Unit 3: Natural Selection and Evolution

Content Area: **Science**
Course(s): **Biology/Lab Honors**
Time Period: **3rd Marking Period**
Length: **4 Weeks**
Status: **Published**

Unit Overview

Species change over time through a process called natural selection. Scientific evidence is used to support theories of biological evolution.

Transfer

Students will be able to independently use their learning to...

-Use evidence to establish relationships between species.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

-Species change over time.

-Many factors affect the variation in traits within species.

-Scientific evidence supports natural selection as a mechanism of evolution.

Essential Questions

Students will keep considering...

-How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

-How does biodiversity affect humans?

Application of Knowledge and Skill

Students will know...

Students will know...

-Species change over time.

-Many factors affect the variation in traits within species.

-Scientific evidence supports natural selection as a mechanism of evolution.

Students will be skilled at...

Students will be skilled at...

-Representing evolutionary relationships using cladograms and phylogenetic trees.

-Analyzing evidence that supports evolutionary relationships.

Academic Vocabulary

Biogenesis
Spontaneous generation
Evolution
Acquired traits
Natural selection
Adapt
Fitness
Adaptive advantage
Homologous structures
Analogous structures
Vestigial structures
Coevolution
Convergent evolution
Divergent evolution
Adaptive radiation

Artificial selection

Learning Goal 1

Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Proficiency Scale

Target 1

SWBAT:

-Define biological evolution.

-Discuss theories of evolution.

-Describe types of evidence that support evolution and give examples.

-Use a phylogenetic tree and/or cladogram to show evidence of evolution of organisms.

-Create a dichotomous key to identify differences among organisms and reveal respective scientific names.

-Justify which form of evidence is most effective in supporting evolution.

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- -Discuss theories of evolution.
- -Justify which form of evidence is most effective in supporting evolution.
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SCI.9-12.HS-LS4-1   Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Further Inquiry

How is evolutionary fitness measured?

Learning Goal 2

Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Proficiency Scale

Target 1

SWBAT:

-Compare different patterns of evolution.

-Recall types of evidence that support evolution and how they affect other populations.

-Use a real-life example to illustrate the evolution of a species due to environmental and genetic factors.

-Apply the concepts of DNA replication, reproduction, and Mendelian genetics to provide evidence of evolution.

-Relate patterns of evolution to specific populations in nature.

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- -Use a real-life example to illustrate the evolution of a species due to environmental and genetic factors.

SCI.9-12.HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Further Inquiry

Why are fossils weak supportive evidence for evolution?

Learning Goal 3

Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Proficiency Scale

Target 1

SWBAT:
-Identify organisms with an adaptive advantage over others within a species.

-Predict the frequency of a trait within a population if it is no longer an advantage.

-Show evidence of genetic equilibrium within a population.

-Apply concepts of natural selection to genetic equilibrium.

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SCI.9-12.HS-LS4-3   Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Further Inquiry

Why is it almost impossible to eliminate a recessive allele within a population?

Learning Goal 4

Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

[Proficiency Scale](#)

Target 1

SWBAT:

-Evaluate traits that would be an adaptive advantage to individuals within a population.

-Describe how greater fitness in an individual will affect the phenotypes of the population over time.

-Apply concepts of population genetics to the adaptations of populations.

-Provide an example of how natural selection caused change within a population.

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- -Describe how greater fitness in an individual will affect the phenotypes of the population over time.
- -Evaluate traits that would be an adaptive advantage to individuals within a population.
- -Provide an example of how natural selection caused change within a population.

SCI.9-12.HS-LS4-4   Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Further Inquiry

How does artificial selection speed up divergent evolution?

Learning Goal 5

Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

[Proficiency Scale](#)

Target 1

SWBAT:

-Evaluate environmental conditions that may increase the number of individuals of a species.

-Evaluate environmental conditions that may lead to the emergence of a new species.

-Evaluate environmental conditions that may lead to the extinction of other species.

-Develop a logical argument of how environmental change is the driving force behind evolution within a population.

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- -Evaluate environmental conditions that may lead to the emergence of a new species.
- -Evaluate environmental conditions that may lead to the extinction of other species.

| SCI.9-12.HS-LS4-5 | Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. |

Further Inquiry

Give one possible example in the US of a possible limit to gene flow?

Formative Assessment and Performance Opportunities

-Science notebook

-Homework assignments

-Classwork assignments

-Lab activities/explorations

-Quizzes, Tests, Projects

-Unit Test Open-ended Response
-Formal Lab Report

Summative Assessment

Common unit assessment aligned to the NJSLS and differentiated for varied learners.

Common Assessment is administered through LinkIt.

Accommodations/Modifications

 -504 accommodations

-IEP modifications

-Science notebook entries

-Videos, models, posters

 Ex:

- provide students with evolutionary timeline
- provide students with hardy-weinberg formulas
- model the effects of natural selection (bird beak lab)

Unit Resources

-Holt Modern Biology 2009

-Supplemental textbook materials

-Online resources

-Laptops

-Student Response Systems

-Lab materials

-POGIL: Activities for HS Biology

-Videos, models, posters

21st Century Life and Careers

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand

how to bring innovation to an organization.

CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.