

A FRIDAY IN SEPTEMBER: TEACHER GUIDE

Subject: Life Science

Grade Level: Middle School

Last Updated: February 27, 2008

Case Summary

While on a field trip for Ecology class, a group of students take a short cut that get them lost in the woods for over an hour. One of the students becomes ill, resulting in a hospital stay.

As his friends learn about the disease that landed him in the hospital, they get the chance to better understand what is wrong with their friend by using his disease for their class project.

Credits

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Learning Objectives

At the end of the case students should be able to:

1. Define genetic disorder.
2. Distinguish between infectious and noninfectious diseases.
3. Identify common infectious diseases, their symptoms, their pathogenic agent and some modes of transmission.
4. Identify how one acquires noninfectious diseases (asthma, allergies, genetic disorders).
5. Identify organs and functions of the systems affected by common infectious diseases and noninfectious diseases
6. Identify common diseases and cultural practices of Nigeria
7. Explain what penicillin is and how it works.
8. Identify the organs and functions of the respiratory system and the explain the mechanisms of breathing
9. Identify the organs of the circulatory system and explain how they function.
10. Identify the role of blood, blood cells, and hemoglobin in transporting oxygen.
11. Discuss how the respiratory and circulatory system are interrelated to perform the task of oxygen transport.
12. Identify some current medical technologies that are used by hospitals to monitor patients, to perform diagnostic tests, and to administer treatments.
13. Use a pedigree to predict future probabilities of disease.
14. Understand and apply terms such as recessive, dominant, allele, trait, phenotype, carrier, pedigree, inheritance.

15. Explain why and how sickle cell disease affects oxygen delivery and causes a sickle cell crisis.
16. Explain how a person with sickle cell disease can take steps to prevent or reduce sickle cell crisis.
17. Define genetic counseling and a genetic counselor. Determine what types of schooling must a person have to be a genetic counselor

Georgia Performance Standards

- S7CS1.* Students will explore of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works. (NSES Content Standard A)
- a. Understand the importance of—and keep—honest, clear, and accurate records in science.
 - b. Understand that hypotheses can be valuable, even if they turn out not to be completely accurate.
- S7CS6.* Students will communicate scientific ideas and activities clearly. (NSES Content Standard A)
- S7CS7.* Students will question scientific claims and arguments effectively. (NSES Content Standard A)
- a. Question claims based on vague attributions (such as “Leading doctors say...”) or on statements made by people outside the area of their particular expertise.
 - b. Identify the flaws of reasoning that are based on poorly designed research (i.e., facts intermingled with opinion, conclusions based on insufficient evidence).
 - c. Question the value of arguments based on small samples of data, biased samples, or samples for which there was no control.
 - d. Recognize that there may be more than one way to interpret a given set of findings.
- S7L2.* Students will describe the structure and function of cells, tissues, organs, and organ systems. (NSES Content Standard C)
- 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.
- S7L5.* Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring. (NSES Content Standard C)

Assessment

Pedigree: Students will read Abu's family pedigree and make predictions about the probability of disease for Abu's children.

Pamphlet: Students create a pamphlet about Sickle Cell using information they have learned from the case. The pamphlet will be "adopted" by a children's hospital and will be geared to children and parents of children with sickle cell. Students should include the following in their

pamphlet: Genetics of sickle cell, systems affected by sickle cell, how specific systems are affected during a crisis, management of sickle cell (to prevent a crisis), and Atlanta area resources for people with sickle cell. A sample grading rubric is included with the Student Materials.

Team Portfolio: Each group will complete a collaborative portfolio that will contain the data, analysis, hypothesis, and learning issues generated from each session, their research presentations to the group, references and graphics used, process of elimination used to narrow focus of case direction, and further questions the group would like to explore. Sample point distribution for team portfolio is included with the Student Materials.

Group Dynamic Evaluation:

Students will evaluate themselves and the other individuals in the group using a 1-5 scale for each of the following group interaction criteria (5 being excellent adherence to criteria).

