Unit 3- Biological Evolution & Diversity (Life Science)

Content Area: **Science**
Course(s): **Science 8 Honors**
Time Period:
Length: **40 Days & Grade 8**
Status: **Published**

Unit 3

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science Honors, Grade 8

Biological Evolution & Diversity

Belleville Board of Education

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Unit Overview

Unit 3: Biological Evolution

- Common Ancestry and Diversity
- Fossil Record
- Evolution
- Theories of evolution
- Natural Selection
- Adaptation
- Mutation and variation
- Speciation and extinction
- Biodiversity and Humans
- Genetic Engineering

The History of Life on Earth (D)

- The Fossil Record
- Patterns of Change in Life on Earth
- Evidence of Common Ancestry

Evolution (D)

- Genetic change and traits
- Natural selection

- Speciation and extinction

Students should expect to learn:

- Theories of Evolution
- Fossil record
- Primates, evidence of evolution
- Adaptations
- Darwin's theory of Evolution by Natural Selection
- Speciation and extinction
- Artificial Selection
- Genetic change and traits
- Environmental factors
- Mutations and allele frequency
- Genetic engineering

Enduring Understanding

- We are unique individuals as a direct result of DNA from prior generations.
- Organisms reproduce, develop, have predictable life cycles, and pass on some traits to their offspring.
- Sometimes differences between organisms of the same kind give advantages in surviving and reproducing in different environments.
- All living things interact with and cause changes in their environment.
- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.
- Living organisms have a variety of observable features that enable them to obtain food and reproduce.
- All living things have many of the same traits.
- All living things interact with and cause changes in their environment.
- We are unique individuals as a direct result of DNA from prior generations.
- Organisms reproduce, develop, have predictable life cycles, and pass on some traits to their offspring.
- Sometimes differences between organisms of the same kind give advantages in surviving and reproducing in different environments.

Essential Questions

- How do organisms change over time in response to changes in the environment?
- How does natural and artificial selection lead to population increases and decreases over time?
- How do organisms change as they go through their life cycles?
- In what ways are organisms of the same kind different from each other?

- How do differences aid in survival?
- How are traits and organisms passed from one generation to another?

Exit Skills

Students will be able to:

- Define species and evolution
- Compare and contrast theories of evolution
- Describe how organisms can change over time in response to environmental factors.
- Describe how mutation causes variation in a population, and how species vary based on factors such as climate, changing landforms, interspecies interaction, and genetic mutation.
- Explain difference between physical and behavioral adaptations in a variety of organisms.
- Explain how reproductive success coupled with advantageous traits over many generations contributes to natural selection.
- Describe how fossil evidence and comparative anatomy provide evidence for evolution.
- Explain why the extinction of a species may occur when the environment changes
- Relate the theory of natural selection to species adaption
- Distinguish between relative and radiometric dating in fossil layers
- Describe primates
- Debate the value of Genetic engineering
- Construct explanations based on evidence to support fundamental understandings of natural selection and evolution
- Use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species.
- Use fossil records and anatomical similarities of the relationships among organisms and species to support their understanding

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

6-8.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.
6-8.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.
6-8.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.
6-8.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.

6-8.MS-LS4-5	Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.
6-8.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.

