Englewood Public School District
Science
Grade 7
Second Marking Period

Unit 4: Selection and Adaptation

Overview: Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. The crosscutting concepts of *patterns* and *structure and function* are called out as organizing concepts that students use to describe biological evolution. Students use the practices of *constructing explanations*, *obtaining, evaluating, and communicating information*, and *using mathematical and computational thinking*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 15-20 Days

Enduring Understandings:
Genetic variations of traits in a population increase or decrease some individuals' probability of surviving and reproducing in a specific environment.
Natural selection, which over generations leads to adaptations, is one important process through which species change over time in response to changes in environmental conditions.
In artificial selection, humans choose desirable, genetically determined traits in to pass on to offspring.

Essential Questions:
How can changes to the genetic code increase or decrease an individual's chances of survival?
How can the environment effect natural selection?
Are Genetically Modified Organisms (GMO) safe to eat?

Standards	Topics and Objectives	Activities	Resources	Assessments
(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.**	**Topics** Natural Selection Artificial Selection Evolution Twenty-First Century Themes	Students will complete the text activities: 1. Discover Activity (123) What do fingerprints reveal? 2. Lab (p129) Guilty or Innocent? 3. Write an Ad (127) PBL LANGUAGE ARTS	**Text:** Prentice Hall Science Explorer: Cells and Heredity **Materials:** For Discover Activity (123) What do fingerprints reveal? • Plain white paper • Ink pad	**Formative Assessments:** • Journals • Learning/Response Logs • Discussions

(MS-LS4-5) **Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.** **(MS-LS4-6)** **Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.**	and Skills include: • The Four C's • Life and Career Skills • Information, Media, and ITC Literacy • Environmental Literacy • Health Literacy **Objectives** Students will: Use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment. Use mathematical representations to support conclusions about how natural selection may lead to increases and decreases of genetic traits in populations over time. Gather, read, and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) from multiple appropriate sources.	4. Discover Activity (p138) How do Living Things Vary? 5. Lab (p141) Bird Beak Adaptations 6. Lab (p146) Nature at Work (MS-LS4-4, 8.2.8.A.2) Students will interact with the website Charles Darwin Game to learn about Darwin and complete the natural selection simulation. (WHST.6-8.8) Students will view and discuss the Evolution Misconceptions video clip. (MS-LS4-5, 8.2.8.C.1, CRP4, 9.2.8.B.3) Students will engage in a web simulation that explores adaptive radiation of a fictitious group of birds in An Origin of Species: Pollenpeepers. (MS-LS4-6, RST.6-8.9, 8.2.8.A.2) Students will watch Glow in the Dark Cat Clones to introduce the idea of artificial selection. (CRP8, WHST.6-8.9) Students will watch the documentary "Pharm" Animals & Plants (GMO Documentary) and participate in a GMO Debate . (CRP6, WHST.6-8.2, 6.1.8.C.4.c)	• Hand lens For Lab (p129) Guilty or Innocent? • 4-6 bar codes • Hand lens For Discover Activity (p138) How do Living Things Vary? • Metric ruler • 10 sunflower seeds • Hand lens For Lab (p141) Bird Beak Adaptations • Bird seed • Paper plate • 20 raisins • Tweezers • Hair clips • Hair pins • Clothes pins • Stop watch • Paper cup For Lab (p146) Nature at Work • Scissors • Marking pen • Construction paper, 2 colors **Websites:** • Charles Darwin Game • An Origin of Species: Pollenpeepers: • GMO Debate **Videos:** • Evolution Misconceptions	**Summative Assessments:** Unit quizzes and test Students will receive a grade for responses to lab analysis questions for the *Lab (p129) Guilty or Innocent?* and *Lab (p146) Nature at Work.* Lab Report Students will take an online natural selection quiz after completing the Charles Darwin Game. Post Test, Performance Students will demonstrate understanding of artificial selection based on contributions to class discussion and the quality of information and analysis in their position papers. Reflection Journals, Checklists, Rubrics, Report **Benchmark Assessment:** Exact Path **Alternative Assessments:** Students will use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment. Graphic Organizers Students will explain some causes of natural selection and the effect it has on the

		Enrichment Activity: Students complete a hands-on simulation using Skittles and mini-marshmallows to show how natural selection can act as a mechanism to increase the presence of antibacterial resistance in a population in the 99.99% Antibacterial Products and Natural Selection activity. (MP.4, 7.RP.A.2, RST.6-8.1)	• Glow in the Dark Cat Clones • "Pharm" Animals & Plants (GMO Documentary) **Enrichment Lesson Plans:** • See 99.99% Antibacterial Products and Natural Selection **Additional Resources:** **Books:** **Adaptation and Natural Selection: A Critique of Some Current Evolutionary Thought** by George C. Williams https://www.amazon.com/adaptation-natural-selection-Books/s?page=1&rh=n%3A283155%2Ck%3Aadaptation%20and%20natural%20selection	increase or decrease of specific traits in populations over time. Charts, Graphs, Rubrics Students will describe how information from publications about technologies and methods that have changed the way humans influence the inheritance of desired traits in organisms. Writing, Rubric, Essay, Capstone Projects

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning.
The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
This particular unit has limited language barriers due to the physical nature of the curriculum.

