



Wizards of Wright

Lesson: Genetics

<p>Background Info for Wizards:</p>	<p>In the state of Ohio, these standards are covered in 8th grade Science and in High School Biology. Depending on the class, this lesson may be a review of objectives already covered, but it is possible that these topics are new to the class. You should be prepared either way.</p> <ul style="list-style-type: none"> - Genetics is the study of genes and heredity. - A geneticist is a scientist that studies traits. - Genes are found within a cell's chromosomes along with DNA. They are the instruction manual for the cell. - Gregor Mendel, the father of genetics, studied pea plants and discovered the secrets of inheritance. - A Biotechnology Engineer takes living organisms and improves on them to better human life.
<p>Materials:</p>	<p>1 bag of beads for each group</p> <ul style="list-style-type: none"> - 3 different color beads (green, brown and red) mixed together - equaling at least 100 beads <p>Grasshopper Worksheets, pages 1 and 2 (per student)</p> <p>5 Fruit Fly Genetics simulation cards from Flinn Scientific (1 deck of cards per group)</p> <p>Fruit Fly Worksheet (1 per student)</p>
<p>Lesson Time: 80-85 minutes</p>	<p>Introduction: 10-15 minutes Student Activity #1: 20 minutes Guided Lesson #1: 15 minutes Guided Lesson #2: 10 minutes Student Activity #2: 15 minutes Conclusion: 10 minutes</p>
<p>Learning Targets:</p>	<p>Students will expand their knowledge of genetics.</p> <p>Students will review key terms used in the science of genetics.</p> <p>Students will study the inheritance traits of the fruit fly.</p> <p>Students will practice Punnett squares.</p>



Introduction for Students:

10-15 minutes

Say to the students: In the 1800's a man named Gregor Mendel discovered that he could control the colors of the flowers on his pea plants by cross-pollinating them. His research on inheritance earned him the name – the father of genetics.

Ask the students: Who can tell me about the vocabulary I just used?
Cross-Pollinating?

*Cross-pollination happens when pollen is transferred from one plant to another, either by wind, bees, butterflies, etc.

Genetics?

*Genetics is the study of genes and of heredity, or how certain features pass from parents to their offspring. Our genes carry information that gets passed from one generation to the next.

*Every kind of plant and animal produces young of its own species, or type. The young resemble their parents. But offspring are not usually exactly the same as their parents. For example, their hair color or height may be different. Genetics explains how offspring get some of their parents' features, or traits, but not others.

*Genes also determine why some illnesses run in families and whether babies will be male or female.

*A geneticist is a scientist that studies traits and how they are passed on through genetics (or heredity).

Inheritance?

*Inheritance means to pass down, as in the traits are passed down.

Genes?

* Genes are sections of DNA (deoxyribonucleic acid) that are found inside every human cell. They're so tiny that they can be seen only under a powerful microscope.

*Genes are found within a cell's chromosomes along with DNA.

*DNA is made of four chemicals that form pairs in different combinations. The combinations create codes for different genes.

*Each person has about 20,000 genes. The genes code for different traits, such as eye color or body type.

Ask students: What do you already know about chromosomes?

- Genes exist inside the cells that make up living things.



	<ul style="list-style-type: none"> - Threadlike structures called chromosomes carry the genes. - Each chromosome is made up mainly of a substance called deoxyribonucleic acid, or DNA. The genes are short sections of DNA. - In human beings most cells have 23 pairs of chromosomes, or 46 in all. <p>Ask students: What do you already know about dominant and recessive genes?</p> <ul style="list-style-type: none"> - Offspring inherit two genes for each trait from their parents. Some genes are more dominant than others, and they overrule the recessive one.
<p>Student Activity #1: 20 minutes</p>	<p>(Students will be working in small groups for this activity. Groups should be 2-3 students. Ask the teacher if the groups have already been created. If not, wait while he or she does this.)</p> <p>Give 1 bag of beads to each group. Give a chart and a set of directions to each student.</p> <p>Explain to the students that all the information they will need are on these sheets, and that they will be working through an activity about dominant and recessive genes.</p> <p>Allow the groups time to follow the directions and go through four generations of grasshoppers. Roam around as they are working, answer questions, and help them understand what is happening with the grasshopper species.</p> <p>When each group has completed the 4th generation of grasshoppers review with them what has happened.</p> <p>Ask students: Did any genes disappear completely from this species?</p> <ul style="list-style-type: none"> - The red gene should have disappeared. <p>Why do you think that happened?</p> <ul style="list-style-type: none"> - The green and brown grasshoppers were safe and safe to reproduce. <p>What would happen in the future to this grasshopper?</p> <ul style="list-style-type: none"> - You would probably be left with only green and/or brown grasshoppers.