Interdisciplinary Connections

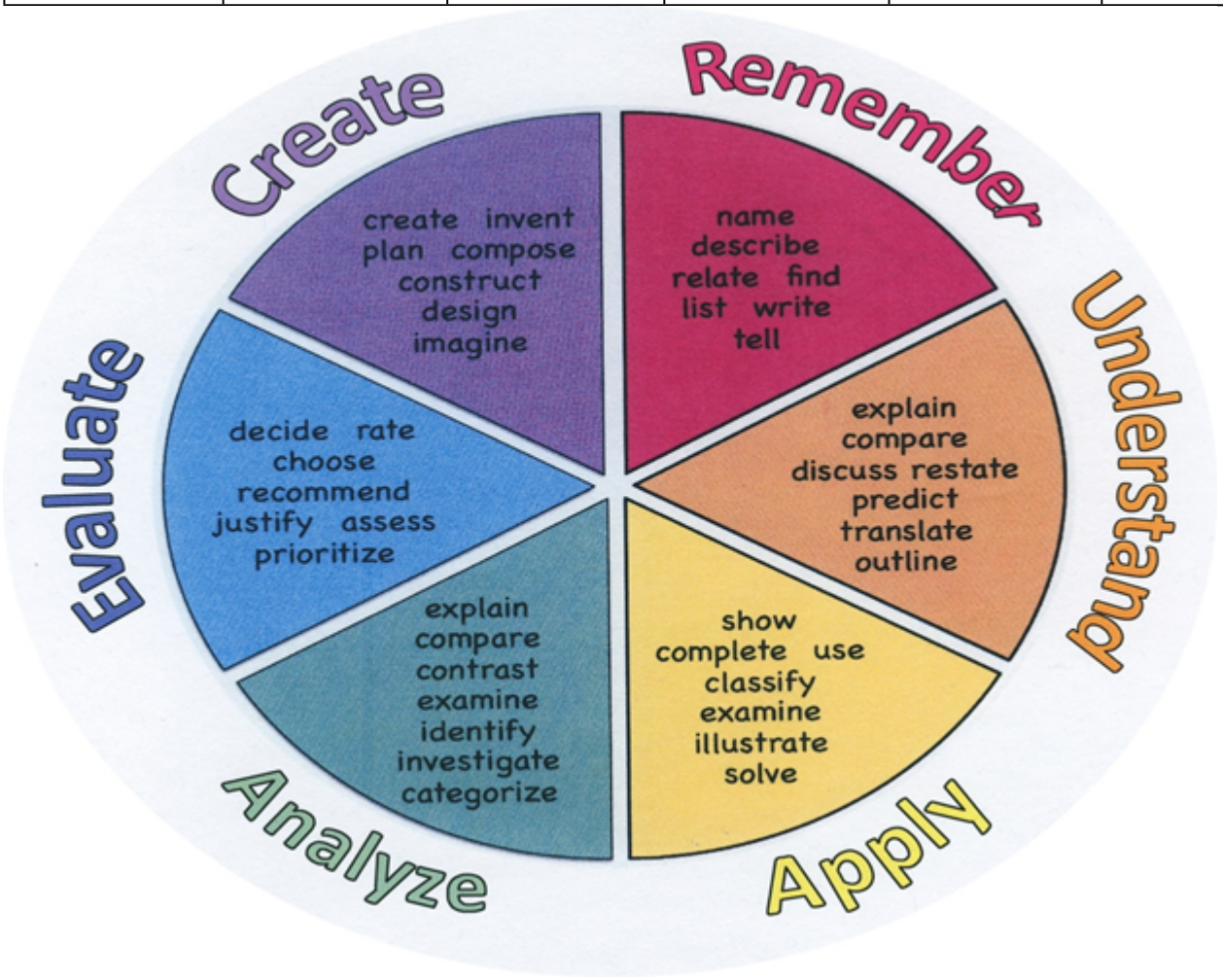
MA.6.RP.A	Understand ratio concepts and use ratio reasoning to solve problems.
MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
LA.RH.6-8.1	Cite specific textual evidence to support analysis of primary and secondary sources.
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.6-8.9	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.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
MA.6.SP.B.5	Summarize numerical data sets in relation to their context, such as by:
SOC.6.1.8.CS4	Expansion and Reform: Westward movement, industrial growth, increased immigration, the expansion of slavery, and the development of transportation systems increased regional tensions.

Learning Objectives

- Students will demonstrate ability to independently use their learning of genetics and heredity to better evaluate how parents' genotype will be reflected in their offspring's genotype and phenotype.
- Students will demonstrate ability to use their learning of the complex nature of living organisms in order to predict if and how an organism will sustain in given situations
- Students will demonstrate ability to examine how fossils give evidence of the history of life on Earth
- Students will demonstrate ability to analyze patterns in the fossil record that indicate extinction events and use physical evidence to describe an extinct organisms behavior
- Students will demonstrate ability to explore the methods scientists use to analyze and interpret fossil records to document the existence, diversity, extinction, and change of many life forms over time

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize

Select State Count Draw Outline Point Quote Recall Recognize Repeat Reproduce	Interpret Infer Match Paraphrase Represent Restate Rewrite Select Show Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Sketch Solve Use Add Calculate Change Classify Complete Compute Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Arrange Breakdown Combine Detect Diagram Discriminate Illustrate Outline Point out Separate	Justify Measure Rank Rate Support Test	Plan Produce Role Play Drive Devise Generate Integrate Prescribe Propose Reconstruct Revise Rewrite Transform



