DRAGON GENETICS LAB
-- Principles of Mendelian Genetics

BACKGROUND

Students will work in pairs in the lab to produce a dragon from the random mixing of genetic traits. Each student will be a surrogate dragon parent. They will pick up a complete set of dragon chromosomes. Surrogate dragon parent partners must be of the opposite sex, therefore one parent must pick up the double X chromosomes while the other must pick up the X/Y chromosomes. The homologous chromosomes will be separated according to Mendel's law of Independent Assortment. The genetic codes that are passed on to the baby will be recorded on the following pages. The surrogate parents must then decode the genes inherited by their *bundle of joy* to determine the phenotype traits of their baby.   Using the pictures at the end of the handout, they will cut out these traits and paste them together to have a picture of their baby.

PROCEDURE

1. Choose a partner carefully. You and your spouse will share the grade for this lab. Your instructor does not care which partner worked the hardest.   This is a no divorce classroom. The lab must be completed on time.
2.   Each partner must pick up five Popsicle sticks -- one of each color of autosome, and one sex chromosome stick. Each side of a stick represents a chromosome, and the two sides together represent a pair of homologous chromosomes.
3. For each color autosome and then for the sex chromosomes, each parent will randomly drop his or her stick on the table. The side of the stick that is up represents the chromosome that is passed on to the baby.
4. The alleles from each pair of homologous chromosomes will be recorded in the data chart on pages 3-4.
5. The decoding chart on page 2 indicates the phenotypic effect of each gene. The trait produced by each pair of alleles should be recorded in the data chart. Remember that a CAPITAL letter is dominant over a small letter [recessive] unless the decoding chart indicates those traits are codominant, sex-influenced, or sex-limited.
6. The students will cut out the traits for their baby. Fit them together and produce a picture of the baby. Students may trace the traits to produce their baby's picture or just glue them to the page.
7. The baby's colors will be added to the picture, if possible; otherwise indicate the baby's colors below the picture.

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[1] 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/.

DRAGON GENOME
DECODING OF THE GENES

Chromosome	Dominant genes	Recessive genes
Green Autosome	A. no chin spike	a. chin spike
	B. nose spike	b. no nose spike
	C. three head flaps	c. four head flaps
	D. no visible ear hole	d. visible ear hole
	E. [see below]	
Red Autosome	F. long neck	f. short neck
	G. no back hump	g. back hump
	H. no back spikes	h. back spikes
	I. long tail	i. short tail
	J. flat feet	j. arched feet
Orange Autosome	K. red eyes	k. yellow eyes
	L. spots on neck	l. no spots on neck
	M. [see below]	
	N. no fang	n. fang
	O. spots on back	o. no spots on back
Yellow Autosome	P. no spots on thigh	p. spots on thigh
	Q. green body	q. purple body
	R small comb on head [see below]	r. large comb on head
	S. [See below]	
	T. [See below]	
Sex Chromosomes	U. regular thigh	u. pointed thigh
	V. four toes	v. three toes
	W. no chest plate	w. chest plate
X Chromosome Only	X. no. tail spike	x. tail spike
	Z. long arms	z. short arms
	+ non-fire breather	- fire breather
Y chromosome only	Y. male sex	

Codominant traits

E. eye pointed at each end	e. round eye	Ee. eye round at front only
S. Red spots	s. yellow spots	Ss. orange spots

Sex-influenced traits

M. wings	m. no wings [dominant in presence of male hormone]
T. no elbow spike	t. elbow spike [dominant in presence of male hormone]

Sex-limited traits

R or r   Only males have the comb on the head.

Our Baby !

Names _____

_____

Green Autosomes

GENOTYPES			Alleles in		TRAIT---Phenotype of Baby
MOM	DAD		Egg	Sperm	

Red Autosomes

GENOTYPES			Alleles in		TRAIT---Phenotype of Baby
MOM	DAD		Egg	Sperm	

Orange Autosomes

GENOTYPES			Alleles in		TRAIT---Phenotype of Baby
MOM	DAD		Egg	Sperm	

Yellow Autosomes

GENOTYPES		Alleles in		TRAIT---Phenotype of Baby
MOM	DAD	Egg	Sperm	

Sex Chromosomes

GENOTYPES		Alleles in		TRAIT---Phenotype of Baby
MOM	DAD	Egg	Sperm	

Questions

1. How does dropping the stick on the table and transcribing the letters on the sides facing up follow Mendel's Law of Segregation? [First state the law.]
2. Explain how dropping the green, orange, and red sticks illustrates Mendel's Law of **Independent** Assortment? [First state the law.]
3. The gene for fangs is recessive, yet most of the dragons have fangs. How can this happen? [Hint. The gene that causes dwarfism (achondroplasia) in humans is dominant.]
4. What is the sex of your baby?
5. What traits are *sex-linked?* [First define "sex-linked".]
6. Identify any gene deletions or inversions in the chromosomes you have.
7a. What traits are *more likely* to be found in males? [Consider sex-linked, sex-influenced and sex-limited traits.]
7b. How might these be an advantage to this sex?   [Be creative in your answers.]
8a. What traits are *more likely* to be found in females?
8b. How might these be an advantage to this sex?

chin spike+

No Ear hole

No chin spike

 Earhole

Eyes

COMB

small

Large

no hair

hump

No hump

No spikes

No back moles

Spikes

No chest plate

chest plate

Back moles

long arm

short arm

ELBOW spike

Tail spike

3 flaps

4 flaps

0,0 Neck moles

Flat feet

Arched feet

No dots

Dots

Pointed thigh

Regular thigh