WHO'S YOUR DADDY: TEACHER GUIDE

Subject: Life Science
Grade Level: Middle School
Last Updated: October 2, 2008

Case Summary

Did you see that crazy episode of *Maury Povich* yesterday? Those DNA cases are always interesting, but this time he had a twist to it. I recorded it so that I can watch it again; why don't you come over and we'll watch it together?

Credits

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Learning Objectives

Upon completing the case students will be able to:

1. Explain the experiments of Gregor Mendel.
2. Explain how genes and alleles are related to genotypes and phenotypes.
3. Use genotype and phenotype to create a Punnett square.
4. Define key terms: heredity, dominant trait, recessive trait, genes, alleles, genotype, phenotype, and probability.
5. Explain and demonstrate the role of probability in genetics.
6. Perform theoretical genetic crosses through the construction and use of Punnet Squares.
7. Apply probability principles to genetic crosses.
8. Determine phenotypes and genotypes using Punnet Square crosses.

Georgia Performance Standards

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science. (NSES Content Standard A)

S7CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities. (NSES Content Standard A)

a. Use appropriate technology to store and retrieve scientific information in topical, alphabetical, numerical, and keyword files, and create simple files.

S7CS6. Students will communicate scientific ideas and activities clearly. (NSES Content Standard A)

a. Write clear, step-by-step instructions for conducting particular scientific investigations, operating a piece of equipment, or following a procedure.

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b. Write for scientific purposes incorporating data from circle, bar, and line graphs, two-way data tables, diagrams, and symbols.
c. Organize scientific information using appropriate simple tables, charts, and graphs, and identify relationships they reveal.

S7CS8. Students will investigate the characteristics of scientific knowledge and how that knowledge is achieved. (NSES Content Standard A)
Students will apply the following to scientific concepts:
a. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often requires further study. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as meaningful.
b. When new experimental results are inconsistent with an existing, well established theory, scientists may pursue further experimentation to determine whether the results are flawed or the theory requires modification.
c. As prevailing theories are challenged by new information, scientific knowledge may change.

S7CS9. Students will investigate the features of the process of scientific inquiry. (NSES Content Standard A)
Students will apply the following to inquiry learning practices:
a. Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing competing theories.
b. Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations to make sense of collected evidence.
c. Scientific experiments investigate the effect of one variable on another. All other variables are kept constant.
d. Scientists often collaborate to design research. To prevent bias, scientists conduct independent studies of the same questions.
e. Accurate record keeping, data sharing, and replication of results are essential for maintaining an investigator's credibility with other scientists and society.
f. Scientists use technology and mathematics to enhance the process of scientific inquiry.
g. The ethics of science require that special care must be taken and used for human subjects and animals in scientific research. Scientists must adhere to the appropriate rules and guidelines when conducting research.

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.

Assessment

Students will work in groups to complete box charts, after which an informal assessment is conducted through class discussion and brainstorming about the information that students wrote into the box chart. Students will research learning issues for the case. To conduct the research, students will remain in groups as they reference the resources

provided, i.e. textbook, internet, library, etc. A recorder from each group will document information found. Each team will work to create real products as per the assignment worksheets.

Overall grading for the case is based on their combined grades for their box charts and products. Grading will be based on a 5-point scale (5=excellent, 4=very good, 3=good, 2=fair, and 1=poor) that will be converted into a percentage and from there into total points depending on the weight of the assignment for each criterion:

- Accuracy and depth of product components; attention to grammar, word usage, and mechanics,
- Individual contribution and participation within the team,
- Individual research ability and effort, i.e. investigative questioning, online exploration, and etc…

There are three assignment worksheets in this case: Tracing Traits, Puttett Squares, and Fingerprinting. Each assignment worksheet has instructions on how to complete them. Allow students the opportunity to complete assignments on their own first; if more help is needed, then only facilitate in completion.

Implementation Strategy

This case is designed for a class on block scheduling and as such is created to take place over a nine-day period. Timeframe varies from day to day. Average span time is 1 hour and 10 minutes.

