**Ailyn Barrios**

**Best Teaching Practice**

The Lab that I did with genetics this year was fun and very educational for my students. It applies to the NGSSS SC. 912.L.16.2- "Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic and multiple alleles". The purpose of this lab is 1. to understand and demonstrate the process of meiosis, fertilization, alleles, genetics, recessive and dominant traits, 2. to understand and demonstrate the role of alleles in determining traits of an offspring, 3. to understand and demonstrate the difference between Genotypes and Phenotypes.

This lab is called Marshmallow Genetics. First, the students pick an allele from mom out of a paper bag, then they pick an allele from dad. They then combine the two alleles and now have the phenotype for the baby rebop. After they have picked all the genes for the baby rebop from mom and dad, they make their baby rebop using marshmallows, toothpicks, pipe cleaners, and markers.

My students had a lot of fun doing this very simple lab. They really understood the concept of homozygous and heterozygous genotypes and how that translates to the phenotype. Before I did this lab, it was hard for my students to see the difference between genotypes and phenotypes by doing Punnett square word problem worksheets. After I did this lab, the students knew the difference with proficient knowledge. Most of them were a 4 on Marzano's Scale.

Please see attached Lab procedures and Post Lab Questions.

## Marshmallow Genetics Lab

**Introduction:**

A Reebop is a little marshmallow organism that has 14 chromosomes (7 pairs). It reproduces sexually. Male and female Reebops go through meiosis to produce their sperm and eggs. These gametes have ½ the genetic information of the parents. When the gametes join together through fertilization the baby will have a new set of 14 complete chromosomes, with 7 chromosomes from mom and 7 chromosomes from dad. This combination of parent DNA in the unique baby makes the baby a Hybrid of the parents. The Reebop baby is 2n=_____ .

**Purpose:**

1. To understand and demonstrate the process of meiosis, fertilization, alleles, genetics, recessive and dominant traits.
2. To understand and demonstrate the role of alleles in determining traits of an offspring.
3. To understand and demonstrate the difference between Genotypes and Phenotypes.

**Procedure:**

1) Observe the Parent Generation Reebops that your teacher has provided for you
   Describe their Physical characteristics_____

   _____
   _____

2) It is well known that Parent Generation Reebops always have one baby when they reproduce. Decide who will choose the male and female alleles from the parent gonad envelopes and each person will be responsible for recording their information below.

   a. Person who is choosing alleles from the mommy Reebop to make her gamete is to do this portion. Choose **one** allele for **each** of the 7 traits from the "mommy gonad envelope" and fill them in to the Egg gamete chart below.

**Egg Gamete Chart:**

| Chromosome | Trait and letter representing it | Allele donated by mommy for trait |
|------------|--------------------------------|-----------------------------------|
| 1 | Antenna (A or a) | |
| 2 | Humps (M or m) | |
| 3 | Nose (Q or q) | |
| 4 | Tail (T or t) | |
| 5 | Eyes (E or e) | |
| 6 | Legs (L or l) | |
| 7 | Body Segments (D or d) | |

b. Person who is choosing alleles from the daddy Reebop to make her gamete is to do this portion. Choose **one** allele for **each** of the 7 traits from the "daddy gonad envelope" and fill them in to the Sperm gamete chart below.

**Sperm Gamete Chart:**

| Chromosome | Trait and letter representing it | Allele donated by daddy for trait |
|---|---|---|
| 1 | Antenna (A or a) | |
| 2 | Humps (M or m) | |
| 3 | Nose (Q or q) | |
| 4 | Tail (T or t) | |
| 5 | Eyes (E or e) | |
| 6 | Legs (L or l) | |
| 7 | Body Segments (D or d) | |

c. It is now time to fertilize your gametes. Take the ½ DNA information donated by the mommy Reebop on her gamete and join that with the ½ DNA information donated by the daddy Reebop on his gamete through sexual reproduction.

   *Fill in the chart below to show the genotype of each chromosome of the f1 generation baby. Then use the "Reference Table" to find out what the Phenotype would look like for that combination of alleles. Fill in what the f1 baby's phenotype is for each chromosome/trait.

| Chromosome | Genotype of chromosome | | Phenotype shown of each chromosome for f1 baby |
|---|---|---|---|
| | Mom allele | Dad allele | |
| 1 | _____ | _____ | |
| 2 | _____ | _____ | |
| 3 | _____ | _____ | |
| 4 | _____ | _____ | |
| 5 | _____ | _____ | |
| 6 | _____ | _____ | |
| 7 | _____ | _____ | |

# Reference Table

| Trait | Genotype | Phenotype | Parts Used |
|-------|----------|-----------|------------|
| Antenna | AA or Aa or aA | 1 antenna | Toothpicks |
| | aa | 2 antenna | |
| Humps | MM or Mm or mM | 2 pink humps | Small pink marshmallows |
| | mm | 1 pink hump | |
| Nose | QQ or Qq or qQ | yellow nose | Small yellow or orange marshmallows |
| | qq | Orange nose | |
| Tail | TT or Tt or tT | Straight tail | Pipe cleaner |
| | tt | Curly tail | |
| Eyes | EE or Ee or eE | 2 eyes | Draw eyes with marker |
| | ee | 4 eyes | |
| Legs | LL or Ll or lL | Blue legs | Toothpicks |
| | ll | Red legs | |
| Body Segments | DD or Dd or dD | 3 body segments | Large white marshmallows |
| | dd | 2 body segments | |

    **d.** With fertilization complete Mitosis begins to happen inside your momma Reebop! **Put your Reebop together according to the Phenotypes expressed on their chromosomes.**

**Follow up Questions:**
Congratulations!!! You have just created a Karyotype! Karyotyping is a technique used to analyze the chromosomes of an individual.

1. How many chromosomes does the f1 generation baby have?_____

2. How many chromosomes did each parent have to start with?  Mom_____        Dad_____

3. How many pairs of Homozygous genotypes did the f1 baby have?_____

4. List the Homozygous genotypes your Reebop has _____

5. How many pairs of Heterozygous genotypes did the f1 baby have?_____

6. List the Heterozygous genotypes your Reebop has. _____

Notice the letters on each chromosome (AA, Aa, aa). These letters (capital and lowercase) represent alleles.

Alleles are different forms of a gene for a specific trait.

7.  What do capital letters represent?_____

8.  What do lower case letters represent? _____

9.  Why does the f1 baby Reebop have two letters(alleles) for each trait?_____

    _____

8. What are gametes? _____

9. How much genetic information is found in a gamete?_____

10. Draw an accurate diagram of your baby f1 generation Reebop in the space provided. Also name your baby Reebop on the line provided below. This will complete your baby Reebop's Birth certificate.



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Baby name_____

**Dad (Sperm)**     **Dad (Sperm)**

A          a          A          a

M          m          M          m

Q          q          Q          q

T                    t     T                    t

E                e     E                e

L                l     L                l

D                d     D                d

**Mom (Egg)**          **Mom (Egg)**

A          a          A          a

M          m          M          m

Q          q          Q          q

T          t          T          t

E          e          E          e

L          l          L          l

D          d          D          d