School:	Miami Southridge	Subject:	Biology	Teacher:	Robbi Jackson	Lesson Plan Date:	Wednesday 3/1/17

PRE-PLANNING

OBJECTIVE What will your students be able to learn?	**BENCHMARK**:
• Investigate the probability of genotypes and phenotypes of an offspring • Investigate traits that are dominant, recessive, and hybrid	**SC.912.L16.1** Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.

ASSESSMENT *"Begin with the End in Mind"*
How will you know whether your students have made progress toward the objective? How and when will you assess mastery?

Students will complete the "An Inventory of My Traits" and answer corresponding questions to demonstrate mastery and understanding on the topics of genetic dominance and the relationship between genotypes and phenotypes. Students will also complete the Virtual Punnett Squares Lab in order to better enforce the ability to complete Punnett Squares and determine the relationship between genotypes and phenotypes.

ESSENTIAL QUESTION
A higher order question that is directly derived from the benchmark, introduced at the beginning of the lesson, discussed throughout the lesson, and answered by students at the end of the lesson to show understanding of the concepts taught.

If you know both of the parents' phenotypes for a trait, can you predict the phenotype of their offspring?

HIGHER ORDER QUESTIONS (3-5)
What questions will be answered to provoke higher order thinking and include Moderate to High FCAT Complexity Levels? What would the ideal student response be for each question?

- How does the law of probability apply to genetics? **Each individual has two alleles for each trait. Only one allele is passed on from each parent for each trait to their offspring, and the allele that is passed on of the two is randomly selected. Therefore, you have a 50% probability of receiving each allele copy from each of your parents.**
- Is there any way to predict if a specific trait is dominant or recessive? **There is no way to concretely determine if a trait is dominant or recessive just by looking at the trait itself. However, you can come to an educated prediction on if the trait is dominant or recessive based on how prevalent it is in a given population.**
- How is it possible for an offspring to have a different physical trait that both of his/her parents have? **If both of the offspring's parents are heterozygous for a particular trait, the offspring could receive a copy of the recessive allele from each parent, leading to the offspring having a homozygous recessive genotype, and thus a different phenotype than his/her parents.**

LESSON CYLCE

	TIME Approximate
BELLRINGER Follow the Focus Calendar to provide reinforcement of previously taught skills. Engage the students in a brief discussion to review the differences between genotype and phenotype and the three different types of genotypes in monohybrid crosses in order to reinforce the concepts taught during the last class. Encourage students to ask questions on any topics that they might still be confused about.	*10 min*
INTRODUCTION Brief part of the lesson when students learn the objective/essential question and how mastering the objective leads to achieving the bigger goal of the course. • Provide a hook to motivate students and link to prior knowledge in order to introduce a new concept. • Explain the relevance of lesson and the importance of learning the concept. • Introduce important vocabulary using the word wall as an interactive learning tool.	*70-80 min*
Draw a Punnett Square on the board and ask students if they know what it is and what they know about it. Students will likely not know what it is. Explain to students the purpose of Punnett Squares in determining an offspring's genotype and phenotype in monohybrid crosses.	
MODELING *"I DO"* Component of the lesson when teacher explicitly models to students exactly what they are expected to do during guided practice and eventually during independent work. • Conduct a think aloud while modeling the steps to completing an activity or solving a problem. • Model the use of a graphic organizer. • Use questioning techniques such as re-directing, wait-time and prompting.	
Introduce "An Inventory of My Traits" to the students. Explain that they will be determining if they are dominant or recessive for a number of traits and comparing their results to the whole class. Key terms: phenotype, genotype, Punnett Square, homozygous, heterozygous, dominant, recessive	

GUIDED PRACTICE *"WE DO"* Guide students to independent practice by providing an opportunity to work in small groups and practice what was taught during the modeled portion of the lesson. • Incorporate the use of a collaborative strategy in small groups. • Encourage student accountable talk during group discussion. • Perform checks for understanding.	
As a class, complete Part 1 and Part 2 of "An Inventory of My Traits". Go through each trait one by one and have students determine if they are dominant or recessive for each trait. Calculate for the students the percent of the class with the dominant and recessive phenotypes and have students record these results in Part 2.	
COLLABORATIVE PRACTICE *"THEY DO"* Guide students to independent practice by providing an opportunity to work in small groups and practice what was taught during the shared portion of the lesson. • Incorporate the use of a collaborative strategy in small groups. • Circulate throughout the room and provide guidance to each group as needed.	
Students will answer in pairs the 4 exit slip questions for "An Inventory of My Traits" in order to collaborate and reinforce the concepts taught in the activity. Assist any students who might need help.	
INDEPENDENT PRACTICE *"YOU DO"* Differentiate your instruction to reach the diversity of learners in your classroom. • Assign students independent work that is directly aligned with the "I Do" and "We Do" portions of the lesson. • Conduct Center Rotations • Circulate around the room to provide individual support. • Pull small groups or individuals for more intensive support.	
Have students log onto the Punnett Squares Virtual Lab (www.mhhe.com/biosci/genbio/virtual_labs_2K8/). Introduce the activity to the students and explain that they will be examining 10 different monohybrid crosses for different scenarios involving Drosophila and will have to use Punnett Squares to determine the genotypes and phenotypes of the resulting offspring. Have students first complete Part 1 to reinforce previously taught concepts before moving on to Part 2. Assist any students who might need help.	
CLOSURE Wrap up the lesson and help students organize the information learned into a meaningful context. • Have students reflect on or answer the Essential Question. Help students connect today's learning to their bigger goal in the course.	*5 min*
Students will reflect on the essential question and write their responses in their interactive notebooks. If there is time, we will discuss as a class some of the students' responses.	
HOME-LEARNING How will students practice what they learned? How will opportunities be provided for students to maintain mastery of previously mastered skills/concepts?	
Students must finish the Punnett Squares lab if they did not have a chance to do so in class. Students must also finish Part 3 of the "An Inventory of My Traits" activity.	

