

Genetics Unit

Goals:

- Learn the underlying science behind the study of genetics
- Understand how genetics plays a role in our lives

Unit Essential Questions:

- How does DNA affect the phenotype of an organism?
- How are traits inherited?
- How does the interaction of genetics and the environment shape who we are?
- How are genetic disorders inherited? What effects can they have on the individual?

Understandings:

- Genes code for proteins
- DNA is the blueprint for life, and is passed down from parent to offspring
- DNA is translated into RNA which is then transcribed into proteins
- Mitosis produces 2 exact copies of a cell. Meiosis produces haploid sex cells.
- An individual's genetics and environment interact, making it difficult to predict the actual phenotype of many complicated human traits.

Students will know . . .

- Simple Mendelian genetics: traits are inherited according to predictable rules, illustrated by Punnett squares
- The structure of DNA and RNA
- The “central dogma” of biology: DNA is transcribed into RNA, which is translated into proteins
- The processes and stages of mitosis and meiosis
- How to identify, predict, and describe genotypes and phenotypes
- Different types of inheritance (dominant, recessive, codominant, sex linked, etc)

Students will be able to...

- Diagram Punnett squares and predict outcomes for two generations of offspring
- Create family trees (pedigrees) that correlate to genetic disorders

Performance Tasks:

- Daily warmups, activities, labs, etc.
- [Mitosis/meiosis quiz](#)
- [Meiosis stop-motion animation mini-project](#)
- [Onion root tip lab](#)
- Inheritance patterns quiz (I used questions from [here](#))
- [Genetics project](#)

Links/Resources:

[Genetics Home Reference](#)

Daily Learning Activities

Note: All class warmups and daily assignments can be found [here](#).

Day 1	“Intro to genetics” assignment. After completing assignment, have class discussion about what they know/don’t know about genetics.
Day 2	Mitosis warmup Please help Latrice! (assignment based on online interactive resource)
Day 3	Day 3 warmup Introduce project Begin work on project
Day 4	Stages of mitosis warmup Work on project
Day 5	Mitosis in Onion Root Tip lab Project checkpoint 1 due
Day 6	Mitosis vs meiosis warmup Onion root tip pictures due
Day 7	Intro to Punnet squares Punnet squares practice (on canvas) HW: punnet squares practice
Day 8	Mitosis and meiosis quiz Intro to pedigrees Project checkpoint 2 due
Day 9	Stop motion meiosis animation
Day 10	Genetics/Inheritance warmup Work on project and/or stop motion animation
Day 11	Sex-linked inheritance warmup Hemophilia: The Royal Disease Project checkpoint 3 due
Day 12	Codominance warmup Project checkpoint 4 due
Day 13	Presentations
Day 14	Project checkpoint 5 due
Day 15	Incomplete dominance warmup Lactose intolerance reading (Read this , fill in this guided notes sheet and/or answer questions listed under day 15 here)
Day 16	Genetic conditions video and assignment Transcription and Translation text assignment (read about transcription/translation in text book, answer basic questions. Reinforce with an online animation like this)
Day 17	Color blindness warmup Quiz on inheritance patterns Transcription/translation analogy

Project Guidelines

Note: Please see the [Genetics Project Student Guide](#) for a detailed description of this project

Project Summary	You will collaborate with your team to research and present a genetic condition. Your work should demonstrate that you understand how traits are inherited, and how changes to our genes can affect the body. Think of this project as having 3 parts; a group written component, an individual written component, and a lesson your group will teach the class 1. Group Component (all of this will be submitted via your group google doc.) 1. Description - Provide an overview of this condition. What are the symptoms? How did it get its name? What is this condition's history? Give an example of a real-life person who has/had this condition. 2. Genetic changes - Discuss how the gene(s) associated with the condition is/are different from the normal gene(s). How does the genetic condition alter biochemical processes or reactions? Which proteins are affected? How does this affect the body overall? 3. Diagnosis - How do we test for this condition and/or determine if someone is affected with this condition? Refer back to the person you mentioned in part 1. 4. Treatment/Recommendations - Once someone is diagnosed, what do we do? Again, refer back to your case study example. 5. Inheritance pattern - Is it recessive, dominant, sex linked, co-dominant or incomplete dominant? What does this mean? Explain how your case study inherited this condition. 2. Individual Component 6. Consultation report/ Letter to the patient or the referring physician. Write either a consultation report for the medical record, a letter to the patient or the referring physician (you can find examples of consultation letters online, one good website is: www.nchealthliteracy.org/toolkit/Rheum/tool22cl.doc, you may not need all the parts found in this template so adjust the template according to your genetic condition). The length of your consultation letter will range from half a page to a page. 7. Provide at least 5 Punnett square examples, listing all genotypes, phenotypes, and percent chance of each. 8. Pedigree chart - Show a sample pedigree of a family with this condition (could be your case study, or an imaginary family). At least one parent in generation 2 must either be a carrier or an affected individual. Download blank pedigree sheet here. 3. Final Project - Teach the Class After researching a genetic condition, you will teach the class what you have learned using a case study as an example (this is the real life person who has/had the condition). 1. Your lesson should cover and include: a) All the things listed under group component (Do not copy and paste, summarize your work). b) An activity or an assignment for the class to complete (such as practice punnett square problems, a pedigree, etc.). 2. All of the work for the lesson should be on your group's google doc (this includes any notes you wrote down for yourself and any handouts you may have made).
Inquiry	Students choose a genetic condition to study, based on their knowledge and interests
Research	Students research this genetic disorder, and complete benchmark project based on the disorder.

Collaboration	Students work together during class activities (human genetics, punnet squares, etc). Students peer evaluate their BM work, and complete a sample genetics problem created by another students.
Presentation	Students assemble their work in a shared google doc. Students create and deliver a short lesson on their studied condition.
Reflection	Students reflect on what they've learned in the project as they write a consultation report regarding their studied condition. Students reflect on the delivery of their lesson.
State Standards	PA Common Core Standards: CC 3.5.9-10.D-E CC 3.5.9-10.G CC 3.5.9-10.I-J CC 3.6.9-10.B-C CC 3.6.9-10.E-H PA Science/Tech/Engineering Standards: 3.1.10.A.4 3.1.10.B.1-5
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