Suggested Activities & Best Practices

Peppered Moth Simulator- http://peppermoths.weebly.com/

- SW work in heterogeneous groups of 2 or 3
- SW answer a series of questions through google classroom pertaining to why the environment changed over time (Industrial Revolution)
- SW analyze how this event was enabling certain colored peppered moths to survive and others to die off
- SW present their findings in both line and pie charts

Design a Rat Project

- SW work in small groups of 2 or 3.
- SW design a rat which is adapted to survive on an island.
- There will 4 different island descriptions assigned to groups
- SW determine how their rats are physically and behaviorally adapted to their island.

Assessment Evidence - Checking for Understanding (CFU)

Exit ticket: What physical trait allows you to excel at your favorite sport? What behavioral trait allows you to do well in school? (Formative)
Module D Google Assessment Test (Summative)

• Admit Tickets (Formative)

• Compare & Contrast.(Formative)

• Create a Multimedia Poster.(Alternate)

• Define.(Formative)

• Describe.(Formative)

• Evaluate.(Formative)

• Evaluation rubrics.(Alternate)

• Exit Tickets. (Formative)

• Explaining. (Formative)

• Fist- to-Five or Thumb-Ometer. (Formative)

• Illustration. (Formative)

• Kahoot. (Formative)

• KWL Chart. (Formative)

• Question Stems. (Formative)

• Quickwrite.(Formative)

• Quizzes.(Summative)

• Self- assessments. (Alternate)

• Study Guide. (Formative)

• Teacher Observation Checklist. (Alternate

• Think, Pair, Share. (Formative)

• Unit test. (Summative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline

- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

1. HMH Dimensions Module D, supplementary materials
2. Internet resources
3. Science Department video DVD library
4. Laboratory materials

Ancillary Resources

1. Outdoor area of school
2. Guest speakers
3. Field trips
4. Hallway
5. Interactive lessons with behaviorally challenged classes.

An Origin of Species: Pollenpeepers: This web simulation allows students to explore adaptive radiation of a fictitious group of birds called Pollenpeepers over a period of 5 million years.

Making Sense of Natural Selection: This article from The Science Teacher magazine describes a unit of study on natural selection. Students begin by trying to explain the phenomenon of the exponential increase in a population of fish.

Bug Hunt "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.

Color Variation over Time in Rock Pocket Mouse Populations: This activity provides an introduction to natural selection and the role of genetic variation by asking students to analyze illustrations of rock pocket mouse populations (dark/light fur) on different color substrates in the Sonoran Desert (light/dark) over time. Based on this evidence, and what they learn about variation and natural selection in the accompanying short film, students use this evidence to explain the change in the rock pocket mouse populations on the lava flow (dark substrate) over time.

Catch Up on Tomato Technology: 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.

http://peppermoths.weebly.com/: This web simulation allows students to act as a predator and capture light

then dark peppered moths within a dark then light colored forest.

