

December 2B Gr.8: Genes

Content Area: **Science**
Course(s):
Time Period: **December**
Length: **3-4 Weeks**
Status: **Published**

Unit Overview

Organisms inherit traits from their parents. The Human Genome Project has finished mapping all the chromosomes in human DNA, but we still have a lot to learn. In this concept, you will learn about genes and the study of genetics.

Enduring Understandings

Lesson Objectives

By the end of the lesson, students should be able to:

- Explain the purpose and function of a gene.
- Explain how genes are organized within DNA.
- Explain the relationship between genotypes and phenotypes.
- Explain and compare the effects of genetics and environment on an organism's characteristics.

Essential Questions

- **Overarching Question**
 - How are characteristics of one generation passed to the next?
- **Focus Question**
 - How are the characteristics of one generation related to the previous generation?
- **Lesson Questions**
 - How are genes organized?
 - How do genes affect traits?
- **Can You Explain?**

- What are the structure and function of genes?

Instructional Strategies & Learning Activities

- [The Five E Instructional Model](#)

Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- [Engage \(45–90 minutes\)](#)

Students are presented with the phenomenon of similarities and differences between identical twins. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- [Explore \(90 minutes\)](#)

Students investigate questions about genes and inheritance using evidence from text and media assets. Students complete a Hands-on Activity to model how proteins are created from a genetic code.

- [Explain \(45–90 minutes\)](#)

Students construct scientific explanations to the CYE question by including evidence of how genes are structured and organized and how they affect traits.

- [Elaborate with STEM \(45–90 minutes\)](#)

Students apply their understanding of genes as they learn about scientists who hunt for specific genes, investigate cloning, and apply probability to genetics.

- [Evaluate \(45–90 minutes\)](#)

Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Integration of Career Exploration, Life Literacies and Key Skills

Students will work in small groups or partnerships to conduct investigations, build models or prototypes and present findings.

Students will learn about the careers of scientists in gene manipulation.

WRK.9.2.8.CAP.2	Develop a plan that includes information about career areas of interest.
WRK.9.2.8.CAP.3	Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
WRK.9.2.8.CAP.10	Evaluate how careers have evolved regionally, nationally, and globally.
WRK.9.2.8.CAP.11	Analyze potential career opportunities by considering different types of resources, including occupation databases, and state and national labor market statistics.
WRK.9.2.8.CAP.12	Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
TECH.9.4.8.IML.4	<p>Ask insightful questions to organize different types of data and create meaningful visualizations.</p> <p>Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.</p> <p>Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.</p> <p>Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.</p> <p>An individual's strengths, lifestyle goals, choices, and interests affect employment and income.</p> <p>An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.</p> <p>Multiple solutions often exist to solve a problem.</p>

Technology and Design Integration

Technology is fully integrated using Discovery Techbook.

CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
CS.6-8.8.2.8.EC.1	Explain ethical issues that may arise from the use of new technologies.
CS.6-8.8.2.8.EC.2	<p>Examine the effects of ethical and unethical practices in product design and development.</p> <p>People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data.</p>

Interdisciplinary Connections

LA.RST.6-8	Reading Science and Technical Subjects
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RI.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RI.8.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RI.8.7	Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RI.8.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
LA.RI.8.10	By the end of the year read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8	Writing History, Science and Technical Subjects
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.W.8.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.W.8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the

relationships between information and ideas clearly and efficiently.

LA.WHST.6-8.7

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LA.WHST.6-8.8

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LA.WHST.6-8.9

Draw evidence from informational texts to support analysis, reflection, and research.

LA.WHST.6-8.10

Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LA.W.8.7

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LA.SL.8.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

MA.6.SP.A.2

Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

MA.6.SP.B.4

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

LA.SL.8.4

Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Differentiation

Struggling Students

1. Assist students in creating a word web or other graphic organizer to help connect the key terms and ideas in this concept. For example, students can start with the word *DNA* and show how it connects to other terms such as *gene* and *chromosome*.

ELL

1. Assist students in identifying familiar prefixes and/or words within words for each glossary term (for example, *hetero-* is a prefix derived from the Greek word *héteros*, which means “two, other, different”).

Accelerated Students

1. Challenge students to identify dominant and recessive forms of a trait and then identify the phenotype and predict the genotype of their family members for the single trait. Students can choose a trait such as earlobe shape, presence of a cleft chin, presence of a pointed frontal hairline (widow's peak), and presence of hair on the middle section of the fingers.
2. After completing the STEM Project Starter: What Are the Odds?, instruct students to compare their data to the data collected by classmates and the class as a whole and discuss their observations

about small versus large sample sizes.

[Differentiation in science](#) can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.
- Find websites on the current science unit that students can explore on their own.
- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMODATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

In addition to differentiated instruction, IEP's and 504 accommodations will be utilized.

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Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

See assessments located in links above.

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

See assessments located in links above.

Instructional Materials

See materials located in links above.

Discovery Techbook

Teacher made materials

Additional labs are available through NJCTL on-line curriculum

Standards

All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).

SCI.MS-LS3-1

Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

SCI.MS.LS3.A

Inheritance of Traits

Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes(mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.