# Nov. 2E Gr.8: Mendel and Heredity

Content Area: **Science**
Course(s):
Time Period: **November**
Length: **4-5 Weeks**
Status: **Published**

## Unit Overview

A monk named Gregor Mendel found out that you can predict what the offspring of two parents will look like. When the offspring changes over time, the entire species can change. In this concept, you will learn about heredity and how it came to be.

## Enduring Understandings

**Lesson Objectives**

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

- Describe how dominant and recessive traits may be inherited.
- Predict the probable genotype of offspring based on the genotypes of the parents.
- Describe the discovery and process of artificial selection.

## Essential Questions

- **Overarching Questions**
    - How are characteristics of one generation passed to the next?
    - How can individuals of the same species and even siblings have different characteristics?
    - How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?
    - How does biodiversity affect humans?

- **Focus Questions**
    - How are the characteristics of one generation related to the previous generation?
    - Why do individuals of the same species vary in how they look, function, and behave?
    - How does genetic variation among organisms affect survival and reproduction?

- **Lesson Questions**

- What is heredity, and how were the principles of heredity discovered?
- How do scientists make predictions about genetic inheritance and expression of traits?
- How do humans select for certain traits in some organisms?

- **Can You Explain?**

  - What did Gregor Mendel's work teach us about the passing of traits from one generation to the next?

## Instructional Strategies & Learning Activities

**Science 8th grade Periods 2,4, 6**
Mendel and Modern Genetics
**Objective(s)**
Students will be introduced to the basic principals of heredity and modern genetics, starting with the contributions and tenets laid down by G Mendel.
**Goal(s)**
Students will be able to understand and use technical vocabulary to describe how and why physical traits are passed from parents to offspring.
**Procedures**

Apple to Apples lab

**Course Material TCI Bring Science Alive- Cells and Genetics**- Unit 4:8 Genes- Proteins, Genes, Chromosomes

4:9 Inheriting Genes 4:10 Genes/Environment

**Assessment**

class discussion
review of assignments
quizzes
tests
projects/ labs

**Differentiation**

Change the Pace:

pre-testing

curriculum compacting

tiered activities (start with more difficult activities and skip the easier ones)

independent study

learning centers (skip centers that student has mastered)

Change the Delivery/Content:

mini-lessons for small groups

use different resources (higher level books, higher level response questions, open ended questions/problems…)

curriculum compacting

independent study

open-ended questions

teacher conferences

reading journals

Change the Product:

choice boards or Tic Tack Toe menus

student choice options

game creation

technology-based products/presentations

Change the Process - Add Depth:

tiered activities

open-ended activities

higher-level questions

student experts

increase complexity, decrease structure

Change the Process - Add Breadth:

choice boards or Tic Tack Toe menus

interdisciplinary units

## Integration of Career Readiness, 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 what geneticists do.

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| | An individual's strengths, lifestyle goals, choices, and interests affect employment and income. |
| | Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking. |
| | Multiple solutions often exist to solve a problem. |
| 9.2.8.CAP.10 | Evaluate how careers have evolved regionally, nationally, and globally. |
| 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. |
| 9.2.8.CAP.12 | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential. |
| 9.4.8.GCA | Global and Cultural Awareness |
| | Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. |
| 9.4.8.GCA.1 | Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a). |
| 9.4.8.GCA.2 | Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. |
| | Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation. |
| 9.4.8.IML.1 | Critically curate multiple resources to assess the credibility of sources when searching for information. |
| | Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated. |
| 9.4.8.IML.4 | Ask insightful questions to organize different types of data and create meaningful visualizations. |
| | 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. |
| 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). |
| 9.4.8.TL.3 | Select appropriate tools to organize and present information digitally. |

## Technology and Design Integration

Technology is fully integrated using Discovery Techbook.

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| | 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. |
| 8.1.8.DA.1 | Organize and transform data collected using computational tools to make it usable for a specific purpose. |

## Interdisciplinary Connections

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| 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.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.6-8.7 | 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.8.8 | 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.RST.6-8.9 | Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. |
| 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 |

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| LA.W.8.1 | Write arguments to support claims with clear reasons and relevant evidence. |
| LA.WHST.6-8.1 | Write arguments focused on discipline-specific content. |
| 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.6-8.2 | Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. |
| 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. |
| 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. Show students the video segment "Mendel's Contribution to Genetics." Ask the questions: How did people think heredity occurred before Gregor Mendel did his research? How did Mendel's work change scientists' ideas about heredity? Show the video segment again. Then ask the questions again and facilitate a discussion around

ELL

1. Assist students in identifying familiar prefixes and/or words within words (for example, "inherit" can be related to "inheritance") for each term.

Accelerated Students

1. Before completing the Core Interactive Text, ask students to use their existing knowledge to describe how traits get passed from parent to offspring. Do this with each Lesson Question and have students amend their answers after each lesson.
2. Using their previous

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| students' answers.<br>2. Provide students with clear examples of alleles and gene inheritance using rabbits. Assume that white-haired rabbits have two recessive alleles (cc). Dark-haired rabbits have at least one dominant allele (Cc or CC). | | knowledge of heredity, ask students to examine Punnett squares as evidence of dominant traits. Use the Punnett square example of ear lobes used in the glossary term Punnett squares. |

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 ACCOMMOCATIONS spreadsheet in this discipline.

**Modifications and Accommodations used in this unit:**

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

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## Benchmark Assessments

**Benchmark Assessments** are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

**Schoolwide Benchmark assessments:**

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

**Additional Benchmarks used in this unit:**

Pre and post assessments to measure growth.

## 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

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| MS-LS3 | Heredity: Inheritance and Variation of Traits |
| MS-LS3-2 | Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. |
| | Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes(and therefore genes) inherited. |
| MS-LS4 | Biological Evolution: Unity and Diversity |
| MS-LS4-4 | Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. |
| | Emphasis is on using simple probability statements and proportional reasoning to construct explanations. |
| | Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. |
| LS4.B | Natural Selection |
| | Natural selection leads to the predominance of certain traits in a population, and the suppression of others. |
| | Cause and Effect |

Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.