTC Tasting
Yes No

Tongue Rolling
Yes No

Earlobes
Attached Free

PTC Tasting
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Tongue Rolling
Yes No

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PTC Tasting
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Tongue Rolling
Yes No

Earlobes
Attached Free

PTC Tasting
Yes No

Tongue Rolling
Yes No

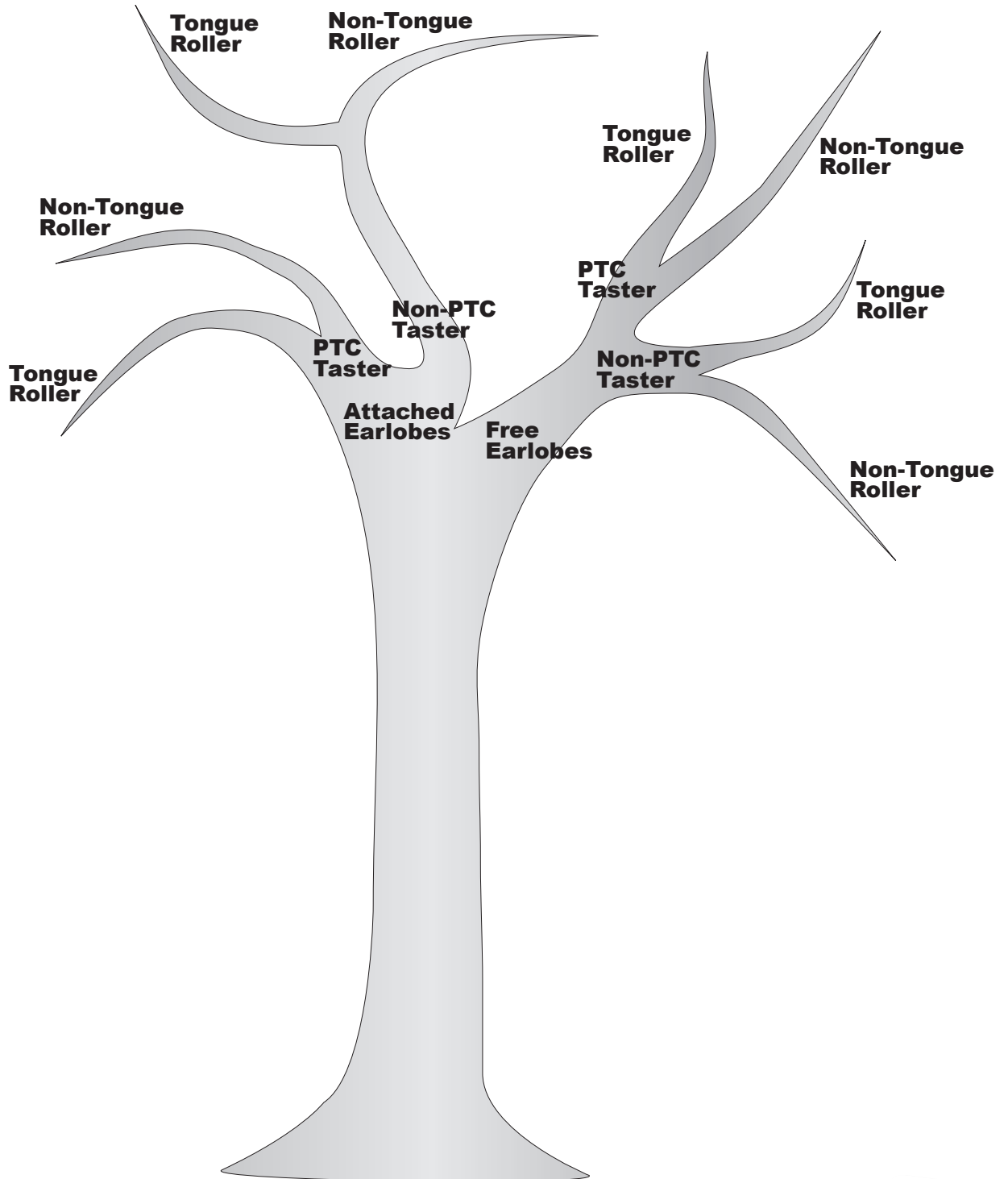
Earlobes
Attached Free

PTC Tasting
Yes No

Tongue Rolling
Yes No

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Example Trait Tree



Adapted from "State Your Traits - Genetic Traits Tree", the GENETICS Project, University of Washington (2001).

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Leaf Cut-outs

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Lóbulos de Orejas
Unidos Libres

Sabor a la Feniltiocarbamida (PTC)
Si No

Enrolla la Lengua
Si No

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Si No

Enrolla la Lengua
Si No

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El Árbol de los Rasgos

Adapted from "State Your Traits - Genetic Traits Tree", the GENETICS Project, University of Washington (2001).

