



Unit 3: Genetics

Subject Area: Science	Course: Biology		
Unit Title: Genetics	Grades(s): 9th	Start: November	End: December
Unit Summary: In this unit, students will learn about DNA and how it is the essential code to life. From here, students will investigate the central dogma of molecular biology and learn the processes of transcription and translation in terms of gene expression. Students will investigate how DNA, in the form of chromosomes, is passed from parents to offspring in sexual reproduction. Students will understand the ways in which sexual reproduction results in new genetic combinations that give rise to genetic diversity in species. Students will use the rules of probability to explore the concept of inheritance and work through various inheritance patterns. Students will discuss the ways that genotype and environment contribute to phenotype.			

Stage 1: Desired Results

Massachusetts Learning Standards

- HS-LS1-4. Construct an explanation using evidence for why the cell cycle is necessary for the growth, maintenance, and repair of multicellular organisms. Model the major events of the cell cycle, including (a) cell growth and DNA replication, (b) separation of chromosomes (mitosis), and (c) separation of cell contents.
- HS-LS3-2. Make and defend a claim based on evidence that genetic variations (alleles) may result from (a) new genetic combinations via the processes of crossing over and random segregation of chromosomes during meiosis, (b) mutations that occur during replication, and/or (c) mutations caused by environmental factors. Recognize that mutations that occur in gametes can be passed to offspring.
- HS-LS3-4(MA). Use scientific information to illustrate that many traits of individuals, and the presence of specific alleles in a population, are due to interactions of genetic factors and environmental factors.
- HS-LS1-4. Construct an explanation using evidence for why the cell cycle is necessary for the growth, maintenance, and repair of multicellular organisms. Model the major events of the cell cycle, including (a) cell growth and DNA replication, (b) separation of chromosomes (mitosis), and (c) separation of cell contents.
- HS-LS1-1. Construct a model of transcription and translation to explain the roles of DNA and RNA that code for proteins that regulate and carry out essential functions of life.



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Vision of a Graduate Performance Outcome(s)

Innovative Thinker

An innovative thinker is someone who:

- Uses reasoning to question, process, and evaluate Information.
- Is curious, creative, resourceful, and adaptable when looking for solutions.

Approaches challenges as opportunities for growth.

Balanced Life

An individual with a balanced life is someone who:

- Identifies and maintains the characteristics of relationships that support overall personal health and wellness.
- Demonstrates skills for self-awareness, self-regulation, and self-advocacy.
- Applies strategies to prioritize, manage time, and organize responsibilities, and adjusts routines accordingly to support health and happiness.
- Identifies and maintains interests and/or passions that foster overall health and happiness.

Lifelong Learner

A lifelong learner is someone who:

- Explores a variety of learning opportunities and experiences to inform life decisions.
- Takes ownership of their learning by adapting to change, responding to feedback, and demonstrating persistence.
- Finds the curiosity and motivation within themselves to identify opportunities for personal growth and self-improvement.

Effective Communicator

An effective communicator is someone who:



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- Selects, uses, and interprets types of communication (verbal, non-verbal, digital) according to context and audience.
- Collaborates with others in order to achieve desired learning outcomes.
- Engages others with differing opinions through thoughtful, healthy discourse.
- Presents information in a purposeful manner to a variety of audiences in order to inform, influence, motivate, and/or entertain.

Transfer (Authentic, relevant application of learning to new situations)

Students will be able to independently use their learning to...

- Transfer goal: Understand how DNA is passed from parents to offspring in sexual reproduction and how traits are inherited
 - Transfer task: You are a genetic counselor. You need to explain to a couple the probability that their child could have a particular genetic trait and walk them through the way that a segment of DNA can impact their child's phenotype and ultimately their life.
- Transfer goal: Understand how to make informed decisions about genetically modified products
 - Transfer task: You are at a grocery store and you have to decide whether it is worth the extra cost to buy non-GMO foods. Use your knowledge of monoculture and genetic diversity to justify your reasoning.

Meaning

Enduring Understandings

Students will understand that...

- Cellular information passes from one generation to another.
- The structure of DNA functions in genetic inheritance
- Information flows from the cell nucleus to direct the synthesis of proteins in the cytoplasm.
- We can use genetics to study human inheritance.

Essential Questions

Students will consider...

- Do offspring always resemble their parents?
- Why is DNA called the blueprint of life?
- How are proteins made?
- How can we use genetics to study human inheritance?
- How and why do scientists manipulate DNA in living cells?

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- Scientists manipulate DNA in living things.

Acquisition
Knowledge
Students will know...

- An organism pass its characteristics onto its offspring
- How can you predict the outcome of a genetic cross
- Interactions between alleles, genes, and the environment affect an organism's traits
- Cell divide to create cells with exactly half of the original cell's genetic information
- Scientists determined that DNA is responsible for storing, copying, and transmitting genetic information
- The basic structure of DNA was discovered
- Cells copy their DNA
- And describe RNA
- The way cells make proteins
- Changes in DNA changes cells
- The ways cells regulate gene expression
- Studying the human genome helps us draw conclusions about the inheritance of traits
- Causes for human genetic disorders
- About the human genome, and what have we learned so far
- The advantages of naturally occurring variation among organisms
- Scientists study and work with specific genes
- How humans use genetic engineering
- Ethical issues raised by genetic engineering

Skills
Students will be skilled at...

- Conduct inquiry based experimentation
- Improve problem solving skills
- Utilize scientific tools such as microscopes and balances
- Interpret graphs and data
- Cooperative group work
- Make and interpret a punnett square
- Make and interpret a pedigree chart
- Solve genetics probability problems
- Analyze Mendel's experiments
- Apply knowledge about genetics to a research poster on a particular genetic disease



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