DRAGON GENETICS – Understanding Inheritance[1]

INTRODUCTION

In this activity, you and a partner will work together to produce a baby dragon. You will simulate meiosis and fertilization, the biological processes by which the parents' genes are passed on to a baby. To begin, we will review meiosis and fertilization for dragons that have only one chromosome with a single gene.

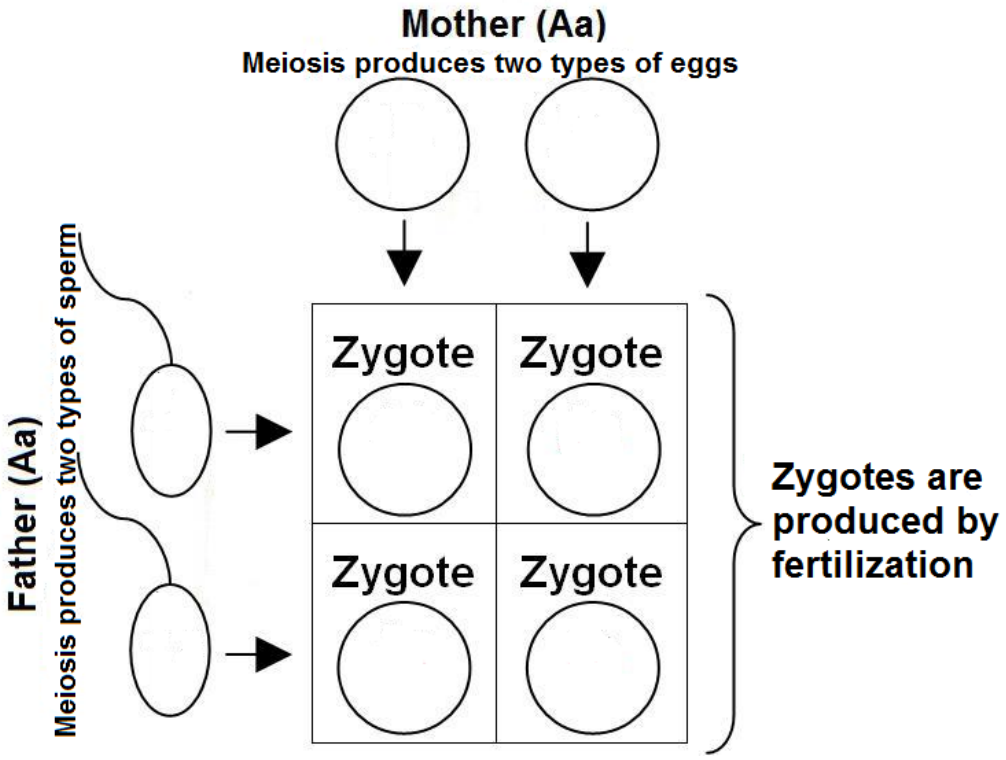
This gene codes for the enzyme that makes the pigment that gives dragon skin its color.

- The dominant allele, **A**, codes for a normal enzyme that results in normal skin color.
- The recessive allele, **a**, codes for a defective enzyme that cannot make skin pigment, so an **aa** dragon is an albino with completely white skin.

★ Suppose that each dragon parent has the pair of homologous chromosomes shown.

Father	Mother
A	**A**
a	**a**

Draw the chromosomes of the two types of eggs and the two types of sperm produced by meiosis. Then, draw the chromosomes of the zygotes that are produced when the different types of sperm fertilize the different types of eggs. Next, use an * to indicate any zygote or zygotes that will develop into albino baby dragons.



[1]By Bob Farber, Central High School, Philadelphia, PA,and Ingrid Waldron, Department of Biology, University of Pennsylvania, copyright 2012. Based on the work of Dr. Pamela Esprivalo Harrell, University of North Texas, who developed an earlier version of "Dragon Genetics" described in the January 1997 issue of Science Scope, 20:4, 33-37 and the April 2001 issue of The Science Teacher, pages 52-57.Teachers are encouraged to copy this Student Handout for classroom use. A Word file (which can be used to prepare a modified version if desired), Teacher Preparation Notes, comments, and the complete list of our hands-on activities are available at http://serendip.brynmawr.edu/sci_edu/waldron/.

