



Grade 8 Science – Course 3
Unit 2 – Life Science
Topic 4 Genes and Heredity– 15 Days

Unit Overview - Students will explore patterns of reproduction and inheritance through investigation of advances in the fields of genetics and inheritance. Students will discover how inherited alleles are related to an organism’s traits and how probability is related to inheritance. Students will then explore the relationship between genes, chromosomes, and inheritance. Models such as a pedigree chart will be used to track inheritance. DNA replication, protein synthesis, trait variations due to changes in DNA and RNA will be introduced. Artificial selection, mutations, and the engineering of new traits will be investigated. Students will then use this information to explore the process that explains how organisms change over time. Students will investigate factors that drive natural selection and learn about evidence that supports the scientific theory of evolution. This will lead into the investigation of how genetics and trait variations influence a population as well as how species interactions affect evolution. Studying fossil evidence and modern technologies and DNA will provide new evidence about the theory of evolution.

Topic Essential Question: How do offspring receive traits from their parents?

Lessons

- Topic Launch/Quest Kickoff
- Lesson 1 Patterns of Inheritance
- Lesson 2 Chromosomes and Inheritance
- Lesson 3 Genetic Coding and Protein Synthesis
- Lesson 4 Trait Variations
- Lesson 5 Genetic Technologies (enrichment)
- Topic Close – Assessment, Quest Findings

NYSSLS Performance Expectations

MS-LS3-1. Develop and use a model to explain 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. [Clarification Statement: Mutations in body cells are not inherited. Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. Develop and use a model to describe how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as diagrams and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring.]

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. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, selective breeding, gene therapy); and, on the impacts these technologies have on society.]

Topic Opener

Savvas

PE: MS-LS3-1; MS-LS3-2; MS-LS4-5

SEP: Obtaining, Evaluating, and Communicating Information

DCI:

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. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

CCC – Cause and Effect

Highlighted labs are important to the understanding of the instructional concepts in this lesson and must be completed during Science instructional time.

- Topic Readiness Test
- **uConnect Lab – Making More**
- Quest Kickoff Video – How can you sell a new fruit?

PE:MS-LS3-2

SEP: Developing and Using Models

DCI:

LS1.B – Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)

LS3.A – Inheritance of Traits

- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B – Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3- 2)

CCC: Cause and Effect

Guiding Objectives:

- Students will examine the history of science to identify Gregor Mendel’s contributions to the fields of genetics and inheritance.
- Students will use a model to describe how variations of traits between parents and offspring arise from variations between genes (and therefore alleles) from each parent.
- Students will develop and use a model to predict the probability of inheritance of specific genetic variations.

Literacy Connection

- Determine Conclusions

Vocabulary

- heredity
- dominant allele
- recessive allele
- probability
- genotype
- phenotype

Academic Vocabulary

- quantify
- factor

Connect - TE/SB p.172

- Connect It!
- Quest Connection
- Inquiry Warm-Up Lab – How Tall is Tall?

Investigate - TE/SB pp.173-179

- **Investigate Lab – Observing Pistils and Stamens***
- Video – Patterns of Inheritance
- Interactivity – Making Copies
- Virtual Lab – Launching a Spacecraft into Motion
- Plan It! (p.174)
- Literacy Connection (p.176)
- Reading Checks (p.175)
- Math Toolbox (pp.177; 179)

Synthesize - TE/SB pp. 280-181

- Interactivity – Offspring Season
- Quest Check-In Interactivity – An Apple Lesson
- Quest Check-In
- Reading Check (p.180)

Demonstrate – TE/SB p.181

- Lesson 1 Check
- Lesson Quiz 1

***Denotes accompanying lab video**

Lesson 2 – Chromosomes and Inheritance

PE: MS-LS3-2

SEP: Developing and Using Models

DCI:

LS1.B – Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)

LS3.A – Inheritance of Traits

- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

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CCC: Cause and Effect

zSpace Activities (code)

Mitosis (A112)

[Mitosis - Teacher Activity Plan](#)

In this activity students will examine each phase of mitosis and learn how the cell transitions from one phase to another.

[Mitosis - Student Worksheet](#)

[Mitosis - Student Worksheet GoogleDoc](#)

Mitosis vs. Meiosis (A213)

[Mitosis vs. Meiosis - Teacher Activity Plan](#)

In this activity, students will examine the similarities and differences between mitosis and meiosis.

[Mitosis vs. Meiosis - Student Worksheet](#)

[Mitosis vs. Meiosis - Student Worksheet GoogleDoc](#)

Savvas

Guiding Objectives:

- Students will develop and use models to differentiate between genes, alleles, and chromosomes and determine how they are related to inheritance.
- Students will use a model to demonstrate and describe the cause and effect of the influence of pedigree on variations in inherited traits across generations.
- Students will use models to compare and contrast the formation of sex cells during meiosis and the process of cell division.

