

HEREDITY: TEACHER GUIDE

Subject: Life Science

Grade Level: Middle School

Last Updated: December 10, 2008

Case Summary

Jason and Rochelle are planning to begin a family. In the midst of the excitement, the question of the appearance of the child arises. One parent believes that they have dominant genes based on their gender while the other disagrees. There is also a question of how cells reproduce. Who is right and who is wrong? It's up to you to find out!

Credits

This case was written by Jereme Doss (PhD Student, Polymer Chemistry, Clark Atlanta University, Atlanta, GA) and Tania Armer (teacher, Chamblee Middle School, Chamblee, GA) fellows of the Emory University PRISM program (<http://www.prism.emory.edu>). Authors may be contacted at tania_t_armer@fc.dekalb.k12.ga.us.

Learning Objectives

Upon completing the case students will be able to:

1. Define the following terms:
 - a. Gene
 - b. Chromosome
 - c. Trait
 - d. Chromatids
 - e. Alleles
 - f. Genotype
 - g. Phenotype
 - h. Mitosis
 - i. Meiosis
2. Hypothesize the results of a cross between a heterozygous dominant trait and a recessive trait.
3. Explain the role of genes and chromosomes in the process of inheriting a specific trait.
4. Describe the DNA molecule and identify the main components.
5. Differentiate between a dominant trait versus a recessive trait
6. Contrast an individual's Genotype from their Phenotype
7. Compare and contrast the processes of Mitosis and Meiosis

Georgia Performance Standards

S7L2. Students will describe the structure and function of cells, tissues, organs, and organ systems. (NSES Content Standard C)

- a. Explain that cells take in nutrients in order to grow and divide and to make needed materials.
- S7L3.* Students will recognize how biological traits are passed on to successive generations. (NSES Content Standard C)
- a. Explain the role of genes and chromosomes in the process of inheriting a specific trait.
 - c. Recognize that selective breeding can produce plants or animals with desired traits.

Assessment

Assessment was based on student evaluations as well as supplemental worksheet activities. The supplemental activities used were taken from the *Heredity, the Code of Life* activity book. We used the following activities: 1) Strawberry DNA extraction 2) Secret Code Activity 3) Investigating results of Inherited Traits. 4) Building a DNA Model. 5) What Color Is the Pod.

Prentice Hall (Ed.). (1994). *Heredity: The code of life, activity book*. Upper Saddle River, N.J.: Prentice Hall.

Of course, if you do not have access to that particular book, other genetics activities would work perfectly fine. Feel free to incorporate any activities your current curriculum provides or use any other related activities. Suggested activities are given below:

1. See Your DNA. This activity provides a simple technique for students to extract DNA from their cheek cells.

NOVA Teachers. (2004). See your DNA. Retrieved December 9, 2008 from http://www.pbs.org/wgbh/nova/teachers/activities/2809_genome.html

2. Mystery Message. This activity helps students understand the process of sequencing the human genome.

NOVA Teachers. (2004). Mystery message. Retrieved December 9, 2008 from http://www.pbs.org/wgbh/nova/teachers/activities/2809_genome_04.html

3. Genetics. Students get a chance to work with Punnett squares and to perform pedigree analysis.

Waldon, I. and Daugherty, J. (2008). Genetics. Retrieved December 9, 2008 from http://serendip.brynmawr.edu/sci_edu/waldron/pdf/GeneticsProtocol.pdf
(Teacher prep notes: http://serendip.brynmawr.edu/sci_edu/waldron/pdf/GeneticsTeachPrep.pdf)

4. Build Your Own DNA Molecule. Using a variety of candies, students build a model of DNA.

British Columbia Institute of Technology. (2003). Build a DNA model with sweets. Retrieved December 9, 2008 from http://nobel.scas.bcit.ca/resource/dna/dna_sweets.htm

Implementation Strategy

This case is designed to take place over one 60-minute class period, plus any time needed for supplemental activities. These activities may require two or more extra class periods. Incorporating activities into this case is highly recommended to further student understanding.

Implementation schedule – Case Materials

1. Read Scene One, research, box charts (30 minutes)
2. Read Scene Two, research, box charts (30 minutes)

If time allows, students will enjoy watching Cracking the Code of Life, available from NOVA Online.

NOVA. (2001). Cracking the code of life. Retrieved December 9, 2008 from <http://www.pbs.org/wgbh/nova/genome/program.html>.

Case Notes

1. What worked?

The supplemental activities are what really made this case come alive. They allowed the student to put a visual with what they learned about heredity and the Punnett square. Use of the box chart for each case allows the students to take the initial step in their own learning. From there the teacher/facilitator can add to the students learning and correct any misconceptions.

2. How Students responded

The students enjoyed the activity that demonstrated how random heredity can be. They enjoyed learning how one person doesn't determine the look of his or her offspring.

3. How can the case be improved or altered?

A positive about this case as with many other cases is that there is room for more depth to be added to the case. This case can be adapted for any grade level (maybe provide some suggestions on how to do this, for the novice facilitator?)

Resources

Prentice Hall (Ed.). (1994). *Heredity: The code of life, activity book*. Upper Saddle River, N.J.: Prentice Hall.

Manthea, A. et al. (1994). *Heredity: The code of life*. Englewood Cliffs: Prentice Hall.

Holt Science and Technology. (2001). Life science. Austin: Harcourt Education Company.

NOVA Teachers. (2004). See your DNA. Retrieved December 9, 2008 from http://www.pbs.org/wgbh/nova/teachers/activities/2809_genome.html

NOVA Teachers. (2004). Mystery message. Retrieved December 9, 2008 from http://www.pbs.org/wgbh/nova/teachers/activities/2809_genome_04.html

Waldon, I. and Daugherty, J. (2008). Genetics. Retrieved December 9, 2008 from http://serendip.brynmawr.edu/sci_edu/waldron/pdf/GeneticsProtocol.pdf

British Columbia Institute of Technology. (2003). Build a DNA model with sweets. Retrieved December 9, 2008 from http://nobel.scas.bcit.ca/resource/dna/dna_sweets.htm

NOVA. (2001). Cracking the code of life. Retrieved December 9, 2008 from <http://www.pbs.org/wgbh/nova/genome/program.html>.