In this activity you will work with a partner to carry out a simulation of meiosis and fertilization and produce a baby dragon.

Biological Process	
The parents' diploid cells have pairs of homologous chromosomes. Meiosis separates each pair of homologous chromosomes, so each gamete receives only one from each pair of chromosomes. Thus, the parents' diploid cells have two copies of each gene, but each haploid gamete has only one copy of each gene.	
When a haploid sperm fertilizes a haploid egg, this produces a diploid zygote with one copy of each gene from the mother and one copy from the father. These genes determine the phenotypic traits of the baby dragon that develops from this zygote.	

SIMULATION PROCEDURE

1. Choose a partner carefully. You and your partner will share the grade for this lab.
2. Each partner must choose whether to represent the mother or the father. You must first decide how your dragons will look (one dragon must be homozygous and the other heterozygous.) Each dragon must exhibit 4 different traits.
3. Pick with your partner which traits you want to have included in this lab (skin color, eye color, horns, fangs, fire, wings, tail(with horn or without) Etc…) Fill in Dragon Genome Worksheet and get it signed off.
4. Each person fills in their chart for their Dragon.
5. Fill in the punnett square together.
6. Get your charts checked off by your teacher and you are ready to do the final thing!
7. Create your poster!!!

DRAGON GENOME – *DECODING* OF THE GENES

Chromosome		Dominant Alleles		Recessive Alleles	
		Allele (Letter)	Phenotype (Trait)	Allele (Letter)	Phenotype (Trait)
#1	Skin Color				
	Scales or none				
	Breathes …				
#2	Horn Type				
	Eye Color				

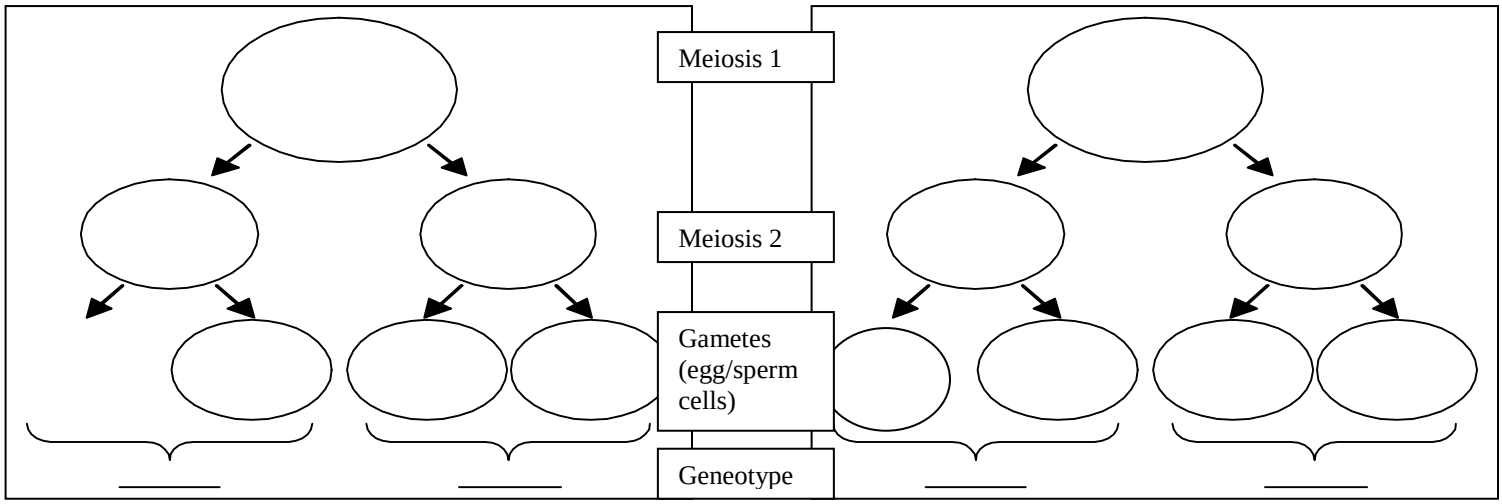
EXAMPLE:

Chromosome	Dominant Alleles		Recessive Alleles	
	Allele (Letter)	Phenotype (Trait)	Allele (Letter)	Phenotype (Trait)
#1	**R**	Red Skin	**r**	Green Skin

Circle one: FATHER/MOTHER:

Genotype (heterozygous):_____ (Don't forget the sex genes)
Phenotype (Draw a rough sketch)

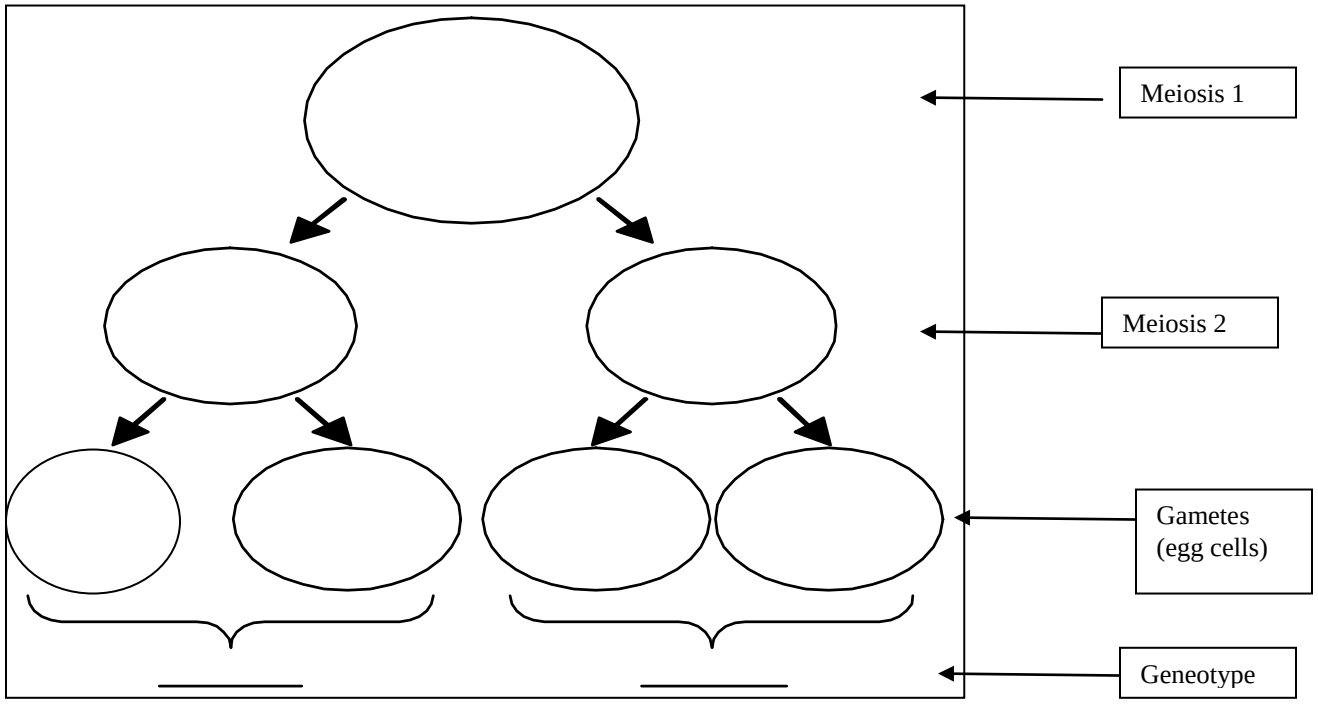
Meiosis (Production of Egg cells)  (White= recessive gene, Large= Chromosome 1)
(Black=dominant gene, Small=Chromosome 2)



