

Lesson 2 slide notes for teachers

- Slide 1:** Return students' completed Human Mendelian Traits worksheets and review the Mendelian inheritance concept along with genetic terms covered in previous lesson.
- Slide 2:** Have students guess how these examples of genetic rules may work. Encourage students to guess a definition or provide an example for each term
- Slide 3:** Define and provide an example for incomplete dominance, and help students understand and apply the concept to the dragon's fire power. Students may ask about using F and F' instead of lower and upper-case letters. Provide clarification that lower and upper-case letters are used to indicate alleles with dominant or recessive traits. And explain that incomplete dominance is indicated with apostrophe (') on an upper case letter.
- Slide 4:** Provide the answers for the phenotypes related to the three different genotypes for the dragon-fire trait.
- Slide 5:** Define and provide an example for codominance, and help students understand and apply the concept to merpeople's tail colors. Clarify the important distinction between codominance and incomplete dominance--the former resulting in a blended or averaged phenotype, the latter showing a mixture of two traits, each trait being observable.
- Slide 6:** Provide the answers for both genotypes and phenotypes for merpeople's tail colors.
- Slide 7:** Explain the multiple alleles—more than 2 variant forms of a gene—related to human blood types. Students may observe additional relationship among the blood types: O is recessive to A and B; A and B are codominant. However they may also notice that the recessive O blood type does not use lower case letter as all blood types are indicated with upper case letters.
- Slide 8:** Guide and review with students how to use the Punnett square to determine possible blood types of children with known genotypes of parents' blood-types.
- Slide 9:** Compare students' answers and provide further explanation as needed.
- Slide 10:** Define and provide the example of a silencing regulatory gene in Manx cats. Have students work in pairs to answer whether two Manx cats without tails can have a kitten with a tail.
- Slide 11:** Have student pairs volunteer their answers and review the answer using a Punnett square.
- Slide 12:** Pose these two questions and help students think about the types of information that they should consider to answer the questions.

- Slide 13:** Demonstrate how Hagrid's height might be a phenotype of an incomplete/blended trait. Concerning estimated average heights for wizards and giants, wizards are humans whose average height may be about 5-6 ft., and giants' height is approximated at 20 ft. by Hermione at the beginning of the chapter 24 in *Harry Potter and the Goblet of Fire*.
- Slide 14:** If necessary, remind students of the examples of incomplete dominance using previous slide 4.
- Slide 15:** Inform students about the multiple alleles related to hippogriff coat colors. Have students use the Punnett square to determine possible genotypes for different hippogriffs.
- Slide 16:** Have students provide their findings and use this slide to guide and clarify reasoning behind the answers.
- Slide 17:** If appropriate, have students work in groups of 3 or 4 to find the genotypes of several characters in *Harry Potter*. Support those students with little knowledge of *Harry Potter*, by provide background information on each character. Brief descriptions of these characters are available in the Vocabulary section of the lesson plan web site.
- Have groups present their answers, along with how they arrived at their answers. When reviewing student groups' work, use the slides 19-27 to guide students in applying the concepts that they have learned in identifying the characters' possible genotypes of their magical ability.
- Slide 18:** Present the guided activity. Have students work in groups of 3 so that the activity is conducted as question-and-answer sessions that alternate between group work and class discussion.
- Slide 19:** Have students describe the characters' magical ability. If groups differ in their descriptions, you can determine the description by majority vote.
- Guide students to think about how to define different kinds/categories of magical ability that apply to all characters, such as Hermione (a powerful witch whose parents do not have any magical ability), Mr. Filch (a squib with very weak magical power, although he is of a wizarding family), and aunt Petunia (a Muggle who has no magical power and whose parents were also Muggles, but has a sister, Harry's mom, with magical power).

Slides 20-22, walk through identifying two categories (i.e., genes) of magical traits demonstrated by the characters, which is one way to be inclusive of different observable magical traits in the characters in *Harry Potter*.

Slide 20: List the characters' magical ability that is represented in two categories of the descriptions of magical ability observed among the characters. This includes Harry's aunt, Petunia who has no magical ability that is defined as a Muggle in the *Harry Potter* novels.

Have students review all different observable traits related to magical ability—different strengths of magical ability (strong, average, or weak) as well as the presence or expression of the ability.

Help students build a connection from the two categories of observable magical traits to the corresponding two genes that are responsible for the two categories of observable magical traits: 1) expression of magical ability, and 2) strength of the ability.

Slide 21: Help students distinguish the two different categories/genes that affect magical ability and identify the possible observable traits from the characters' descriptions above.

Slide 22: Have students work in their groups to identify possible genotypes for the two genes' phenotypes—expressed or unexpressed magical ability; and strong, average or week ability—that the characters demonstrate.

State the hint and help students apply their understanding of the complex traits they learned about previously. If appropriate, provide additional hints by reminding students about the previous examples of different complex traits—Manx cats' regulatory gene that silences the 'expression' of a tail; and dragon fire power under incomplete dominance creating an 'average' trait between strong and no fire power.

Slide 23: Have student groups share the possible genotypes for the expression of magical ability.

Ask what types of inheritance rule(s) they applied to create genotypes that account for all possibilities of how magical ability is expressed or not expressed in the characters—i.e., does it include Muggles, who show no magical ability but can have a child with magical ability?

Guide students in expressing their reasons behind how they determined the possible genotypes for the phenotypes of the characters' magical ability. Work through misconceptions through discussion, and clarify that Muggles with no

magical ability seem to have a gene for magic as they are able to produce children with the ability, such as Hermione and Lily. And this doesn't allow magical ability to be simply dominant or recessive, in which case the Muggles will not be able to have children with magical ability. One possible way for magical ability not to express but for its gene to be passed down to the next generation is if there is another gene that regulates (silences or expresses) the gene for magic.

Slide 24: Have student groups share the possible genotypes for the strength of magical ability. Clarify that this gene may be silenced or expressed by the other regulatory gene, but also is responsible for how powerful the magical ability is—strong, average, or weak.

Ask student groups to demonstrate how their possible genotypes account for all possibilities of magical strength demonstrated by the characters. Discuss that one way to account for the three different magical strengths is to apply incomplete/blended dominance to the gene for the strength of magical ability. If needed, review slide 4 where examples were presented earlier in the lesson.

Slide 25: Summarize all possible genotypes for the two genes—a gene for expression of magical ability and another gene for strength of magical ability.

Slide 26: Apply the possible genotypes of the two genes to the phenotypes of witches, wizards, and Muggles, and the strength of magical ability they demonstrate. If needed, explain that the letters represent the two allele pairs in the two genes—one regulatory and the other magic strength genes—that affect magical ability.

Slide 27: Have student groups assign possible genotypes for the magical ability of the characters. As groups volunteer their answers, use the Summary slide 26 to clarify as needed.

Slide 28: Distribute the handout to all students and have students work in their groups to answer these three questions.

If appropriate, display slides 25 and 26 for students to refer to as they work to answer the questions on the handout.

Slide 29: Have student groups volunteer their answers and how they arrived at their answers. Clarify and correct answers as needed.

Slide 30: Have student groups volunteer their answers and how they arrived at their answers. Clarify and correct answers as needed.

Slide 31: Have student groups volunteer their answers and how they arrived at their answers. Clarify and correct answers as needed.