Literacy Connection

- Read and Comprehend

Vocabulary

- chromosome
- cell cycle
- pedigree
- meiosis
- chromatids
- mitosis

Academic Vocabulary

- structure
- function

Connect - TE/SB p. 184

- Connect It!
- Quest Connection
- Write – It Runs in the Family

Investigate - TE/SB pp.185-190

- Video – Chromosomes and Inheritance
- **uInvestigate Lab – Chromosomes and Inheritance**
- Interactivity – Look Inside
- Virtual Lab – Whose Offspring is This?
- Model It! (p.188)
- Reading Check (pp.187)
- Math Toolbox (p.187)
- Literacy Connection (p.189)

Synthesize - TE/SB pp. 190-192

- Interactivity – Colorful Chromosomes
- Quest Check-In Interactivity – About Those Chromosomes
- Quest Check-In

Demonstrate – TE/SB p.192

- Lesson 2 Check
- Lesson 2 Quiz

Lesson 3 – Genetic Coding and Protein Synthesis

PE: MS-LS3-1

SEP: Developing and Using Models

DCI:

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. (MS-LS3-1)

LS3.B – Variation of Traits

- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

CCC: Structure and Function

Savvas

Guiding Objectives:

- Students will construct explanations by describing why cells undergo DNA replication.
- Students will develop models to explain how cells make protein.
- Students will use models to explain why cells undergo protein synthesis.

Literacy Connection

- Draw Comparative Inferences

Vocabulary

- DNA
- protein synthesis
- messenger RNA
- transfer RNA

Academic Vocabulary

- sequence

Connect - TE/SB p.194

- Connect It!
- Quest Connection
- Class Discussion – Talking Code

Investigate - TE/SB pp. 195-201

● **Investigate Lab – Modeling Protein Synthesis**

- Video – Genetic Coding and Protein Synthesis
- Interactivity – The Role of DNA
- Literacy Connection (p.198)
- Reading Check (pp.196)
- Design It! (p.197)
- Model It (pp.200-201)

Synthesize - TE/SB pp. 201

- Interactivity – Making Proteins

Demonstrate – TE/SB p.202

- Lesson 3 Check
- Lesson 3 Quiz

Lesson 4 – Trait Variations

PE: MS-LS3-1; MS-LS4-4

SEP: Developing and Using Models

DCI:

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. (MS-LS3-1)

LS3.B – Variation of Traits

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CCC: Structure and Function

Savvas

Guiding Objectives:

- Students will construct explanations by: Determining sex-linked inheritance using a Punnett Square; analyzing sex-linked chromosomal indicators of disease.
- Students will construct a model to show how a genetic mutation occurs.
- Students will use a model to relate environmental factors to genetic mutations.

Literacy Connection

- Integrate with Visuals

Vocabulary

- variations
- sex chromosomes
- autosomal chromosomes
- mutation
- sex-linked genes

Academic Vocabulary

- sequence

Connect - TE/SB p.204

- Connect It!
- Quest Connection
- Write – Describe That Dog

Investigate - TE/SB pp. 205-213

- **Investigate Lab – Observing Traits**
- Interactivity – Sex-Linked Traits and Disorders
- Interactivity – Genetic Crosses
- Video – Trait Variations
- Reading Check (pp.207; 211)
- Literacy Connection (p.208)
- Math Toolbox (p.207)
- Model It (p.209)

Synthesize - TE/SB pp.214-215

- Interactivity – Track Your Traits
- Quest Check-In Lab: All in the Numbers
- Reading Check (p.214)
- Quest Check-In

Demonstrate – TE/SB p.215

- Lesson 4 Check
- Lesson 4 Quiz

Lesson 5 – Genetic Technologies (enrichment)

PE: MS-LS4-5

SEP: Obtaining, Evaluating, and Communicating Information

DCI:

LS3.B – Variation of Traits

- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

CCC: Cause and Effect

Savvas

Guiding Objectives:

- Students will gather and synthesize information to explain how humans use artificial selection to produce organisms with desired traits.
- Students will construct explanations that explain how scientists engineer new genes.
- Students will gather and synthesize information to support how genetic information can be used.