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in

reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity in planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
● Give page numbers to help the students find answers ● Speak and display terminology ● Teacher modeling ● Peer modeling ● Provide ELL students with multiple literacy strategies. ● Word walls ● Use peer readers ● Provide a computer for written work ● Provide two sets of textbooks, one for home and one for school ● Provide visual aides ● Provide additional time to complete a task ● Use graphic organizers	● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Utilize modifications & accommodations delineated in the student's IEP ● Work with paraprofessional ● Use multi-sensory teaching approaches. ● Work with a partner ● Provide concrete examples ● Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).	● Give page numbers to help the students find answers ● Using visual demonstrations, illustrations, and models ● Give directions/instructions verbally and in simple written format. Oral prompts can be given. ● Peer Support ● Increase one on one time ● Teachers may modify instructions by modeling what the student is expected to do ● Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. ● Review behavior expectations and make adjustments for personal space or other behaviors as needed. ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.	● Inquiry-based instruction ● Independent study ● Higher order thinking skills ● Adjusting the pace of lessons ● Interest based content ● Real world scenarios ● Student Driven Instruction ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Collaborate with after-school programs or clubs to extend learning opportunities.

		• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	

Interdisciplinary Connections:

ELA-NJSLS/ELA:

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-4),(MS-LS4-5)

RST.6-8.9: Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-4)

WHST.6-8.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-4)

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. (MS-LS4-5)

WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-4)

Mathematics:
MP.4: Model with mathematics. (MS-LS4-6)
7.RP.A.2: Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP6: Demonstrate creativity and innovation.

Integration of Technology Standards NJSLS 8:
8.2.8.A.2: Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

Social Studies:
6.1.8.C.4.c: Analyze how technological innovations affected the status and social class of different groups of people, and explain the outcomes that resulted.

Integration of 21st Century Standards NJSLS 9:
9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions • Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4) **Obtaining, Evaluating, and Communicating Information** • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5) **Using Mathematics and Computational Thinking** • Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)	**LS4.B: Natural Selection** • Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) • In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5) **LS4.C: Adaptation** • Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)	**Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6) - ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5) - ***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** • Scientific knowledge can describe the

		consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)

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Unit 5: Evidence of a Common Ancestry

Overview: In this unit of study, students analyze graphical displays and gather evidence from multiple sources in order to develop an understanding of how fossil records and anatomical similarities of the relationships among organisms and species describe biological evolution. Students search for patterns in the evidence to support their understanding of the fossil record and how those patterns show relationships between modern organisms and their common ancestors. The crosscutting concepts of *cause and effect, patterns*, and *structure and function* are called out as organizing concepts for these disciplinary core ideas. Students use the practices of *analyzing graphical displays* and *gathering, reading, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 20-25 Days

Enduring Understandings:
The fossil record documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.
There are anatomical similarities and differences among modern organisms and between modern organisms and fossil organisms.
Similarities in embryological development across multiple species show relationships that are not evident in the fully formed organisms.

Essential Questions:
How do we know that birds and dinosaurs are related?
How do we know when an organism (fossil) was alive?

Standards	Topics and Objectives	Activities	Resources	Assessments
(MS-LS4-1) **Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.**	**Topics** The Fossil Record Anatomical Similarities Embryological Development Twenty-First Century Themes and Skills include: • The Four C's	Students will complete the text activities: 1. Discover Activity (p148) How Can You Classify Species 2. Skills Activity (p150) Drawing Conclusions 3. Lab (p154) Telltale Molecules 4. Discover Activity (p155) What Can You Learn from	**Text:** Prentice Hall Science Explorer: Cells and Heredity **Materials:** For Discover Activity (p148) How Can You Classify Species • 6-8 different pens For Hands of Primates Lab • Masking Tape	**Formative Assessments:** • Journals • Learning/Response Logs • Discussions **Summative Assessments:** Unit quizzes and test

