

Using the Internet to Do Punnett Squares

Summary

Using a computer connected to the Internet, the student will construct and use Punnett squares of monohybrid crosses to explain how genetic traits are passed to offspring.

Time Frame

1 class periods of 45 minutes each

Group Size

Small Groups

Life Skills

Thinking & Reasoning

Materials

computer lab (1 computer per 1-3 students) or TV or Video projector connected to a demonstration computer
paper and pencil

Background for Teachers

This lesson is best done after students have been introduced to the concept of the Punnett square and how it is used to predict possible traits of offspring.

A Punnett square looks like a box divided into four squares. The gametes for a specific trait of one parent are put over the top of the box and the gametes of the second parent's trait are put next to the left side of the box. The gametes from the first parent are filled into the boxes below them while the gametes of the second parent are filled into the boxes to the right. Within each box you see possible genetic combinations of the trait used for offspring from the two parents.

The ideas of dominant (the expressed allele for a genetic trait), recessive (the allele for a genetic trait that is expressed only when there is not a dominant allele present), purebred (an organism that contains either only dominant or only recessive alleles for a trait), and hybrid (an organism that contains both a dominant and a recessive allele for a trait) should have been introduced as well. For more information on how to use Punnett Squares, see "Mendel's Discoveries" and "The Biology Project--Mendelian Genetics" links below.

Intended Learning Outcomes

1. Use reference sources to obtain information (library databases, handbooks, encyclopedias, etc.).
2. Make predictions.
3. Understand science concepts and principles. Demonstrate scientific principles and phenomena.

Instructional Procedures

1. Ask your students how the color of their eyes was determined. From where did they get their hair color? Listen to their responses to gauge their understanding of genetics and inheritance. Explain to them that a man named Gregor Mendel had similar questions about how peas inherited their characteristics. He studied peas extensively and his work laid the foundation for our current understanding of heredity and genetics. Let the students know that today in class they will be using Mendel's principles of inheritance to predict the outcome of various genetic crosses.

2. Use either one computer connected to a television for the whole class to see or group students at separate computers. Read "Mendel's Discoveries" and review how a Punnett square is built.
3. Visit the "The Biology Project-- Mendelian Genetics" page and use the tutorial to practice a monohybrid cross using a Punnett square. Visit the link for the Pea Soup Experiment. Choose either pea color or pea shape for your virtual pea lab. As you begin the experiment, note the genotypes that are given for parents and children. Choose two of the children as the "parents" for the next generation of peas. Click the top button for one parent and the bottom button for the second parent. Before you click the "Breed" button, write down a Punnett square showing your predictions of what the offspring will look like for the chosen trait. Then click Breed. You will see the children of your cross and their genotypes are given, along with visible phenotypes. Remember that you are only working with one of the two traits and do not worry about the second trait. Compare your predicted offspring with those on the computer. Continue your breeding experiment by choosing new parents with the buttons below the children peas and making a new Punnett square before you click on the Breed button.
4. At the conclusion of the exercise, each student should have at least 5 Punnett squares recorded on a piece of paper.

Extensions

Visit the Mutant Fruit Fly exhibit. Compare the normal versions of the fruit fly with those that show mutations. Determine which are dominant and do Punnett squares showing monohybrid crosses using their traits.

Assessment Plan

Determine how well students have filled in the Punnett squares using the rubric, Assessing Student Use of Data.

Give students a monohybrid cross using traits other than the traits they used previously. Ask them to make a Punnett square that would show the predicted outcome of such a cross. Assess their answers for accuracy.

Ask students to explain, in their own words, the value of Punnett squares. Why are they used? How do they help increase our understanding?

Bibliography

1. The Biology Project-Mendelian Genetics (http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/01t.html)
2. Kendrick, Bill. Mendel's Discoveries (<http://www.sonic.net/~nbs/projects/anthro201/disc/>)
3. Blumberg, Roger MendelWeb (<http://www.netSPACE.org/MendelWeb/>)
4. Mutant Fruit Flies at the Exploratorium (http://www.exploratorium.edu/exhibits/mutant_flies/mutant_flies.html)

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