Literacy Connection

- Corroborate

Vocabulary

- artificial selection
- genetic engineering
- gene therapy
- clone
- genome

Academic Vocabulary

- manipulation

Connect - TE/SB p.216

- Connect It!
- Quest Connection
- Poll – Modifying Foods

Investigate - TE/SB pp. 217-223

- **Investigate Lab – Extraction in Action***
- Interactivity – DNA Fingerprinting
- Video – Genetic Technologies
- Reading Check (p.221)
- Literacy Connection (p.217)
- Plan It! (p.218)

Synthesize - TE/SB pp.224

- Interactivity – Solving Problems with Genetics

Demonstrate – TE/SB p.225

- Lesson 4 Check
- Lesson 4 Quiz

***Denotes accompanying lab video**

CLRI Connections:

- Article: “[How can we find out about ancient Egyptian germs?](#)”

Microbes are everywhere on Earth - in the soil, the rocks, the oceans, and in the human body. The organisms living on humans are called the microbiome and are an important part of health. Using a technique that matches up broken pieces of DNA, the DNA on mummified ancient Egyptian people was examined. The results showed that the microbiome of mummies included microbes that can cause gum disease as well as germs that cause leprosy, hepatitis, and other infectious diseases.

<p><u>Topic Close</u></p> <ul style="list-style-type: none"> ● Topic 4 Assessment and Remediation TE/SB pp. 226-229 ● Quest Finding and Reflection TE/SB p. 229 	<p><u>Topic 4 Enrichment</u></p> <p>Topic 4 - Lesson 1 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – Probability and Genetics ● Case Study – Cephalopods (pp.182-183) <p>Topic 4- Lesson 2 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – Genetic Diseases ● Careers – Genetic Counselor (p.193) <p>Topic 4- Lesson 3 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – How Cells Make Proteins ● <i>u</i>Engineer It! – Reinventing DNA as Data Storage (p.203) <p>Topic 4 – Lesson 4 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – Human Genetic Disorders <p>Topic 4 – Lesson 5 Enrichment</p> <ul style="list-style-type: none"> ● Advances in Genetics <p>Topic 4 Close</p> <ul style="list-style-type: none"> ● <i>u</i>Demonstrate Lab – Make the Right Call (pp.230-233)
<p>English Language Learners (ELL) Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p><u>Listening</u></p> <ul style="list-style-type: none"> ● <u>Cross- Linguistic Practices</u>: Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates). ● <u>Activating Prior Knowledge</u> Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content. ● <u>Visuals</u> - GIFs, pictures- will assist students in understanding what they are listening to. Use <u>visual thinking strategies</u> to set the lens for learning. ● Video to review or introduce a topic – use <u>closed captioning</u> to help students see the words and pronunciations while they listen to the content. ● <u>Word stretching / Vowel stretching</u> when instructing allows students to listen closely to the pronunciation of the word. ● <u>Performance Level Descriptors</u> this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening. Scroll for grade 8. <p><u>Speaking</u></p> <ul style="list-style-type: none"> ● <u>Sentence Stems/Frames</u> - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> ● <u>Academic Conversation Starters</u>: Have a visual of a list of academic sentence starters that students can refer to in a discussion. ● <u>Choral Reading</u> - To build fluency, self-confidence and motivation with reading/speaking. ● Create <u>movement</u> to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning. ● <u>Performance Level Descriptors</u> This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grade 8. <p><u>Reading</u></p>

	<ul style="list-style-type: none"> ● Supplementary Text to help reinforce concepts. ● Visual Aids - Pictures or models to support vocabulary words and concepts ● Video to review or introduce a topic - use closed captioning to help students read along while they listen to the content. ● 4 Square / Frayer models to help students gain a deeper understanding of vocabulary. ● Highlighting important text to assist students in answering questions after the reading. ● Chunking-Break reading of text into chunks or paragraphs ● Vocabulary Morphology- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary. ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grade 8. <p>Instructional Accommodations (depending on the student’s needs)</p> <ul style="list-style-type: none"> ● Extended time for tests in class, projects and assignments ● Directions read. Broken down as necessary ● Model how to complete the activity in the lesson ● Oral simplification of directions or questions ● Translated version of test when available. Student may have both version English and native language version ● Use of approved bilingual glossaries from NYS in each subject
<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p>Instructional</p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for scientific concepts <p>Technology:</p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize science concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes <p>In Class Assessments</p> <ul style="list-style-type: none"> ● Provide multiple options for projects ● Use of timer in class ● Break all complex tasks into chunks
<p>Step Up to</p>	<ul style="list-style-type: none"> ● Easy Two-Column Notes

Grade 8 Unit 2 Life Science

<p>Writing Step Up to Writing Materials can be found in BPS Science K-12 Schoology Folder □ Grade 8 Resources □ Grade 8 SUTW materials</p>	<ul style="list-style-type: none">● Breaking Down Definitions● Paragraph Frame- What I Learned● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grade 8.
<p>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</p>	<ul style="list-style-type: none">● Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population● All students are given an opportunity to engage in science discourse● Teacher demonstrates high expectations for all students