

LESSON:

Happening Vocab: Genetics

Summary: Students piece suffixes, prefixes, and compound words together to generate definitions for genetics vocabulary. After reading the *EHP Student Edition* article "HapMap Complete" they refine their definitions and summarize how the HapMap and SNPs can help scientists study disease.

EHP Article: "HapMap Complete," *EHP Student Edition*, January 2006, p. A662
<http://ehp.niehs.nih.gov/docs/2005/113-10/forum.html>

Objectives: By the end of this lesson, students should be able to

1. define common genetics vocabulary;
2. describe how biology/science terminology works using common prefixes and suffixes; and
3. summarize how the HapMap can help scientists understand diseases and drug responses.

Class Time: 30 minutes

Grade Level: 9–12

Subjects Addressed: Biology, Genetics, Health, Environmental Health

► **Prepping the Lesson (15 minutes)**

INSTRUCTIONS:

1. Obtain a class set of *EHP Student Edition*, January 2006, or download the article at <http://ehp.niehs.nih.gov/docs/2005/113-10/forum.html>.
2. Make copies of the Student Instructions.

MATERIALS (per student):

- 1 copy of *EHP Student Edition*, January 2006, or 1 copy of "HapMap Complete"
- 1 copy of the Student Instructions

VOCABULARY:

- chromosome
- gene
- genetic
- genome
- genotype
- haploid
- haplotype
- -ploidy
- polymorphism
- single-nucleotide polymorphisms (SNPs)

BACKGROUND INFORMATION:

Sufficient information is provided in the article and the lesson.

RESOURCES:

Environmental Health Perspectives, Environews by Topic page. Choose Genetic Research, Genomics, <http://ehp.niehs.nih.gov/topic>
 Dictionary, <http://dictionary.reference.com/>

International HapMap Project, Haplotype origins, <http://www.hapmap.org/originhaplotype.html.en>

International HapMap Project, What Is The HapMap?, <http://www.hapmap.org/whatishapmap.html.en>

Wikipedia

Chromosome, <http://en.wikipedia.org/wiki/Chromosome>

Genome, <http://en.wikipedia.org/wiki/Genome>



Haplotype, <http://en.wikipedia.org/wiki/Haplotype>

► Implementing the Lesson

INSTRUCTIONS:

1. Hand out the Student Instructions and the article “HapMap Complete.”
2. After the students complete their work, discuss terms and concepts as needed.

NOTES and HELPFUL HINTS:

- Although it may help for students to have some genetics background prior to the lesson, this lesson is designed for them to be able to independently piece together an understanding of the vocabulary by using suffixes, prefixes, compound words, and information from the article.

► Aligning with Standards

SKILLS USED OR DEVELOPED:

- Classification
- Communication (written)
- Comprehension (reading)

SPECIFIC CONTENT ADDRESSED:

- Genetics
- Biology vocabulary techniques

NATIONAL SCIENCE EDUCATION STANDARDS MET:

Unifying Concepts and Processes Standard

- Systems, order, and organization
- Evidence, models, and explanation
- Change, constancy, and measurement
- Evolution and equilibrium
- Form and function

Life Science Standard

- Molecular basis of heredity
- Biological evolution

Science and Technology Standard

- Abilities of technical design
- Understanding about science and technology

Science in Personal and Social Perspectives Standard

- Personal and community health
- Science and technology in local, national, and global challenges

History and Nature of Science Standard

- Science as a human endeavor
- Nature of scientific knowledge

► Assessing the Lesson

Step 2: Using the information below, define the terms *genetic*, *haplotype* (contraction for haploid genotype), *genome*, and *single nucleotide polymorphisms (SNPs)*.

genetic: Piecing together the individual definitions of the prefix and suffix: “Relating to a sequence of DNA on a chromosome that determines a particular trait of an organism.”

haplotype (contraction for haploid genotype): Piecing together the individual definitions of the prefix and suffix and compound words: “One copy of a chromosome in an individual” (a refined definition based on the article is: blocks of genes on an individual chromosome).



genome: Piecing together the individual definitions of the prefix and suffix: “A complete set of DNA sequences that make up an organism.”

single nucleotide polymorphisms (SNPs): Piecing together the individual definitions of the prefix and suffix and compound words: “Many changes on a single structural unit of DNA” (a refined definition is: “A DNA sequence variation occurring on a single nucleotide”).

Step 3: Now that you know some of the vocabulary, read the article “HapMap Complete.” Refine your definitions based on the reading and answer this question: How can the HapMap help scientists understand diseases and drug responses?

The HapMap provides researchers with a shortcut to map genes contributing to particular diseases and drug responses. The HapMap allows scientists to accelerate their understanding of genetic variation as they use SNPs to identify gene variations and see if there are any genetic variations that relate to a specific disease. With the HapMap, scientists are better able to investigate the genetic components of many complex disorders, such as asthma, cancer, and obesity.

► Authors and Reviewers

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Step 1: Some sciences, especially biological sciences, have many vocabulary words. When you first begin learning about a new topic in biology all of the new words may seem overwhelming. But once you learn some of the tricks of how biology vocabulary works, it becomes a lot easier. In this lesson you are going to learn and apply some of those tricks.

You may wonder why there is so much terminology in science. The reason is to quickly communicate an idea. For example, the word *biome* is easier to say than “a region characterized by specific types of plants and animals in a certain climate.” The parts of the word give someone an idea of what it means. *Bio-* means “life or living organism” and *-ome* means “a mass of.” If you put the prefix and suffix together you get the general idea that it is a region or mass of living organisms.

Sometimes prefixes and suffixes can really help define a word, other times it's not as clear. *Chromosome*, for example, is less obvious. *Chroma-* means “color” and *-some* means “characterized by a specific quality.” In Greek, *soma* means “body.” If we simply put the meanings of the prefix and suffix together for *chromosome* it would mean “color body” or “characterized by a specific color.” Although *chromosome* refers to “a continuous piece of DNA that carries the genetic information for an individual,” the understanding of the prefix and suffix can still help. Because the chromosome carries the genetic information, it provides the instructions for the coloring (and much more) of the individual with that chromosome—that is, what color the person's skin, eyes, and hair are. Using techniques like this can help you remember and define new vocabulary.

Step 2: Using the information below, define the terms *genetic*, *haplotype* (contraction for haploid genotype), *genome*, and *single nucleotide polymorphisms (SNPs)*.

chromosome = a continuous piece of DNA that carries the genetic information for an individual.

gene = a sequence of DNA on a chromosome that determines a particular trait of an organism.

genotype = specific DNA makeup of an individual, or the “types” of genes in one person. The genotype instructs the phenotype, which is the physical appearance of that individual (e.g., brown eyes, long legs).

hap- = simple; often interchanged with “mono-” or “one.”

-ic = relating to.

morph- = change

nucleotide = a structural unit of DNA or RNA (e.g., adenine, thymine, cytosine, or guanine)

-ome = en masse, complete, in entirety

-ploidy = number of copies of a chromosome

poly- = many

single = one

genetic:

haplotype (contraction for haploid genotype):

genome:

single-nucleotide polymorphisms (SNPs):

Step 3: Now that you know some of the vocabulary, read the article "HapMap Complete." Refine your definitions based on the reading and answer this question: How can the HapMAP help scientists understand diseases and drug responses?