Circle one FATHER/MOTHER
Genotype (Homozygous):_____(don't forget the sex genes)

Phenotype:

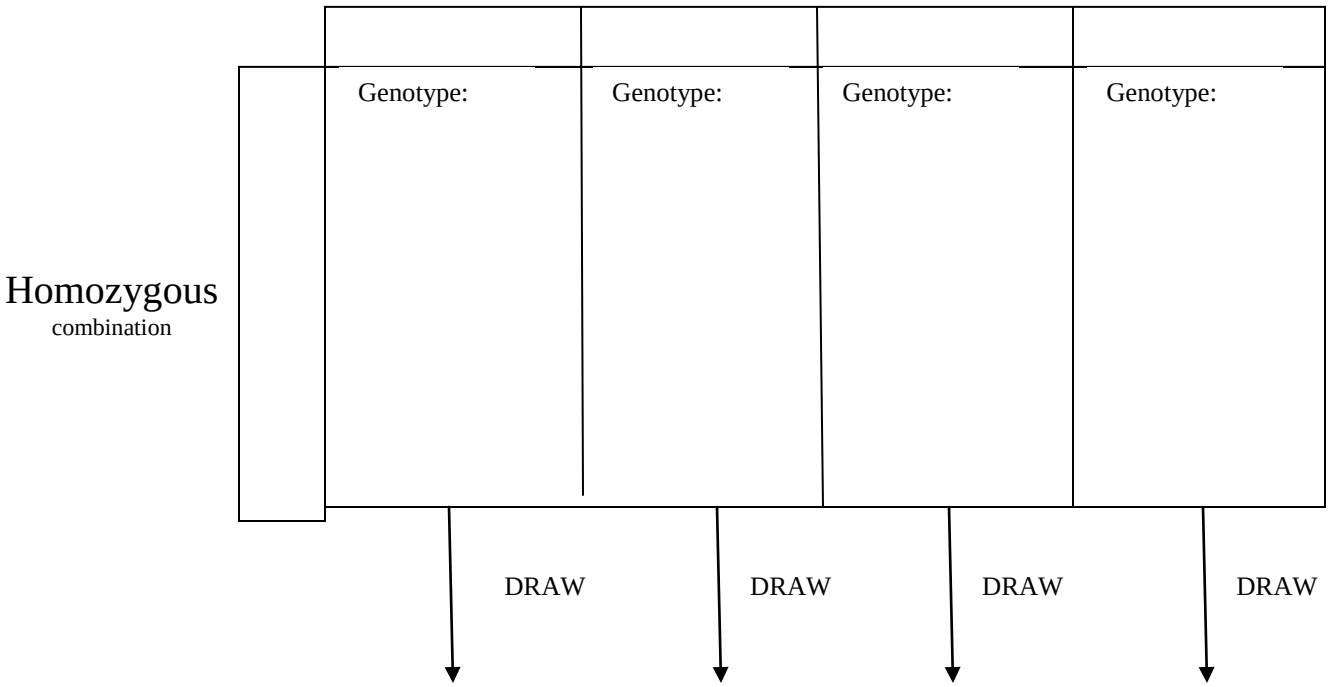
Meiosis (Production of Sperm/egg cells) (White= recessive gene, Large= Chromosome 1)
(Black=dominant gene, Small=Chromosome 2)



Punnett Square:

Complete the punnett square filling in the lines with the kid combinations.