Technology Infusion

https://create.kahoot.it/details/41f2c019-da25-4e9f-a949-e00d76752adb

https://www.brainpop.com/science/cellularlifeandgenetics/naturalselection/

Smartboard

Document Camera

Podcasts

Discovery Education

BrainPop

Microscopes

Laptops

Khan Academy

Online polling

Prezi presentation

National Geographic Kids

Encyclopedia Britannica Online

Studentreasures Publishing

NOVA video programs

World Almanac for Kids Online

Google Scholar

HMH Field Trips powered by Google Expeditions

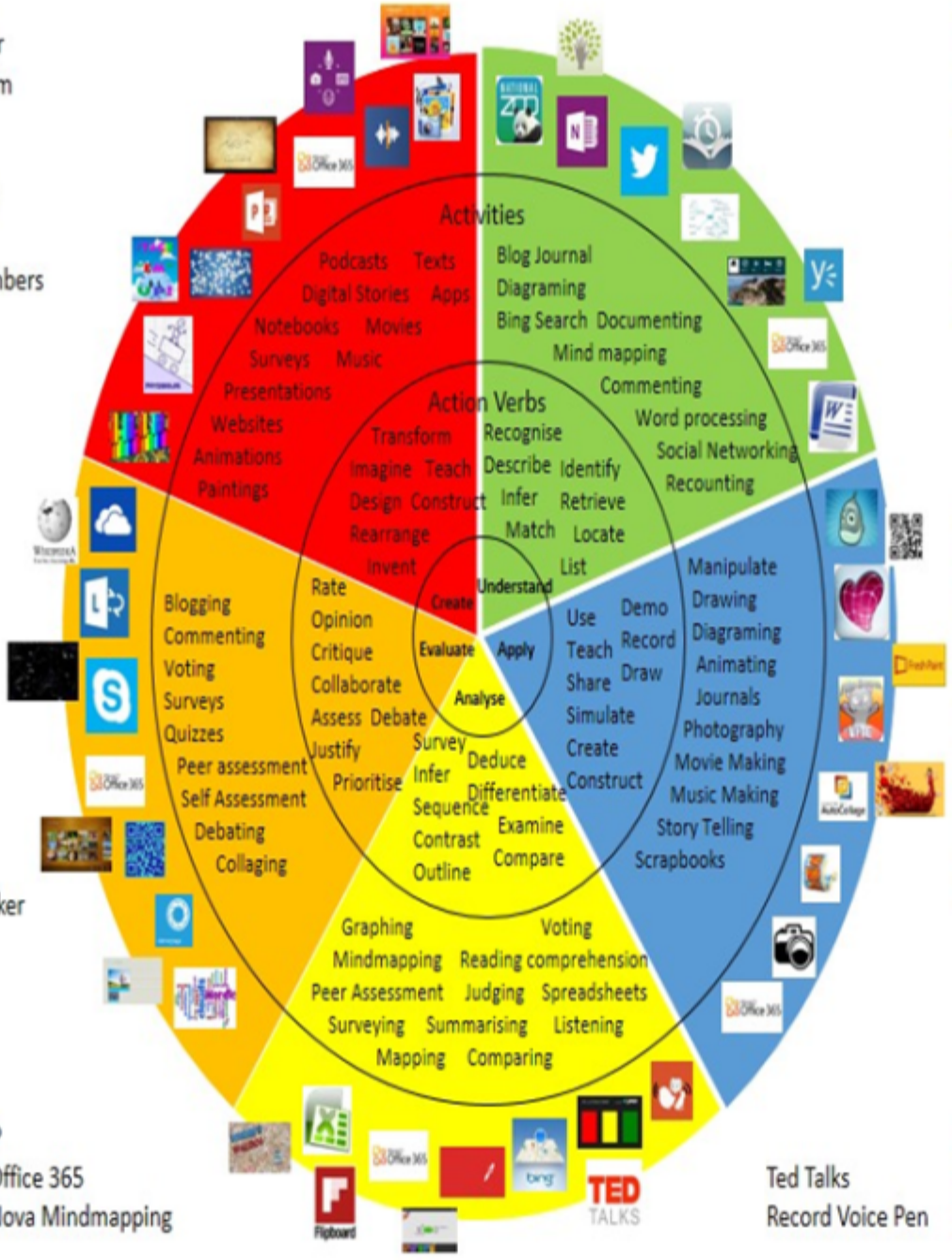
Interactive Online Student Edition

HMH "You Solve It" digital

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
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.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
CAEP.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.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A.2	Create a document (e.g., newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.
TECH.8.1.8.A.CS1	Understand and use technology systems.

21st Century Skills/Interdisciplinary Themes

- Environmental Literacy.
- Financial, Economic, Business and Entrepreneurial Literacy.
- Global Awareness.
- Health Literacy
- Civic Literacy

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Communication and Collaboration
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- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Use of Whale Evolutionary Flash cards. Students will physically arrange these cards to show the progression, specifically in bone structure.

Select 2 different organisms of your choosing and research how that organism is well adapted to its environment.

Differentiations:

- Small group instruction
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time

- Highlight text

Lo-Prep Differentiations

- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

Special Education Learning (IEP's & 504's)

Use of Whale Evolutionary Flash cards. Students will physically arrange these cards to show the progression, specifically in bone structure.

Select 2 different organisms of your choosing and research how that organism is well adapted to its environment.

• printed copy of board work/notes provided

• additional time for skill mastery.

• assistive technology

• behavior management plan.