1. Listened to directions
2. Stayed on task
3. Listened as the case was read
4. Participated in brainstorming ideas about the case
5. Researched the assigned topic
6. Reported research findings to the group
7. Listened to others in the group
8. Did not interrupt others while they reported research or shared ideas
9. Worked quietly in my group
10. Participated in preparing the student product

Implementation Strategy

This case was implemented over two weeks in a 7th grade life sciences class that had already been exposed to genetics. A suggested implementation plan is listed below, based on 50 minute class periods.

Day 1

Read Scene 1	10 min
Learning Issues	20 min
Research Learning Issues	20 min

Day 2

Read Scene 2	10 min
Learning Issues	20 min
Research Learning Issues	20 min

Day 3

Read Scene 3	10 min
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Learning Issues	20 min
Research Learning Issues	20 min

Day 4

Read Scene 4	10 min
Learning Issues	20 min
Research Learning Issues	20 min

Day 5

Read Scene 5	10 min
Learning Issues	20 min
Research Learning Issues	20 min

Day 6

Read Scene 6	10 min
Learning Issues	20 min
Research Learning Issues	20 min

Day 7

Class instruction and group work on pedigree	50 min
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Day 8

Read Scene 7	10 min
Learning Issues	20 min
Read Epilogue	5 min
Group Work and Research	15 min

Days 9-10

Group and individual work as needed

Facilitator Guide:

Learning Issues from Session 1:

1. Is Abu's condition infectious or genetic or some other?
Objective: Define infectious disease
Objective: Define genetic disorder
Objective: Distinguish between infectious and noninfectious diseases
2. What are possible infectious diseases?
Objective: Identify common infectious diseases, their symptoms, their pathogenic agent and some modes of transmission.
3. What are possible noninfectious diseases?
Objective: identify how one acquires a noninfectious diseases (asthma, allergies, genetic disorders)
Objective: Identifies organs and functions of the involved systems
4. Identify common diseases and cultural practices of Nigeria
5. What is penicillin? How does it work?

Learning Issues from Session 2:

1. What systems are responsible for the transport and delivery of oxygen to various parts of the body?
Objective: Identify the organs and functions of the respiratory system and the mechanisms of breathing
Objective: Identify the organs and functions of the circulatory system
Objective: Identify the role of blood, blood cells, and hemoglobin in transporting oxygen.
Objective: Discuss how the respiratory and circulatory system are interrelated to perform the task of oxygen transport
2. What are some current medical technologies that are used by hospitals to monitor patients, to perform diagnostic tests, and to administer treatments

Learning Issues from Session 3:

1. What is a pedigree and how is it used to understand hereditary diseases?
Objective: Read and understand a pedigree objective: Use a pedigree to predict future probabilities of disease
2. What is the pattern of inheritance for sickle cell disease?
Objective: Understand and apply terms such as recessive, dominant, allele, trait, phenotype, carrier, pedigree, inheritance
3. Why and how does sickle cell disease affect oxygen delivery and cause "sickle cell crisis"?
4. What type of things can persons with sickle cell do to remain "crisis free"?
5. What is a genetic counselor and what types of schooling must a person have to be a genetic counselor objective: explore careers and criteria for careers in science.

Resources

WebMD. (2007) WebMD. Retrieved November 27, 2007 from <http://www.webmd.com/>

Department of Health and Human Services. (2007). Centers for Disease Control and Prevention. Retrieved November 27, 2007 from <http://www.cdc.gov/>

Microsoft. (2007). MSN Encarta. Retrieved November 27, 2007 from <http://encarta.msn.com/>

Bridges, K.R. and Okam, M. (2007). How do people get sickle cell disease? Retrieved November 27, 2007 from http://sickle.bwh.harvard.edu/scd_inheritance.html

Public domain image in Student Materials document from:

Noguchi, Rodgers, & Schechter. (1999) Sicklecells.jpg. Retrieved February 27, 2008 from <http://en.wikipedia.org/wiki/Image:Sicklecells.jpg>