



Lab Summary

The Tech Science Labs: DNA and Genetics

Created with Stanford's Genetics Department. Students examine their own DNA from cheek cells, spool DNA from animal cells, and explore how genes shape traits.

Grade Levels:

6–8

Learning Outcomes:

- Students will learn basic information about genetics and inherited traits.
- Students will learn about the role of DNA in determining physical human traits.
- Students will learn the basic structure of an animal cell.

Estimated Time:

1.5 hours

- Introductory Discussion of DNA and Genetics: 5 minutes
- Cheek Cell Experiment: 15 minutes
- DNA Spooling Experiment: 35 minutes
- Introductory Discussion of Genetics and Inherited Traits: 10 minutes
- Inherited Trait Worksheet Activity: 10 minutes
- Taste Testing: 10 minutes
- Summary and Closing: 5 minutes

California Science Content Standards Connections:

- Grade 7: Life Sciences: 1a, 1c, 1e, 2, 2b, 2c, 2d, 2e, 3a
- Grade 8: Life Sciences: 6c
- All Grades: Investigation and Experimentation: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other 3 strands, students should develop their own questions and perform investigations.

The Tech Museum™ Gallery Connections:

Life Tech Gallery:

- “Genetics: Technology with a Twist”: Students further explore many aspects of genetics as they can:
 - Zoom in on a gene, from the cell down to the DNA.
 - Genetically engineer a jellyfish protein in our genetics wet lab.
 - Use a sequencing machine to track down a harmful mutation causing a genetic disorder.
 - Learn about gene therapy and how genetics has impacted people's lives.
 - See a physical simulation of a gene array to determine medical plans for a patient.
 - Get the impact of genes on traits like eye color and color blindness.
 - Make a speech or lead a protest for ethical genetics issues.
 - Ask our Stanford gene scientist any genetics-related questions.

The Tech Museum™ Gallery Connections (continued):*The Tech Awards Gallery:*

- “Guilty Until Proven Innocent”: Students see how a laureate of The Tech Awards uses DNA testing to reveal flaws in the criminal justice system, taking samples from crime scenes and suspects to prove innocence.

Pre-Visit Vocabulary:

These are words and concepts that we will discuss in the lab. Your students’ lab experience will be enhanced if they are familiar with these terms prior to your visit.

- Allele: Any of the possible forms in which a gene for a specific trait can occur.
- Cell: The basic structural unit of all organisms.
- DNA (deoxyribonucleic acid): The genetic material of living organisms, located in the chromosomes of each cell.
- Dominant: The one of a pair of alternative alleles that masks the effect of the other when both are present in the same cell or organism.
- Gene: The basic physical unit of heredity.
- Nucleus: A large, membrane-bound structure within a living cell, containing the cell’s hereditary material and controlling its metabolism, growth, and reproduction.
- Punnett Square: A type of grid that can indicate all the possible outcomes of a genetic cross.
- Recessive: One of a pair of alternative alleles whose effect is masked by the activity of the second when both are present in the same cell or organism.
- Trait: A genetically determined characteristic or condition.

Teacher Resources:

- Online Genetics Game: Fun for a Pre-Visit Activity
http://www.tryscience.org/experiments/experiments_dna_online.html
- Kids Genetics @ GlaxoSmithKline: Great Online Games and Activities for Grades 4 – 7
http://genetics.gsk.com/kids/index_kids.htm
- Genetics Education Partnership: Database of Tools to Purchase
<http://genetics-education-partnership.mbt.washington.edu/cool/coolgrade.html>
- Time.com: The Genetics Revolution: Summary of Genetics Breakthroughs
<http://www.time.com/time/daily/special/genetics/>
- PBS NOVA Online: Cracking the Code of Life: Curriculum Supplements
<http://www.pbs.org/wgbh/nova/israel/>
- PBS NOVA Online: Cracking the Code of Life: Curriculum Supplements
<http://www.pbs.org/wgbh/nova/genome/teacherresources.html>
- University of Utah Genetic Science Learning Center: Pre-and Post activities
<http://learn.genetics.utah.edu/teachers/tindex/>
- Dozens of Simple Activities for Middle and High School Students
http://serendip.brynmawr.edu/sci_edu/waldron/
- Toothpick Fish activity: Genetics and Natural Selection in the Context of an Environmental Disaster
<http://chroma.gs.washington.edu/outreach/genetics/download.html>

Post-Lab Activity—PTC Tasting Papers:

Handout available in The Tech Science Labs

Estimated Time: 15 minutes

Students see (and taste!) what 1,000 letters of their DNA look like—a tiny fraction of the genetic instructions that make them who they are. They'll reinforce the genetics behind taster and non-taster genes and take home chemical PTC papers to test on their parents and siblings.

Learning Outcomes:

- Students learn that genes are passed down from parents to children.
- Students learn that they have 2 copies of each of their genes.
- Students learn that each gene comes in different versions.
- Students learn they get 1 chromosome from each parent to make each gene pair.
- Students learn that there are dominant and recessive genes.