Honors Science 8 Unit 6: Natural Selection and Adaptation 2019

Content Area:	**Science**
Course(s):	**Honors Life Science 8**
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Enduring Understandings:

- All life on earth evolved from a common ancestor that first appeared billions of years ago.
- Natural selection is the process by which evolution occurs.
- Survival of the best adapted

Essential Questions:

- How does genetic variation among organisms in a species affect survival and reproduction?
- How does natural selection lead to increase and decrease of specific traits in a population?
- How does the environment influence genetic traits in populations over multiple generations?
- How have different technologies influenced how traits are inherited?

Lesson Titles:

- Bird Beak Lab
- Design the Best Fish - STEM
- Field Trip
- Introduction Evolution/Adaptation/Natural Selection
- Only the strongest Survives
- Peppered Moth Lab
- Virtual Lab
- Vocabulary Quiz

21st Century Skills and Career Ready Practices:

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.

CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Inter-Disciplinary 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.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.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.6-8.7	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.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.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.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Students analyze images or data to identify patterns in the locations of fossils in layers of sedimentary rock. They can use their understanding of these patterns to place fossils in chronological order. Students may make connections between their studies of plate movement in grade 7 and the possible shifting of layers of sedimentary rock to explain inconsistencies in the relative chronological order of the fossil record as it is seen today.
- Students could be provided with multimedia experiences in order to analyze visual displays of the embryological development of different species. They can analyze the linear and nonlinear relationships among the embryological developments of different species. For example, students can analyze data about embryological development to determine whether development across species shares a similar

rate, similar size of embryos, or similar characteristics over a period of time. If these characteristics are consistent across species, a linear relationship can be inferred. At the point where the rate, size, or general characteristics of development diverge, the relationship can then be classified as nonlinear.

- Prior to middle school, students know that some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago. In this unit of study, students will build on this knowledge by examining how the fossil record documents the existence, diversity, extinction, and change of many life forms through Earth's history. The fossil record and comparisons of anatomical similarities between organisms and their embryos enable the inference of lines of evolutionary descent.
- Students can analyze data on the chronology of the fossil record based on radioactive dating. An explanation of radioactive dating can be provided to students along with data, but students are not expected to complete any calculations. Information can be provided in the form of data tables correlating fossil age with half-life. This information could also be presented in the form of a graph.
- Students can integrate the patterns they identified in the fossil record by studying sedimentary rock images and radioactive dating data provided by the teacher and the relationships they discovered through their study of embryological development with evidence from informational texts to develop an explanation of changes in life forms throughout the history of life on Earth. This explanation could be presented in the form of a claim, with students required to cite evidence from their studies of diagrams, images, and texts to explain that life on Earth has changed over time.
- Students may analyze images from the fossil record to identify patterns of change in the complexity of the anatomical structures in organisms. For example, students can observe pictures of fossilized organisms with similar evolutionary histories in order to compare and contrast changes in their anatomical structures over time. Students may be placed in groups, with each group examining changes in anatomical structures over time within one evolutionary lineage (e.g., the whale, the horse, cycads). Once students have identified patterns of change within one evolutionary lineage, they can meet with students from other groups to discuss patterns of change across multiple evolutionary lineages. Students could then present their findings using a variety of media choices (PowerPoint, poster, short skit or play, comic strip, etc.). This activity would provide application of the real-world phenomenon that life on Earth changes over time.
- Tutoring during Academic Enrichment

Modifications

Formative Assessment:

- Thumps up/down
- 3-2-1 Review
- Anticipatory Set
- Closure
- Kahoot (online game)
- Pair / Share
- Pass-out of Class
- Review Ball
- Survey Students using Technology (Edmodo, Google Classroom, ect
- Type 1 Writing Prompt (Brainstorm)

- Warm-Up

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Benchmark Assessments

Skills-based assessment

Reading response

Writing prompt

Lab practical

Summative Assessment:

- Alternate Assessment
- Benchmark
- Marking Period Assessment
- Moth virtual Lab
- Natural Selection Lab
- Vocabulary Quiz on Natural Selection

Resources & Materials:

- Bug Hunt
- 99.99% Antibacterial Products and Natural Selection
- Bug Hunt" uses NetLogo software and simulates an insect population that is preyed on by birds. There are six speeds of bugs from slow to fast and the bird tries to catch as many insects as possible in a certain amount of time. Students are able to see the results graphed as the average insect speed over time, the current bug population and the number of insects caught. There are two variations to try for the predator, one where the predator pursues the prey and one where the predator stays still and captures insects that pass nearby. In the first case the "bird" catches the slow insects and the faster ones survive, reproduce and pass genes on. The average speed of bug should increase over time. In the second case the faster bugs come near to the bird more often than the slow ones. The slow ones survive more, reproduce and pass their genes on. So the average speed decreases over time. Netlogo is free, but will need to be downloaded to run the simulation. It can be found at: https://ccl.northwestern.edu/netlogo/
- Catch up on the Tomato
- his activity is 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. Students simulate the effect of hand sanitizer on a population of bacteria, collect, record, graph and analyze their data. The bacteria that are affected by the selective pressure decrease and the population of bacteria evolves to be one that is largely populated by bacteria that are unaffected by the selective pressure. To begin the lesson students are given background information about natural selection and discuss how this can relate to their lives. Then students are given Skittles and mini-marshmallows and simulate the effect of hand sanitizer on bacteria. Since most of the "bacteria" are soft marshmallows they are caught more easily by a toothpick (the hand sanitizer) than the hard shelled Skittles. After a specified period of time the round ends and the remaining "bacteria" reproduce by fission for the next generation. The process continues for three generations. Possible follow-up lessons include watching videoclips and reading about antibiotic resistance having student role play scenarios to illustrate how antibiotic resistance happens in our world. http://ngss.nsta.org/Resource.aspx?ResourceID=17
- Making Sense of Natural Selection
- The activities in the lessons include "Oh Deer" to teach about limiting factors and selective advantage, observations of sunflower seeds to explore variation and a "Wormeater" game for students to experience natural selection. These activities guide students as they develop a model of natural selection and then use that model to construct Darwinian explanations about how a population changes over time. The science practices are incorporated into the lessons . The article is written for high school level students, but the same approach has been used in the middle school classroom with similar results. http://ngss.nsta.org/Resource.aspx?ResourceID=62
- This lesson is a tool to demonstrate how various technological advances have changed the tomato and the tomato industry over the years. The technology includes both selective breeding and genetic engineering.