

**Grade level:** 7 - 12

**Subject:** Life Sciences, Genetics

**Duration:** one class period

**Setting:** classroom

**Content Standards:** Life Science/Biology: Grade 7 – 2c, 2d, 2e; Grade 9-12 – 3a, 3c

**Objective(s):**

Students will learn the difference between a genotype and a phenotype. They will demonstrate that recombination of gametes (coins) will result in the formation of unique individuals.

**Brief Summary:**

Students flip a pair of coins to determine what genotype and what phenotype their fish will have for 8 given traits. They then draw a picture of their fish based on their coin flip phenotypes. They will then perform Punnett cross to determine what their offspring might look like.

**Materials Needed for each student:**

- white paper
- colored pencils, crayons, or markers
- 2 coins (pennies)
- copy of 8 trait genotype and phenotype options

**Procedure:**

1. Give each student a copy of 8 trait genotype and phenotype options, and a piece of white paper and coloring items.
2. For each of the 8 trait options, have the students flip 2 coins (Heads=H and Tails=T) to determine the genotype and phenotype of their new fish species. HH=the trait is dominant, HT=the trait is mixed but still dominant, or TT=the trait is recessive. They should toss the coins for each different trait that is listed, and circle what the genotype will be.
3. Once they have determined what the genotype is, they can then generate what the phenotype of their fish will look like. Have the students draw their fish's phenotype on the white paper. On their drawing, have them write their fish's genotype. (ie BrttDDPpeeMmssCC)
4. Next, have each student pair up with another. Their fish will represent parents. From the parent's genotype, have them complete a genetic cross (Punnett squares) for each trait to determine what their offspring might look like. Determine the ratios of each possible outcome.

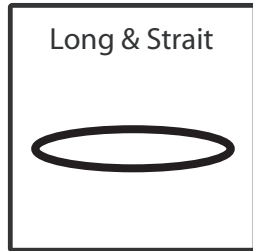
**Discussion and Conclusion:**

Diversity is what makes unique individuals. Phenotypes are the physical characteristics that we develop from our genotype (our genetic makeup). Both the environment and our genotype interact to make us what we are. Any genetic unit can incorporate this lesson as an activity to introduce genotype and phenotype.

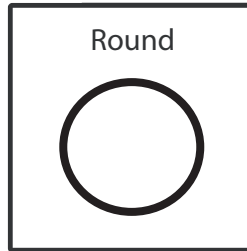
**Extension:**

Have each student create a natural history story that goes along with their fish. What type of environment does it live in? What does it eat? Does it have any characteristic unique to that fish?

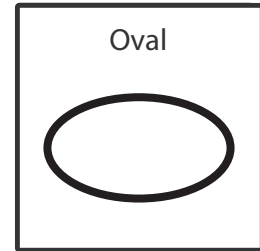
## Body Shape



**BB**

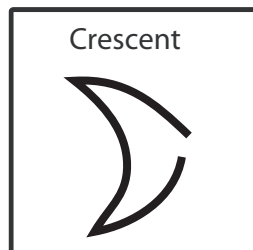


**Bb**

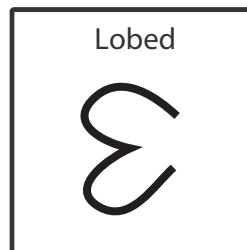


**bb**

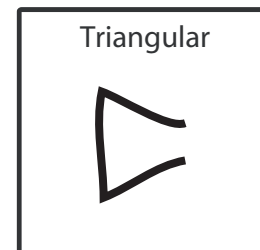
## Tail Fin Shape



**TT**

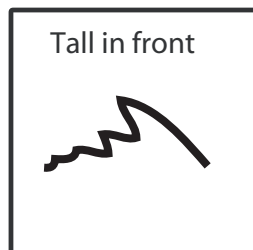


**Tt**

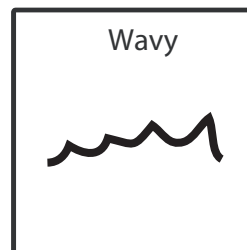


**tt**

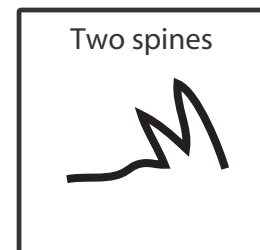
## Dorsal Fin Shape



**DD**

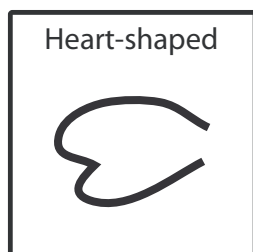


**Dd**



**dd**

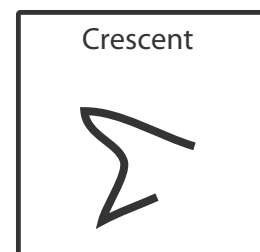
## Pectoral Fin Shape



**PP**



**Pp**

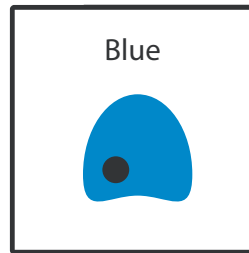


**pp**

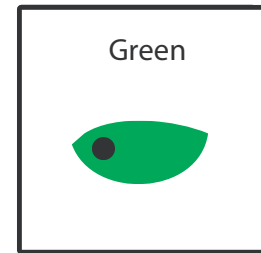
## Eye Shape



**EE**

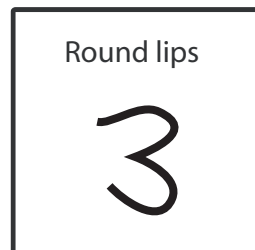


**Ee**

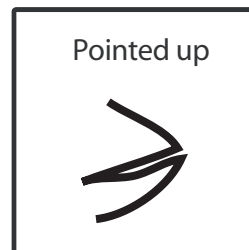


**ee**

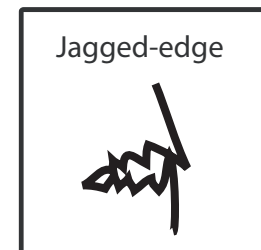
## Mouth Shape



**MM**

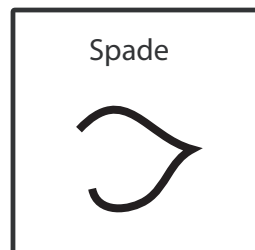


**Mm**

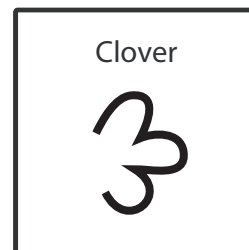


**mm**

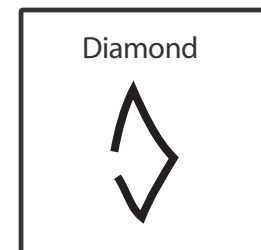
## Scales Shape



**SS**

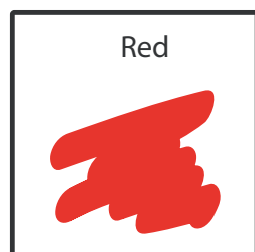


**Ss**

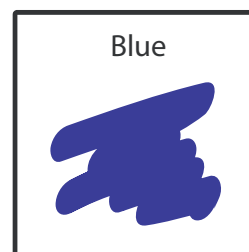


**ss**

## Scales Color



**CC**



**Cc**



**cc**