(MS-LS4-2) **Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.** **(MS-LS4-3)** **Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.**	• Life and Career Skills • Information, Media, and ITC Literacy **Objectives** Students will: Use graphs, charts, and images to identify patterns within the fossil record and determine similarities and differences in findings. Make logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth. Apply the patterns in gross anatomical structures among modern organisms and between modern organisms and fossil organisms to construct explanations of evolutionary relationships. Use diagrams or pictures to identify patterns and similarities in embryological development across multiple species.	Fossils? Students attempt to reconstruct an organism based on fossil evidence in the Xenosmilus activity. (MS-LS4-1, CRP8, CRP6) Students will analyze the relative ages of fossils by completing Dating the Fossil Record. (CRP4, 9.2.8.B.3) Students will interact with the geologic time scale by visiting the website Geologic Time. Students will take part in an interactive video quiz, The Day The Mesozoic Died, about the asteroid that caused the extinction of dinosaurs. (MS-LS4-2, RST.6-8.1) Students will investigate homologies and analogies with the interactive website Similarities and Differences. (8.2.8.A.5, WHST.6-8.2, 8.2.8.A.2) Student will complete the Hands of Primates Lab to investigate anatomical similarities. (MS-LS4-3, RST.6-8.7) Students will watch NOVA: Judgement Day: Intelligent Design on Trial: Human Chromosome 2 to explore the	• Timer/Stopwatch **Websites:** • Geologic Time **Videos:** • The Day The Mesozoic Died • NOVA: Judgement Day: Intelligent Design on Trial: Human Chromosome 2 **Enrichment Lesson Plans:** • See Examining the Fossil Record • See What did T. Rex Taste Like? **Additional Resources:** **Book:** Common People: The History of An English Family by Alison Light **Web:** https://wiki.kidzsearch.com/wiki/Ancestor	Student responses to Xenosmilus and Dating the Fossil Record activities will demonstrate understanding of patterns in the fossil record. Student will be answer quiz questions while viewing The Day The Mesozoic Died. Student will complete a quiz at the conclusion of the interactive website Similarities and Differences. Students will be graded on responses to *Lab (p154) Telltale Molecules* and the *Hands of Primates Lab.* **Benchmark Assessment:** See Unit 4 for quarterly assessment **Alternative Assessments:** Students will use graphs, charts, and images to identify patterns within the fossil record. Graphic Organizers Students will analyze and interpret data within the fossil record to determine similarities and differences in findings. Venn Diagram, Graphic Organizers Students will apply scientific ideas to construct

		concept of common ancestry. (8.2.8.A.5, 6.1.8.C.4.c) **Enrichment Activity:** Students will analyze characteristics of fossils as they change over time by Examining the Fossil Record. Students will discover the relationship between dinosaurs and birds in the simulation What did T. Rex Taste Like? (RST.6-8.9, WHST.6-8.9)	explanations for evolutionary relationships. Writing, Reflection Journals Students will use diagrams or pictures to identify patterns in embryological development across multiple species. Graphic Organizers

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning.
The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
This particular unit has limited language barriers due to the physical nature of the curriculum.

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity In planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
● Teacher modeling ● Peer modeling ● Provide ELL students	● Speak and display terminology ● Utilize modifications &	● Using visual demonstrations, illustrations, and models	● Students can create questions that they still have and can study outside of class ● Inquiry-based instruction

	with multiple literacy strategies. ● Word walls ● Use peer readers ● Give page numbers to help the students find answers ● Provide a computer for written work ● Provide two sets of textbooks, one for home and one for school ● Provide visual aides ● Provide additional time to complete a task ● Use graphic organizers	accommodations delineated in the student's IEP ● Work with paraprofessional ● Use multi-sensory teaching approaches. ● Work with a partner ● Provide concrete examples ● Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA). ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).	● Give directions/instructions verbally and in simple written format. Oral prompts can be given. ● Peer Support ● Increase one on one time ● Teachers may modify instructions by modeling what the student is expected to do ● Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. ● Review behavior expectations and make adjustments for personal space or other behaviors as needed. ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	● Independent study ● Higher order thinking skills ● Adjusting the pace of lessons ● Interest based content ● Real world scenarios ● Student Driven Instruction ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-1),(MS-LS4-2),(MS-LS4-3)

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). (MS-LS4-1),(MS-LS4-3)

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. (MS-LS4-3)

WHST.6-8.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2)

WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2)

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP6: Demonstrate creativity and innovation.

Integration of Technology Standards NJSLS 8:
8.2.8.A.5: Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
8.2.8.A.2: Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

Social Studies:
6.1.8.C.4.c: Analyze how technological innovations affected the status and social class of different groups of people, and explain the outcomes that resulted.

Integration of 21st Century Standards NJSLS 9:
9.2.8.B.3
Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
	Analyzing and Interpreting Data • Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) • Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1) **Constructing Explanations and Designing Solutions** • Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2) - **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** • Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)	**LS4.A: Evidence of Common Ancestry and Diversity** • The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) • Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)	**Patterns** • Patterns can be used to identify cause and effect relationships. (MS-LS4-2) • Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3) **Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6) - **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)