• Center-Based Instruction

• check work frequently for understanding

• computer or electronic device utilizes

• extended time on tests/ quizzes

• have student repeat directions to check for understanding

• highlighted text visual presentation

• modified assignment format

• modified test content

• modified test format

• modified test length.

• multiple test sessions.

• multi-sensory presentation

• preferential seating

• preview of content, concepts, and vocabulary.

• reduced/shortened reading assignments

• Reduced/shortened written assignments.

• secure attention before giving instruction/directions

• shortened assignments

• student working with an assigned partner.

• teacher initiated weekly assignment sheet.

• Use open book, study guides, test prototype

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation

- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Use of Whale Evolutionary Flash cards. Students will physically arrange these cards to show the progression, specifically in bone structure.

Select 2 different organisms of your choosing and research how that organism is well adapted to its environment.

• reducing the number of answer choices on a multiple choice test

• tutoring by peers

• using computer word processing spell check and grammar check features

• using true/false, matching, or fill in the blank tests in lieu of essay teaching key aspects of a topic. Eliminate nonessential information.

• using videos, illustrations, pictures, and drawings to explain or clarify.

• allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning

• allowing students to correct errors (looking for understanding)

• allowing the use of note cards or open-book during testing

• decreasing the amount of work presented or required

• modifying tests to reflect selected objectives

• providing study guides

• reducing or omitting lengthy outside reading assignments

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- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
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- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Use of Whale Evolutionary Flash cards. Students will physically arrange these cards to show the progression, specifically in bone structure.

Select 2 different organisms of your choosing and research how that organism is well adapted to its environment.

- Allowing students to correct errors (looking for understanding).
- teaching key aspects of a topic. Eliminate nonessential information.
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards
- charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing.
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to
- reflect objectives for the student, eliminate sections of the test, and determine how the grade will be
- determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides

- reducing or omitting lengthy outside reading assignments.
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
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Talented and Gifted Learning (T&G)

Peppered Moth Simulator- http://peppermoths.weebly.com/

- SW work in heterogeneous groups of 2 or 3
- SW answer a series of questions through google classroom pertaining to why the environment changed over time (Industrial Revolution)
- SW analyze how this event was enabling certain colored peppered moths to survive and others to die off
- SW present their findings in both line and pie charts

Design a Rat Project

- SW work in small groups of 2 or 3.
- SW design a rat which is adapted to survive on an island.
- There will 4 different island descriptions assigned to groups
- SW determine how their rats are physically and behaviorally adapted to their island.

- Allowing students to chose their own method of representation, i.e. brochure, poster, powerpoint, youtube video, etc.
- Teaching explorations sections of workbook
- Allowing students to apply concepts to real-life scenarios and how they would be affected
- Higher order, critical & creative thinking skills, and discovery
- Flexible skill grouping within a class or across grade level for rigor
- Cluster grouping
- Project-based learning for greater depth of knowledge
- Utilize exploratory connections
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Allow students to work at a faster pace
- Multi-disciplinary unit and/or project

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Biological Evolution

NJSLS: See Link

Interdisciplinary Connection: See Link

Statement of Objective: SWDAT simulate changes in moth population due to pollution and predation and observe how species can change over time.

Anticipatory Set/Do Now: ANS: A

A drought suddenly strikes an ecosystem and reduces the nutrients available in the area. As a result, larger organisms are less likely to survive. What would you expect to happen to the population over time?

A. Death rates would increase and individuals in the population would tend to get smaller.

B. Death rates would increase and individuals in the population would tend to get larger.

C. Death rates would decrease and individuals in the population would tend to get smaller.

D. Death rates would decrease and individuals in the population would tend to get larger.

Learning Activity: 1. Review Do Now
2. SW be partnered heterogeneously.
3. SW view http://peppermoths.weebly.com/ and then begin their Peppered moth project after brief explanation of expectations https://studyres.com/doc/4354786/natural-selection-in-black-and-white
4. SW Create a line and pie chart on their collected data, finish for HW

Materials:
-Module D
-HMH workbook
-Chromebook
-Google Classroom

-Worksheet

-Smart board

-You Tube video clip

-Audio speakers

21st Century Themes and Skills: See Link

Differentiation: See Link

Integration of Technology:

http://peppermoths.weebly.com/

Google Classroom

6-8.MS-LS4-4.LS4.B.1	Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
6-8.MS-LS4-6.LS4.C.1	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.