Implementation Schedule
Organize students into small groups of 4

Day One
Introduce new case (5 minutes)
Assign parts and read Scene 1 through role play (15 minutes)
Brainstorm and construct box chart in small groups (25 minutes)
Identify/discuss learning issues as a class (15 minutes)
Assign learning issues to groups (5 minutes)
Homework: Students will research family history to allow them to trace an inherited trait. (PBL *Tracing Traits* Assignment Worksheet 1)

Day Two
Continue discussion of learning issues individual within small groups (10 minutes)
Allow students to continue working on assignments (10 minutes)
Review *Tracing Traits* Assignment Worksheet 1… *allow students to share interesting family traits* (approx. 25 minutes)
Write in journals "What have I learned today?" (10 minutes)

Homework: Students will interview family members to trace inherited traits.
(PBL *Tracing Traits* Assignment Worksheet 2)

Day Three
Review *Tracing Traits* Assignment Worksheet 2… *allow students to share findings* (approx. 40 minutes)
Review Scene 1 (5 minutes)
Discuss research of learning issues (15 minutes)
Complete Scene 1 Peer/Self Evaluations (5 minutes)

Day Four
Assign parts and read Scene 2 through role play (10 minutes)
Brainstorm and construct box chart in small groups (25 minutes)
Identify/discuss learning issues as a class (20 minutes)
Assign learning issues to groups (5 minutes)
Homework: Students will illustrate how they might have inherited a recessive trait.
(PBL *Tracing Traits* Assignment Worksheet 3)

Day Five
Continue discussion of learning issues individual within small groups (10 minutes)
Allow students to continue working on assignments (10 minutes)
Review *Tracing Traits* Assignment Worksheet 3… *allow students to share findings* (approx. 15 minutes)
Review Scene 2 (5 minutes)
Discuss research of learning issues (15 minutes)
Write in journals "What have I learned today?" (10 minutes)
Complete Scene 2 Peer/Self evaluations (5 minutes)

Day Six
Assign parts and read Scene 3 through role play (10 minutes)
Brainstorm and construct box chart in small groups (25 minutes)
Identify/discuss learning issues as a class (20 minutes)
Assign learning issues to groups (5 minutes)

Day Seven
Lab exercise: PBL *Punnett Squares* Assignment Worksheet 1 (20 minutes)
Reconvene in small groups to share research from learning issues (25 minutes)
Discuss hypotheses based on research (15 minutes)
Return to large group and discuss learning issues from Scene 3 (20 minutes)
Write in journals "What have I learned today?" (10 minutes)
Complete Scene 3 Peer/Self evaluations (5 minutes)
Homework: PBL *Punnett Squares* Assignment Worksheet 2

Day Eight

Allow students to continue working on homework assignments (10 minutes)
Review *Punnett Squares* Assignment Worksheet 2… *allow students to share worksheet findings* (approx. 25 minutes)
Assign parts and read Scenes 1 - 3 through role play (15 minutes)
Write in journals "What have I learned today/Who's the daddy?" (10 minutes)

Day Nine
Lab exercise: PBL *Fingerprinting* Assignment Worksheet (approx. 45 minutes)
Review *Fingerprinting* Assignment Worksheet (10 minutes)
Homework: Students will write essays on their inherited traits with details from assignments.

Case Notes

It is teacher's choice of who the father is. The internet site "DNA From The Beginning" is a great interactive site for Gregor Mendel's theory. And, "Fingerprinting: A Lesson in Classification" has great in-class activities for teachers to choose from; it is not included on the resource list for students. Teachers may want to familiarize themselves with all sites prior assignments.

Resources

Holt Science & Technology: Life Science. Holt, Rinehart and Winston. Austin, TX, 2001.

Dolan DNA Learning Center. (n.d.). Genetic inheritance follows rules. Retrieved October 2, 2008 from http://www.dnaftb.org/dnaftb/5/concept/

Joseph, L. and Resch, L. (2005). Fingerprinting. Retrieved October 2, 2008 from http://www.cyberbee.com/whodunnit/fp.html