	<p>Collect all bags of beads and all the papers before proceeding to the next activity.</p>												
<p>Guided Lesson #1: 15 minutes</p>	<p>Say to the students: In our next activity we will be looking at an organism's appearance to determine its genetic makeup. We will be reviewing the difference between genotype and phenotype and practicing Punnett squares.</p> <p>Ask students: Can anyone define genotype and phenotype? Can anyone tell me what a Punnett square is?</p> <ul style="list-style-type: none"> - All an individual's genes together are called the genotype. - The physical appearance that results from the alleles is called the phenotype. - A Punnett square is a chart or grid of usually four boxes that predicts the genetic traits based on dominant and recessive genes. - A Punnett square shows all the combinations, and expected percentages, of the different genotypes and phenotypes among offspring of two parents. <p>Say to the students: Let's talk about how to fill in Punnett squares. (You may want to put one on the board and walk the students through it.) Remember that all four squares are filled in based on the alleles represented outside the square.</p> <ul style="list-style-type: none"> - When showing an example, use heterozygous parents represented by a capital letter and a lower-case letter. <div style="display: flex; align-items: center; margin: 10px 0;"> <div style="margin-right: 20px;"> <ul style="list-style-type: none"> - 1 out of 4 squares is BB = ¼ will have two dominant alleles (25%) - 2 out of 4 squares are Bb = ½ will have a dominant and recessive allele (50%) - 1 out of 4 squares is bb = ¼ will have two recessive alleles (25%) </div> <div style="border: 1px solid black; padding: 10px;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 5px;">B</td> <td style="padding: 5px;">B</td> <td style="padding: 5px;">b</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">B</td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">b</td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="padding: 5px;"></td> </tr> </table> </div> </div>	B	B	b		B				b			
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<p>Guided Lesson #2: 10 minutes</p>	<p>Say to the students: The organism that we will be looking at is the common fruit fly, whose scientific name is Drosophila. Fruit flies are used a lot in scientific research because of their protein and chromosome similarities to humans.</p>												



	<p>Say to the students: All insects have 3 body parts. Who can name them?</p> <ul style="list-style-type: none">- head, thorax, and abdomen <p>Say to the students: The 3 physical characteristics that we will be looking for on our fruit flies are eye color found on the head, and body color and wing type, found on the thorax. The abdomen will tell us the sex of our flies.</p> <p>Say to the students: We will need to be able to tell our males from females. We will need these cards.</p> <p>Pass out one deck to each group.</p> <p>Say to the students: We will look together at the male vs. female traits. Male fruit flies have a dark rounded abdomen, while females have larger bodies and a pointy lighter colored abdomen with stripes all the way down. As a group, please sort your cards into 2 piles – one for females and one for males.</p> <p>These traits may be dominant or recessive.</p> <p>Ask students: Who can remind us of the different between dominant and recessive traits.</p> <ul style="list-style-type: none">- A dominant trait means that the allele is seen.- A recessive trait means that the allele is not seen.- A dominant trait will mask a recessive trait. <p>For example, a fruit fly with dominant red eyes will always have offspring with red eyes. That offspring may have a recessive gene for another color of eyes but will visibly have red eyes.</p>
<p>Student Activity #2: 15 minutes</p>	<p>You will notice that your fruit flies also have different traits when it comes to their body color, wings, and eye color. On your worksheet is a list of dominant and recessive genes pertaining to those 3 traits.</p> <p>Pass out the worksheets.</p> <p>Go through the fruit fly traits listed on the worksheet with the students. Have each group find an example of each trait within their female pile and within their male pile.</p> <p>Drosophila traits –</p> <ul style="list-style-type: none">- Eye color: red (dominant), white (recessive), sepia or brown (recessive)



	<ul style="list-style-type: none"> - Body color: yellow (dominant), black (recessive), grey (recessive) - Wing type: long wings (dominant), no wings (recessive), short wings (recessive) <p>Say to the students: Find a red-eyed female and a white-eyed male in your fruit fly cards. This is #1 on the worksheet. Give groups a moment to work through it and ask questions if necessary.</p> <p>Say to the students: Please work through questions 2-5 on your worksheet as a group. You may use letters for your Punnett squares that help you to remember the trait being crossed. For example: body color might be expressed as BB, bb, or Bb. Please look at the last 2 Punnett Squares on your worksheet. You may decide as a group which flies to cross for the last 2 questions. Please raise your hand if you need assistance.</p> <p>Remind them to use percentages in their answers regarding phenotype and genotype.</p> <p>Allow the groups time to work. Roam around as they are working, answer questions, and help if needed.</p> <p>When the groups finish, go through the answers with them to ensure understanding. (An answer key is included.)</p>
<p>Conclusion: 10 minutes</p>	<p>Review what they have learned today. Ask students to explain the terms used.</p> <ul style="list-style-type: none"> - genetics - genes - heredity - Gregor Mendel <p>Ensure understanding by asking the following questions: Where are genes are found? What else is found in a cell's chromosomes? What is DNA? What is a dominant trait? What is an example of a dominant trait found in humans? What is a codominant trait? What is a Punnett square?</p>



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