An Inventory of My Traits

Use the table below to figure out whether you show the dominant or recessive alleles for the traits below. If you have the trait listed, that is the dominant allele—write yes. If you show the opposite trait, that is recessive—write no. To determine your possible genotype, use capital letters for the dominant allele and lower-case letter for the recessive allele. Remember you need to write 2 letters for the genotype since you have 2 parents! Don't forget if you show the dominant trait, you could be homozygous or heterozygous!

Trait Use the capital letter in parentheses to represent the dominant.	Part 1—just you!			Part 2—the class		Part 3—go home and interview your family! ☺			
	Yes or No?	Dominant or Recessive?	Possible Genotype?	% of students in your class with dominant phenotype?	% of students in your class with recessive phenotype?	Mom's Phenotype and Genotype	Dad's Phenotype and Genotype	Sibling #1	Sibling #2
Detached Earlobes (D)									
Tongue Rolling (T)									
Dimples (D)									
Right-Handed (R)									
Freckles (F)									
Chin Cleft (C)									
Widow's Peak (W)									
Straight Thumb (S)									
Finger Mid-digit Hair (H)									
Left Thumb Over Right When Clasping Hands Together (L)									

<u>Thinking about what you observed... EXIT SLIP—15 minutes</u>

1. For each trait, which form was most common—the dominant or the recessive?

_____ _____ _____ _____

_____ _____ _____

_____ _____ _____

2. Why do you think one form is more common than the other?

_____

_____

3. Most people think that the dominant form of a trait is somehow better than the recessive form of the trait. They also think that the dominant trait is more common than the recessive trait. How would you respond to someone who thinks this and explain to them that those 2 ideas are not true? What evidence would you show them to prove your point?

_____

_____

_____

_____

_____

4. Do you think your classroom population is "typical" of a larger population such as our entire school or the city of Miami, and therefore is a good representation of the larger group? What about the whole US? Explain your answers.

_____

_____

_____

Virtual Lab: Punnett Squares

Worksheet

Part I: Answer the following questions:

1. Which of the following is most inclusive?

   a. allele

   b. genotype

2. Dominant alleles are represented by:

   a. an upper case letter

   b. a lower case letter

   c. it does not matter what type of letter is used

3. In fruit flies, gray body color is dominant over black body color. Using the letter G to represent body color, what is the genotype of a heterozygous gray   bodied fly?

   a. GG

   b. gg

   c. Gg

   d. GGgg

4. All of the offspring of two gray bodied flys are also gray. What can you conclude about the genotypes of the parent flies?

   a. They are both heterozygous

   b. They are both homozygous dominant

   c. They are both homozygous recessive

   d. You cannot conclude anything definitively about the parental genotypes

5. Some of the offspring of two gray bodied flies are black. What can you conclude about the genotypes of the parent flies?

    a. They are both heterozygous

    b. They are both homozygous dominant

    c. They are both homozygous recessive

    d. You cannot conclude anything definitively about the parental genotypes

Part II: Follow the instructions in the Question column to complete the virtual lab scenarios and record your data:

Complete all ten scenarios and record your results in Table 1.

When you record a ratio, whether it is genotypic or phenotypic ratio, always record the most dominant characteristic first, followed by the recessive. For example, when recording genotypic ratios:
   1) If your offspring genotypes include 1 GG, 2 Gg, and 1 gg, the ratio would be: 1 GG : 2 Gg : 1 gg
   2) If your offspring genotypes include 2 GG and 2 Gg, the ratio would be: 2 GG : 2 gg (or 1:1 in the reduced form)
   3) If your offspring genotypes are 4 gg, then the ratio would be written as::   4 gg

When you record phenotypic ratios for a monohybrid cross, there are only two possible phenotypes - either the dominant phenotype or the recessive phenotype. So you do not need to indicate the phenotype, simply put the dominant # first, followed by the recessive #:
   4) If your offspring phenotypes are 3 dominant and 1 recessive, the ratio is: 3:1
   5) If your offspring phenotypes are 4 dominant and 0 recessive, the ratio is: 4:0
   6) If your offspring phenotypes are 0 dominant and 4 recessive, the ratio is: 0:4

Table 1:

Scenario #	Genotype of Parent I	Genotype of Parent II	Genotypic Ratio of Offspring	Phenotypic Ratio of Offspring
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				