Dragons in Whyville: A Teacher's Guide

Using Dragons in Your Classroom

The genetics activities are divided into Dragon Quests (found in the **Dragon Book**). Each quest presents a challenge to breed dragons that will produce offspring with specific traits (like nose spikes or wings) that help retrieve treasures hidden in different locations around Whyville. Each quest also contains game-like labs that introduce students to the underlying genetics concepts needed to solve the challenge.

Dragon Quests increase in difficulty, slowly introducing new traits and more complex patterns of inheritance. Progress through the Dragon Quests is saved in the Dragon Book where students collect their treasures. Bonus rounds give students extra prizes for breeding only within specific lairs.

Genetics Concepts Covered in Dragon Quests

The first set of three activities in the **Dragon Book** includes genotype-to-phenotype for dominant/recessive genes; meiosis; thinking "backwards" from phenotype to genotype; and test crosses to determine genotype. Students are then introduced to more complex genetic mechanisms, including a polyallelic trait and incomplete dominance.

- **Quest 1: Sneak by the Magnetic Troll.** Students must produce a dragon that has one specific recessive trait: NOT being shiny. Through labs, students explore the relationship between genotype and phenotype for four basic dominant/recessive genes. Students choose alleles to match dragon phenotypes. The difference between male and female chromosomes is shown visually. A simple meiosis model shows how gametes are formed.
- **Quest 2: Flying Coconut Grabber.** Students breed dragons for two specific traits, both dominant: arms and wings. The earlier labs are reinforced and extended. To prepare for thinking through the process of breeding dragons, students follow the chromosomes (with visible alleles) through meiosis from adult dragons to a set of four possible gametes to fertilization and a resulting offspring dragon.
- **Quest 3: Swimming Dragon.** Students breed dragons for three specific traits, all recessive: no arms, no legs and no wings—good for swimming to fetch a treasure! The complementary labs focus on the inheritance of alleles and traits. Students breed clutches of 20 dragons. They choose alleles for one parent dragon to maximize the possibility of breeding offspring with specific traits.
- **Dragon Certification 1.** Passing this certification exam indicates that students understand the rules of simple dominant/recessive inheritance patterns. Students are challenged to apply all of the lessons from the past three challenges to deduce the genotype of a male dragon by setting the genotype of its mate and breeding.

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The second set of Quests introduces more complex traits and methods of inheritance.

- **Quest 4: Stuck in the Seaweed.** In this challenge, students explore a polyallelic trait with three alleles for tail shape. Labs introduce the three alleles and culminate by challenging students to deduce parental genotypes without seeing the alleles.
- **Quest 5: Armored Dragons.** Students are introduced to incomplete dominance, and discover that there are three phenotypes for armor. Labs help students understand how armor is inherited so that they can breed a dragon with enough armor to secure the treasure.
- **Quest 6: Digger Dragons.** Students explore sex-linkage. Students breed dragons and investigate the inheritance of the nose spike trait, which is carried on the X chromosome.
- **Quest 7: Lava Colored Dragons.** Dragon color is a multigenic trait. The shiny trait is combined with the new "brown" trait to produce four possible colors. Not only are there steel and silver versions of dragons, but there are also lava and copper colored dragons!
- **Quest 8: Horn-headed Dragons.** In this challenge, students will be surprised to learn that the absence of a trait (horns) can be dominant. Supporting labs support student understanding of this interesting twist on inheritance!
- **Dragon Certification 2.** Passing this second certification exam indicates that students understand the rules of more complex traits and inheritance patterns. Students are challenged to apply all of the lessons from the past five challenges to deduce the genotype of a female dragon by setting the genotype of its mate and breeding.

Need help with Dragons? Please write to **dragons@concord.org**.

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