Heterozygous combinations



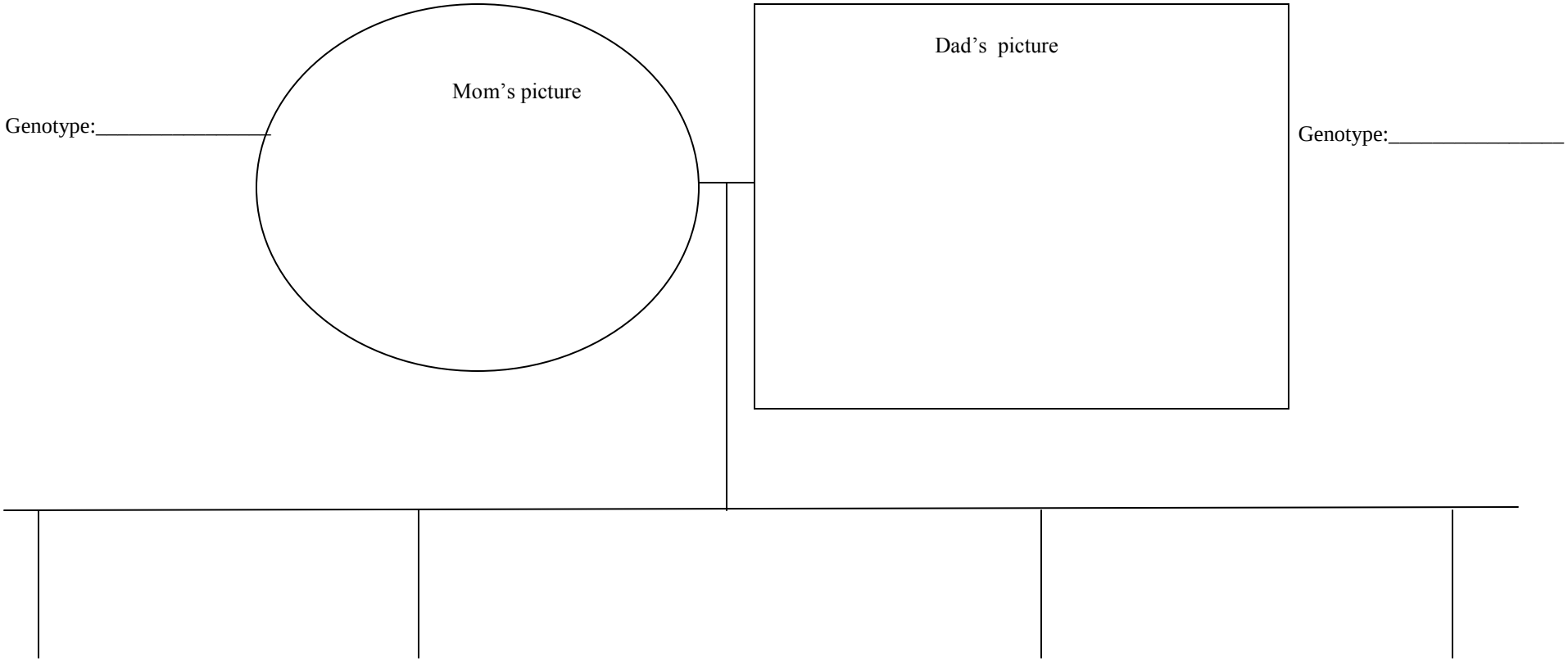
Page 1 poster:

Mother’s Meiosis:

Father’s meosis:

Punnett Square:

Poster Page 2: (Drawings of the mother, father and 4 potential children)



Children's Pictures

(Figure from Dr. Pamela Esprivalo Harrell, "How a Dragon Gets Its Wings – A fanciful approach to teaching meiosis" The Science Teacher, April 2001, pages 52-57.)

Dragon Genetics Cumulative Rubric:

	Packet	5	6	7	8	9	10
MOM	Drawn Colored	5	6	7	8	9	10
	Genotype	5	6	7	8	9	10
	Meiosis	5	6	7	8	9	10
DAD	Drawn Colored	5	6	7	8	9	10
	Genotype	5	6	7	8	9	10
	Meiosis	5	6	7	8	9	10
ALL	Punnet Square	5	6	7	8	9	10
Babies	Drawn Colored	5	6	7	8	9	10
	Genotype	5	6	7	8	9	10

TOTAL: