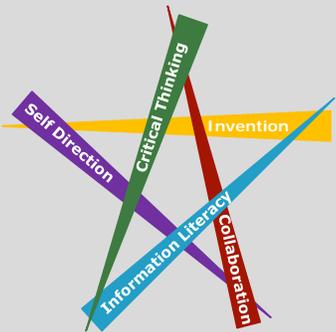


Colorado Teacher-Authored Sample Instructional Unit

Content Area	Science	Grade Level	7 th Grade
Course Name/Course Code			
Standard	Grade Level Expectations (GLE)	GLE Code	
1. Physical Science	1. Mixtures of substances can be separated based on their properties such as solubility, boiling points, magnetic properties, and densities	SC09-GR.7-S.1-GLE.1	
2. Life Science	1. Individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment	SC09-GR.7-S.2-GLE.1	
	2. The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions	SC09-GR.7-S.2-GLE.2	
	3. Cells are the smallest unit of life that can function independently and perform all the necessary functions of life	SC09-GR.7-S.2-GLE.3	
	4. Photosynthesis and cellular respiration are important processes by which energy is acquired and utilized by organisms	SC09-GR.7-S.2-GLE.4	
	5. Multiple lines of evidence show the evolution of organisms over geologic time	SC09-GR.7-S.2-GLE.5	
3. Earth Systems Science	1. Major geologic events such as earthquakes, volcanic eruptions, mid-ocean ridges, and mountain formation are associated with plate boundaries and attributed to plate motions	SC09-GR.7-S.3-GLE.1	
	2. Geologic time, history, and changing life forms are indicated by fossils and successive sedimentation, folding, faulting, and uplifting of layers of sedimentary rock	SC09-GR.7-S.3-GLE.2	

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Reading & Writing Standards for Literacy in Science and Technical Subjects 6 - 12

Reading Standards

- Key Ideas & Details
- Craft And Structure
- Integration of Knowledge and Ideas
- Range of Reading and Levels of Text Complexity

Writing Standards

- Text Types & Purposes
- Production and Distribution of Writing
- Research to Construct and Present Knowledge
- Range of Writing

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Adaptations of Life Over Time	5-6 weeks	4

Colorado Teacher-Authored Sample Instructional Unit

Unit Title	Adaptations of Life Over Time		Length of Unit	5-6 weeks
Focusing Lens(es)	Change	Standards and Grade Level Expectations Addressed in this Unit	SC09-GR.7-S.2-GLE.1	
Inquiry Questions (Engaging-Debatable):	<ul style="list-style-type: none"> • Is there strength in diversity? How does diversity impact species survival? • Why can we find evidence of life on top of mountains? • Why is the relationship between nature and nurture important for survival of a species? • How would the world be different if organisms did not change over time? 			
Unit Strands	Life Science			
Concepts	Change, evidence, time, extinction, traits, adaptation, interaction, survival, reproduction, environment, theory, biological evolution, diversity, organisms, differential survival, reproductive success, evolution, resistance, genetic traits, species			

Generalizations My students will Understand that...	Guiding Questions	
	Factual	Conceptual
Changes in environmental conditions often alter the reproductive success of individual organisms and entire species (SC.09-GR.7-S.2-GLE.5; RA.1)	What traits must an organism express to be successful? (SC09-GR.7-S.2-GLE.1-EO.a) What causes a species to go extinct? (SC09-GR.7-S.2-GLE.1-EO.a)	How is the use of the word “adaptation” different in everyday usage than in biology? (SC.09-GR.7-S.2-GLE.1; IQ.2)
Species that do not adapt become extinct (SC.09-GR.7-S.2-GLE.5; RA.1)	Why don't organisms become extinct? (SC09-GR.7-S.2-GLE.1-EO.a)	Why do some species survive better than others? (SC09-GR.7-S.2-GLE.1-EO.a; IQ.1) What happens to the system when a species becomes extinct? (SC09-GR.7-S.2-GLE.1-EO.a; IQ.1)
Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable (SC.09-GR.7-S.2-GLE.1-EO.a,b,d; IQ.1)	What determines which traits help an organism survive in its environment? (SC09-GR.7-S.2-GLE.1-EO.a; IQ.1) What positive or negative influence can humans have on a species' ability to adapt to an environment? (SC09-GR.7-S.2-GLE.1-EO.a; IQ.1)	Why are some organisms more successful at reproducing than others? (SC09-GR.7-S.2-GLE.1-EO.a,b; IQ.1, 2) How does our knowledge of how organisms adapt to their environment help us modify organisms for human benefit (corn)? (SC09-GR.7-S.2-GLE.1-EO.a,b; IQ.1, 2; N.2)
Similar traits of modern organisms and their predecessors provide evidence for evolution (SC.09-GR.7-S.2-GLE.5-EO.a; IQ.1)	How does the fossil record show how organisms have evolved? (SC.09-GR.7-S.2-GLE.5-EO.a; IQ.1) and (SC.09-GR.7-S.3-GLE.2-EO.c; RA.1;N.2)	What evidence is there that supports the theory of evolution? (SC.09-GR.7-S.2-GLE.5-EO.a; IQ.1) and (SC.09-GR.7-S.3-GLE.2-EO.c; RA.1;N.2)

Colorado Teacher-Authored Sample Instructional Unit

	<p>What might life on Earth have been like in the distant past, and what evidence is there for this?</p>	<p>How does the evidence about the way life has evolved on Earth over long periods of time tell us? (SC.09-GR.7-S.2-GLE.5-EO.a; IQ.1) and (SC.09-GR.7-S.3-GLE.2-EO.c; RA.1;N.2)</p>
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<p>Critical Content: My students will Know...</p>	<p>Key Skills: My students will be able to (Do)...</p>
<ul style="list-style-type: none"> • Examples of traits that are beneficial or detrimental to the survival of a species (natural Selection). (SC09-GR.7-S.2-GLE.1-EO.a) • What adaptation means and how it impacts survival and reproductive success. (SC09-GR.7-S.2-GLE.1-EO.b) • Reasons why biological evolution accounts for the unity and diversity of living organisms (SC09-GR.7-S.2-GLE.1-EO.d) • Why individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment (SC09-GR.7-S.2-GLE.1-EO.a) • Specific adaptations that provide evidence about differential survival and reproductive success (SC09-GR.7-S.2-GLE.1-EO.a, b; IQ.2) • The relationship between an organism's traits and its potential for survival and reproduction (SC09-GR.7-S.2-GLE.1-EO.a; IQ.1) • The evolution of bacteria related to survival in the presence of the environmental pressure of antibiotics - giving rise to antibiotic resistance (SC09-GR.7-S.2-GLE.1; RA.1) • Reasons why species that live with humans -such as rats and pigeons - are more common around towns and cities (SC09-GR.7-S.2-GLE.1; RA.2) 	<ul style="list-style-type: none"> • Develop, communicate, and justify an evidence-based explanation for why a given organism with specific traits will or will not survive to have offspring in a given environment. SC.09-GR.7-S.2-GLE.1-EO.a) • Analyze and interpret data about specific adaptations (SC09-GR.7-S.2-GLE.1-EO.b) • Use information and communication tools to gather information from credible sources, analyze findings, and draw conclusions to create and justify an evidence-based scientific explanation. (SC09-GR.7-S.2-GLE.1-EO.c) • Use computer simulations to model differential survival and reproductive success associated with specific traits in a given environment. (SC09-GR.7-S.2-GLE.1-EO.d) • Analyze and interpret data about specific adaptations to provide evidence and develop claims about differential survival and reproductive success (SC09-GR.7-S.2-GLE.1-EO.b) • Use information and communication technology tools to gather information from credible sources, analyze findings, and draw conclusions to create and justify an evidence-based scientific explanation (SC09-GR.7-S.2-GLE.1-EO.c) • Use computer simulations to model differential survival and reproductive success associated with specific traits in a given environment (SC09-GR.7-S.2-GLE.1-EO.d)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
 EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *“Mark Twain exposes the hypocrisy of slavery through the use of satire.”*

<p>A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):</p>	<p><i>Organisms interact with their environment and adapt to its changing conditions or become extinct, which has happened throughout the history of Earth.</i></p>
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Colorado Teacher-Authored Sample Instructional Unit

Academic Vocabulary:	Interpret, survive, relationship, potential, environment, evidence, theory, claims, consequences, critique, analyze, interaction, diversity
Technical Vocabulary:	Traits, adaptations, organisms, reproduction, evolution, extinction, survival, environment, resistance, genetic traits, populations, species

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Unit Description:	This unit begins with the introduction of Darwin’s scientific research based on his theory of evolution through natural selection. Students are then introduced to how natural selection occurs in an environment, how small changes results in the evolution of a species, and then transitions into evidence that supports the theory of evolution. The unit then shifts to discuss possible scenarios that can impact evolution and speciation and how humans are impacting the future of evolution. This unit culminates in a performance assessment that asks students to publish a book within a book series about how and why natural selection and adaptation occur within various environments.
Considerations:	<p>This unit was created with the intention of following the <i>Geologic Time</i> unit. Teachers could expand this unit to include more information on genetics. Teachers need to consider the political context within their district and possibly use the words “Descent with Modification” or “Change over Time”</p> <p>Misconceptions: Plants do not evolve Evolution only applies to humans Evolution always takes a long time to occur Theory does not mean it is true Humans did not evolve Humans evolve from monkeys</p>
Unit Generalizations	
Key Generalization:	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable
Supporting Generalizations:	Species that do not adapt become extinct
	Changes in environmental conditions often alter the reproductive success of individual organisms and entire species
	Similar traits of modern organisms and their predecessors provide evidence for evolution

Performance Assessment: <i>The capstone/summative assessment for this unit.</i>	
Claims: (Key generalization(s) to be mastered and demonstrated through the capstone assessment.)	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable
Stimulus Material: (Engaging scenario that includes role, audience, goal/outcome and explicitly connects the key generalization)	<p>You are a book publisher asked to create a series of books around planets and the life that inhabits these planets. You have already created the first book around the four different planets and their environments. Now you must create the sequel involving life on these planets. In your book you must design and create animals which will be perfectly suited to their environment on one of the new planets. Your animals must fit into the existing food chain-they cannot be the ultimate predator. You need to include adaptations and reasoning for those adaptations that address these issues:</p> <ul style="list-style-type: none"> ● how the animals are going to stay warm or cool ● what they are going to eat ● how they will get their food and water ● how they find shelter ● how they will protect themselves from their predators

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	<p>Once your animals have been created, you must think about the 3rd book in your series which involves environmental changes on the planet and you must predict what future adaptations will need to occur with your animals and future populations within this new environment.</p>
<p>Product/Evidence: (Expected product from students)</p>	<p>Students take the role of a book publisher asked to create a series of books around planets and the life that inhabits these planets. They have already created the first book around the four different planets and their environments. Now they must create the sequel involving life on these planets. In their book they must design and create animals which will be perfectly suited to their environment on one of the new planets. Their animals must fit into the existing food chain-they cannot be the ultimate predator. They need to include adaptations and reasoning for those adaptations that address these issues:</p> <ul style="list-style-type: none"> ● how the animals are going to stay warm or cool ● what they are going to eat ● how they will get their food and water ● how they find shelter ● how they will protect themselves from their predators <p>Once their animals have been created, they must think about the 3rd book in your series which involves environmental changes on the planet and must predict what future adaptations will need to occur with their animals and future populations within this new environment. Teachers need to determine the environmental changes that happen for the 3rd book.</p> <p>Planet examples:</p> <p>Planet Toto: This planet is dark and cold most of the time. It is very mountainous, it rains almost all day, and because of the wet, dark conditions, the only plants that grow well are small mosses and fungi. Animals on this planet include a type of mouse, a nocturnal hunting large cat, fish, and a variety of insects.</p> <p>Planet Nero: This planet is dry, hot, and flat. Water is found in underground streams but there is little surface water on the planet. Most of the surface is covered in sand and patches of dry grass. Trees are tall and have leaves only at the tops, not along the trunks. Plants are small and dry, but are edible. Animals include insects, birds which roost in the high trees, sand-colored lizards, and rats.</p> <p>Planet Cara: This planet is tropical, flat, wet, and hot. Most of the planet is covered by rain forest and water collects in large pools and lakes which have water all year around. A species of plant grows thickly on the ground with poisonous spines (any animal that steps on it would surely die). Vegetation is plentiful and includes leaves, fruits, and nuts. Animals include carnivorous snakes, insects, monkeys, fish, and birds.</p> <p>Planet Xtreme: This planet has a modern climate (never gets very cold or hot, but stays mild all year around).It rains for part of the year and the water forms pools and lakes which dry up towards the end of the year and then the planet is very dry. Geography is both mountainous and flat. Vegetation includes tall trees with high leaves and fruit, and smaller plants that bear nuts which have hard outer shells. Animals include rats and mice, insects, birds, slow moving mammals, and a carnivorous nocturnal wolf.</p>
<p>Differentiation: (Multiple modes for student expression)</p>	<p>The teacher may allow students to use Power Point, create a book with illustrations, voice thread, etc. as their product.</p>

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Texts for independent reading or for class read aloud to support the content	
Informational/Non-Fiction	Fiction
Winston, R. (2009). <i>Evolution Revolution</i> . Lexile: 1050. Darwin, Charles. (1968). <i>The Origin of Species</i> . Lexile: 1430L. Hartman, E. & Meshbesh, W. (2009). <i>Changing Life on Earth</i> . Lexile: 920L. Sanderson, J. (2011). <i>My Trip to the Galapagos Islands</i> . Lexile: 860L Chin, J. (2012). <i>Island: A Story of the Galapagos</i> . Lexile: 900L	Meyer, C. (2009). <i>The True Adventures of Charley Darwin</i> . Lexile: 1060. Lasky, K. & Trueman, M. (2009) <i>One Beetle Too Many: The Extraordinary Adventures of Charles Darwin</i> . Lexile: 1050L. Lewin, T. (1999). <i>Nilo and the Tortoise</i> . Lexile:AD740L

Ongoing Discipline-Specific Learning Experiences				
1.	Description:	Thinking like a scientist: Using the scientific method	Teacher Resources:	http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (Near middle of page teacher resources page with activities) http://undsci.berkeley.edu/teaching/misconceptions.php (A list of common misconceptions about the nature of science) http://undsci.berkeley.edu/teaching/ (Tips for introducing and teaching scientific method and experimentation) http://www.livescience.com/6727-invisible-gorilla-test-shows-notice.html (Video in which most people fail to observe large “gorilla” moving across room) http://www.shodor.org/succeed-1.0/forensic/teacher/lessons/observation.html (Lesson plan devoted to developing observation skills) http://blogs.loc.gov/teachers/2011/06/look-again-challenging-students-to-develop-close-observation-skills/ (Library of Congress brief of tools for helping students develop observation skills)
			Student Resources:	http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (At top of page student link for movie and activities about scientific method) http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation) http://www.brainpop.com/science/scientificinquiry/scientificmethod/preview.weml (Movie and quiz for scientific method/inquiry) http://lifehacker.com/5960811/how-to-develop-sherlock-holmes-like-powers-of-observation-and-deduction (Explanation of tools to increase observation skills with hook related to Sherlock Holmes)
	Skills:	Designing an experiment, identifying variables, and analyzing results.	Assessment:	The students will be assessed within the learning experiences
2.	Description:	Working like a scientist: Using graphing and mathematics skills	Teacher Resources:	Power Point presentation (Dealing with identification of dependent and independent variables) http://professionaldevelopment.ibo.org/files/ocd/TaughtPractice%20with%20%20identifying%

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			<p>20variables.pdf (Practice worksheet for identifying dependent and independent variables)</p> <p>http://www.clemson.edu/ces/phoenix/tutorials/graph/index.html (Rules for graphing)</p> <p>http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut9_bar.htm#line3 (Teaches how and why to use different graphs and also teaches how to read a graph)</p> <p>http://www.teachervision.fen.com/skill-builder/graphs-and-charts/48946.html?page=1&detoured=1 (Provides questions to ask students as they analyze a graph)</p> <p>http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)</p>
			<p>Student Resources: http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)</p>
	Skills:	Creating and interpreting graphs, creating data tables, creating and interpreting models.	<p>Assessment: Students may create graphs using data from learning experiences in order to analyze relationships between variables. Teachers may make real-time observations and provide feedback for students on their ability to set up a graph correctly.</p>

<p>Prior Knowledge and Experiences</p> <p>Students will have a basic understanding that fossils provide evidence for change throughout history.</p> <p>Vertical Articulation: The last time students have seen the concepts within this unit was in 6th, 4th, and 1st grades.</p>

Learning Experience # 1	
The teacher may present videos and text resources so that students can consider the impact of the Theory of Evolution (Descent with Modifications) on modern scientific thought.	
Generalization Connection(s):	<p>Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable</p> <p>Changes in environmental conditions often alter the reproductive success of individual organisms and entire species</p> <p>Similar traits of modern organisms and their predecessors provide evidence for evolution</p>
Teacher Resources:	<p>http://darwin-online.org.uk/EditorialIntroductions/Freeman_OntheOriginofSpecies.html (Origin of Species)</p> <p>http://www.nuffieldfoundation.org/science-society/activities-evolution (Teacher notes and activity on Darwin’s finches)</p>

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	<p>http://tinyurl.com/pfyj855 (A Teachers Friendly Guide to Evolution) http://tinyurl.com/kbh3boo (A brief biography on Darwin) http://www.pbs.org/wgbh/evolution/darwin/index.html (Darwin's Dangerous Idea) http://www.learnoutloud.com/Content/Topic-Pages/Darwins-Theory-of-Evolution-Did-Man-Really-Evolve-from-Apes/34 (audio/video down-loadable for everything Darwin) http://www.nsta.org/publications/interactive/galapagos/activities/adventuring.html (classroom investigations includes maps) http://www.pbs.org/wgbh/evolution/humans/humankind/n.html (Origins of Mankind) http://www.darwinismrefuted.com/origin_of_man_09.html ("Darwinism Refuted") http://www.darwinproject.ac.uk/ (Darwin Correspondence Project)</p>	
Student Resources:	<p>http://www.shellyssciencepot.com/darwintrip/teacherspage.htm (Web quest Take a Trip with Charles Darwin) http://teacher.scholastic.com/activities/explorations/adaptation/ (Galapagos Island interactive with 3 levels) http://www.pbs.org/wgbh/nova/evolution/explore-galapagos.html (Interactive) http://www.galapagosislands.com/galapagos-resources/galapagos-map.html (interactive map) http://www.nhm.ac.uk/nature-online/science-of-natural-history/expeditions-collecting/beagle-voyage/ (interactive map with brief readings along the way of Darwin's travels) http://www.charlesdarwintrust.org/content/69/ (multiple interactive for The Theory of Evolution) http://www.pbs.org/wgbh/evolution/students/index.html (tutoring resource) http://www.darwinproject.ac.uk/ (Darwin Correspondence Project)</p>	
Assessment:	<p>Students, in small groups, will summarize their understanding of Darwin's importance to science by creating a museum exhibit answering the following questions:</p> <ul style="list-style-type: none"> ● Who was Darwin? ● What did he observe and where did he observe it? ● What important scientific book did he write? ● How did his observations lead to his creation of a new scientific theory? ● What was innovative about his theory? <p>The display may include text, video, graphics, or digital content.</p>	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide resources. The teacher may assign groups and tasks within the groups.	N/A
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	The students may create an online exhibit or web page.
Critical Content:	<ul style="list-style-type: none"> ● The impact of the Theory of Evolution (Descent with Modifications) ● The role of the Galapagos Islands ● The importance of <u>On the Origin of Species</u> to the scientific community 	

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Key Skills:	<ul style="list-style-type: none"> • Analysis of maps
Critical Language:	Theory, descent, modifications, offspring, lineage

Learning Experience # 2	
The teacher may provide various opportunities for students to explore the idea of selection based on favorable traits so that students can explain how genetic variation increases some individuals' probability of surviving and reproducing.	
Generalization Connection(s):	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable
Teacher Resources:	<p>http://www.sepa.duq.edu/darwin/pdf/UniqueBeakPhysique.pdf (lesson plan on Survival of the Fittest, favorable traits, and adaptations)</p> <p>http://evolution.berkeley.edu/evolibrary/article/0_0_0/sneakermales_01 (Survival of the Fittest comic and questions)</p> <p>http://interactivesites.weebly.com/animal-adaptations.html (adaptations of multiple biomes)</p> <p>www.sciencepartnership.org/uploads/1/4/3/7/.../ns_2_goldfish.docx (lab to demonstrate survival of the fittest)</p> <p>https://www.superteachertools.net/jeopardyx/answerkey.php?game=1394398850 (jeopardy includes answer key)</p> <p>http://www.nps.gov/arch/learn/education/upload/FTB_DesertAdaptations.pdf (use for stations)</p>
Student Resources:	<p>http://evolution.berkeley.edu/evolibrary/article/0_0_0/sneakermales_01 (Survival of the Fittest comic and questions)</p> <p>http://www.hhmi.org/biointeractive/explore-evolution (short video clips)</p> <p>http://www.planet-science.com/categories/under-11s/games/2010/09/mission-adaptation.aspx (Mission Adaptation game)</p> <p>http://schoolmediainteractive.com/view/object/clip/F8583B4F33BC26EEBD7FE41BB739DA04 (animal adaptation interactives)</p> <p>http://www.charlesdarwintrust.org/content/69/ (interactive "Are You Smarter Than a Plant" "Food Chain")</p> <p>http://learn.genetics.utah.edu/content/genetherapy/gtdoctor (Extraterrestrial gene therapy lab)</p> <p>http://a-z-animals.com/ (complete glossary of animals)</p> <p>http://www.cracked.com/article_20368_the-6-coolest-survival-traits-designed-by-evolution.html (images, description, and video)</p> <p>http://listverse.com/2014/10/08/10-bizarre-animal-survival-traits/ (images and descriptions)</p>
Assessment:	The student will create a classroom presentation based on their own research of a specific animal and its traits that allow it to survive and reproduce within its environment.

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Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may assign the animal or habitat.	The students may create a poster board with annotated pictures.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide video recording equipment.	The student may create an in-depth video presentation.
Critical Content:	<ul style="list-style-type: none"> • The concept of Survival of the Fittest 	
Key Skills:	<ul style="list-style-type: none"> • Interpret a graph • Utilize a computer simulation 	
Critical Language:	Analyze, interpret, predict, mutation, variation	

Learning Experience # 3		
The teacher may introduce the idea of adaptations so that students can differentiate between physical and behavioral adaptations.		
Generalization Connection(s):	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable	
Teacher Resources:	http://necsi.edu/projects/evolution/activities/newspaper/activities_newspaper.html (activity on camouflage) http://necsi.edu/projects/evolution/activities/build-a-beast/activities_beast.html (build a beast activity) http://interactivesites.weebly.com/animal-adaptations.html (adaptation of multiple biomes) https://sites.google.com/a/mail.fcboe.org/bms_life_sci/home/eller-science/adaptations-over-time (lessons, power points, etc.) http://msbrownclass.weebly.com/natural-selection.html (labs, simulations, articles etc.) http://www.fastplants.org/pdf/activities/variation_SCALE.pdf ("Exploring Natural Selection with Fast Plants" immersion unit) http://www.nhptv.org/natureworks/nwep1.htm (click animal to learn about its adaptation includes teacher guide) http://education.nationalgeographic.com/education/activity/marine-ecosystem-invention/?ar_a=1 (for GT "Create an imaginary marine ecosystem") https://tpwd.texas.gov/education/.../keep.../animal_adaptations.ppt (physical and behavioral adaptations power point) http://news.nationalgeographic.com/news/2004/02/0224_040225_evolution.html (high altitude human adaptation)	
Student Resources:	http://ats.doit.wisc.edu/biology/ev/ns/ns.htm (natural selection interactive) http://adaptationswebquest.weebly.com/structural-behavioral.html (structural and behavioral adaptations web quest) http://www.nhptv.org/natureworks/nwep1.htm (click animal to learn about its adaptation) http://bookbuilder.cast.org/view_print.php?book=40909 (quick overview of examples) http://education.nationalgeographic.com/education/encyclopedia/adaptation/?ar_a=1 (quick overview of images and description) http://www.ecokids.ca/pub/eco_info/topics/climate/adaptations/index.cfm (interactive match game) http://design.tutsplus.com/articles/how-to-draw-animals-quickly-render-fur--vector-17833 (animal drawing guide)	

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	http://www.johnmuirlaws.com/drawing-plants (drawing plants videos)	
Assessment:	Students will write an essay and create illustrations describing how and why specific physical/behavioral adaptations lead to a better chance of survival. Students will be given an environment. They must conceive of one animal with a physical adaptation and one animal with a behavioral adaptation to the given environment.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide an outline for the essay.	The student may produce a drawing adhering to the above criteria, with an oral presentation of their comprehension of the two types of adaptations (behavioral and physical). The student may create an imaginary ecosystem.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	The students may demonstrate an understanding of <u>both</u> physical and behavioral adaptations in a single animal. The students may create a digital image of the animal.
Critical Content:	<ul style="list-style-type: none"> • Concept of Natural Selection 	
Key Skills:	<ul style="list-style-type: none"> • Differentiate between physical and behavioral adaptations 	
Critical Language:	Hibernation, migration, camouflage, mimicry, adaptation, reproduction, predation, environment	

Learning Experience # 4		
The teacher may provide scenarios involving organisms within various habitats so the students can predict the likelihood of an organisms' survival given its traits.		
Generalization Connection(s):	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable Changes in environmental conditions often alter the reproductive success of individual organisms and entire species	
Teacher Resources:	http://lib.colostate.edu/wildlife/types.html (animal types and characteristics) http://mrssimonsonclass.blogspot.com/2015/01/heredity-and-traits-webquest.html (interactive web quest includes multiple resources) http://www.kidsdiscover.com/spotlight/endangered-species/ (positive human impact) http://www.education.com/activity/article/Family_Genes_middle (printable genetic traits charts) https://www.youtube.com/watch?v=NWqgZUnJdAY (Mendelian Genetics by Bozeman Science) https://www.youtube.com/watch?v=-mRphwIVeCM (Mendel's Genetics and heredity play-doh animation) http://mrssimonsonclass.blogspot.com/2015/01/heredity-and-traits-webquest.html (interactive web quest includes multiple resources)	

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	http://exchange.smarttech.com/search.html?q=%20adaptive%20traits (multiple Smart Board Lessons) http://humanorigins.si.edu/research/climate-research/effects (“What Does it Mean to be Human”) http://tinyurl.com/qcrc34q (images of animals) http://a-z-animals.com/reference/habitats/pictures/3778/ (images of habitats)	
Student Resources:	http://www.wartgames.com/themes/animals/adaptations.html (adaptation games) http://lib.colostate.edu/wildlife/types.html (animal types and characteristics) http://interactivesites.weebly.com/animal-adaptations.html (adaptations of multiple biomes) http://www.planet-science.com/categories/under-11s/games/2010/09/mission-adaptation.aspx (Mission Adaptation game) http://teacher.scholastic.com/activities/explorations/adaptation/ (Galapagos Island interactive with 3 levels) http://www.nlm.nih.gov/exhibition/harrypottersworld/education/lessonplans/science.html (genetic traits in Harry Potter complete unit) http://mrfedsscienceclass.weebly.com/for-animals.html (“Inherited and Adapted Characteristics of Animals”) http://tinyurl.com/qcrc34q (images of animals) http://a-z-animals.com/reference/habitats/pictures/3778/ (images of habitats)	
Assessment:	Given a set of traits of an unknown animal, the students will create a short constructed response detailing and justifying the environment that the animal would live in based on its traits.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	Students may complete a simple matching activity connecting specific traits to environmental characteristics.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	Students may create a digital presentation that includes the justifications for the chosen environment.
Critical Content:	<ul style="list-style-type: none"> • The difference between camouflage and mimicry • The impact of limited resources • Mutation • Natural selection 	
Key Skills:	<ul style="list-style-type: none"> • Predict the likelihood of an organism surviving with given traits in a given environment • Analyze and interpret data about specific adaptations genetic variation • Explain how random genetic variations enhance the probability of surviving and reproducing • Differentiate between beneficial and harmful mutations • Determine how/why behavioral and physical adaptations lead to enhanced survival • Recognize that different traits fit different environments 	
Critical Language:	Adaptation, traits, reproduction, camouflage, hibernation, migration, camouflage, mimicry, adaptation, reproduction, hibernation,	

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	migration, predation, survival of the fittest, favorable
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Learning Experience # 5

Teacher may provide information detailing the theory of evolution so that students can justify the impact the environment has on driving evolution through natural selection.

Generalization Connection(s):	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable Changes in environmental conditions often alter the reproductive success of individual organisms and entire species
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Teacher Resources:	http://www.birds.cornell.edu/Page.aspx?pid=1478 (Cornell lab of Ornithology) http://evolution.berkeley.edu/evolibrary/article/0_0_0/lines_01 (Lines of Evidence: The Signs of Evolution) http://tinyurl.com/mmunp6e (Evolution Web Quest) https://sites.google.com/site/gw7science/Home/evolution-webquest (evolution Web Quest)] http://www.ucmp.berkeley.edu/education/explorations/tours/intro/Intro5to12/tour1nav.php (Webquest) http://www.pbs.org/wgbh/evolution/educators/lessons/lesson3/act2.html (“Evidence for Evolution”) http://www.quia.com/files/quia/users/kseastead/Evolution_Webquest (Evolution Web Quest) http://www.windows2universe.org/earth/Life/origins.html (Origins of life on Earth) http://humanorigins.si.edu/research/climate-research/effects (“Climate effects on Human Population”) http://news.nationalgeographic.com/news/2004/02/0224_040225_evolution.html (high altitude human adaptation) http://www.pbs.org/wgbh/evolution/educators/lessons/index.html (on-line lessons on evolution)
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Student Resources:	http://phenomena.nationalgeographic.com/2014/03/25/darwin-in-the-city-my-talk-about-humans-driving-evolution/ (Video) http://www.wellcometreeoflife.org/interactive/ (click for video, images, and 3-D models) http://bio-alive.com/animations/evolution.htm (interactive and videos for evolution) http://cmex.ihmc.us/VikingCD/Puzzle/Evolife.htm (click on section to read about) http://www.sciencedaily.com/releases/2013/04/130409095414.htm (“Environmental Change Triggers Rapid Evolution” article) http://www.animalplanet.com/wild-animals/darwin-survive-game/ (Charles Darwin survival game) http://phys.org/news/2010-02-scientists-reveal-evolution.html (Scientist Reveal Driving Force Behind Evolution” article) http://www.ucmp.berkeley.edu/education/explorations/tours/intro/Intro5to12/tour1nav.php (webquest) http://bms.westfordk12.us/pages/academics/eighth/wq_evolution.pdf (webquest)
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Assessment:	Students will complete a web quest detailing the history of the theory of evolution and diversity of life. http://www.ucmp.berkeley.edu/education/explorations/tours/intro/Intro5to12/tour1nav.php (webquest)
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Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	Students may work in groups.	Students may complete only selected parts of the webquest.

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Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	Students may create their own webquest.
Critical Content:	<ul style="list-style-type: none"> The Theory of Evolution (Descent with Modifications) 	
Key Skills:	<ul style="list-style-type: none"> Trace lines of evolution 	
Critical Language:	Evolution, change over time, common ancestry	

Learning Experience # 6	
The teacher may introduce evidence for the theory of evolution (i.e., vestigial structures, embryology, DNA, homologous structures, fossils) so that students can infer evolutionary relationships among organisms in terms of similarities and differences.	
Generalization Connection(s):	Similar traits of modern organisms and their predecessors provide evidence for evolution Changes in environmental conditions often alter the reproductive success of individual organisms and entire species
Teacher Resources:	http://www.ncsd.k12.pa.us/homework/damarshall/Lesson%204%20Word%20search.pdf (word search) http://www.ck12.org/user:kay.teehan@polk-fl.net/book/7th-Grade-Life-Science%3A-Semester-1/r50/section/7.2/ (Evidence of Evolution) https://www.youtube.com/watch?v=9VyrbG7FZ2Q (Homologous and vestigial structures Lesson format) http://volcanoes.usgs.gov/about/edu/dynamicplanet/wegener/ (use to explain The Theory of Continental Drift) https://www.youtube.com/watch?v=ictZJln3Vj4 ("Evolution-Evidence from Embryology") https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=fossil+interactives (fossil lessons, interactive, maps, etc.,) http://kms.kcs.k12.nc.us/common/pages/DisplayFile.aspx?itemId=7238938 (can be used as a web quest for homologous and analogous structures)
Student Resources:	http://nature.ca/discover/exf/index_e.cfm (gallery of interactives for fossils) http://www.dnai.org/ (DNA interactive and other resources) http://nature.ca/discover/exm/evltnfpndgs/index_e.cfm (evolution of appendages interactive) http://www.pbs.org/wgbh/nova/education/resources/subj_06_02.html (many interactives, on-line quizzes, match games etc.,) http://www2.edc.org/weblabs/ExploringEvolution/evolution.swf (exploring evolution of whales interactive with questions) http://www.hhmi.org/biointeractive/explore-your-inner-animals ("Explore Your Inner Animal interactive") http://www.hhmi.org/biointeractive/using-dna-trace-human-migration (map and explanation of migration) http://www.pbs.org/wgbh/evolution/change/family/ ("All in the Family interactive")
Assessment:	In groups, the students will produce a video presentation acting out the role of scientists who are displaying evidence to prove a theory of how a particular animal changed throughout time. In the video, the student will discuss some of the following topics: <ul style="list-style-type: none"> Vestigial structures Embryology

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	<ul style="list-style-type: none"> • DNA • Homologous structures • Fossils 	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may assign groups. The teacher may allow students to choose an animal. The teacher may assign the animal.	The student may create a variety of other presentations that display the required evidence. The student may compose a short constructed response. The student may work alone. The student may create an imaginary animal.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	The student may artistically create replicas of evidence and present multiple modes of communicating the theory, i.e. poster, video, & a speech.
Critical Content:	<ul style="list-style-type: none"> • The Theory of Evolution • The Theory of Continental Drift 	
Key Skills:	<ul style="list-style-type: none"> • Identify evolutionary connections • Trace the ancestry of an organism 	
Critical Language:	Vestigial structures, embryology, homologous structures, fossils	

Learning Experience # 7	
The teacher may provide animations and/or simulations so that the students can begin to understand how speciation occurs.	
Generalization Connection(s):	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable Species that do not adapt become extinct
Teacher Resources:	http://www.nature.com/scitable/knowledge/library/speciation-the-origin-of-new-species-26230527 ("Speciation: The Origin of a New Species") http://tinyurl.com/q7ahmcg (speciation video "Of Ligers and Men with links to other evolutionary videos) http://ed.ted.com/on/R4PiqPn1 (speciation video from the lab of Ornithology) http://www.hhmi.org/biointeractive/anole-lizards-example-speciation (animated video of speciation of anole lizard) http://video.pbs.org/video/1300397304/ (evolution of the salamander and climate) http://news.nationalgeographic.com/news/2014/03/140331-global-warming-climate-change-ipcc-animals-science-environment/ (video climate change and extinction) http://www.epa.gov/climatechange/impacts-adaptation/ecosystems.html ("Climate Impact on Ecosystems")

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Student Resources:	<p>http://education.nationalgeographic.com/education/encyclopedia/speciation/?ar_a=1 (examples of speciation)</p> <p>http://www.theguardian.com/environment/interactive/2012/sep/03/extinct-and-endangered-species-interactive (Interactive map for endangered species)</p> <p>http://www.nclark.net/Evolution (links to labs, activities, videos, reading, interactive, etc..)</p> <p>http://www.charlesdarwintrust.org/content/69/ (interactive for evolution and food chains)</p> <p>http://tinyurl.com/q7ahmcg (speciation video “Of Ligers and Men)</p> <p>http://www.biologicaldiversity.org/programs/population_and_sustainability/7_billion_and_counting/species.html (“Top 10 US Endangered Species Threatened by human population)</p> <p>http://www.biologicaldiversity.org/programs/population_and_sustainability/T_and_E_map/index.html (Type in address or click map to locate threatened and endangered species)</p> <p>https://www.lucidpress.com/pages/examples/free-brochure-maker (free brochure maker)</p>	
Assessment:	<p>The student will create an imaginary animal and location so that they may demonstrate their understanding of how speciation would occur from that animal. The student will describe the environmental factors that led to speciation, as well as describing what the differences are between the new species and why they have developed those traits. The information will be demonstrated through a digital product (video, Prezi, PowerPoint).</p>	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may allow real-world examples, not imaginary. The student may work with a group.	The student may demonstrate their understanding orally or via a short constructed response.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	The student may create an imaginary environment that experiences a new shift (e.g. dramatic climate change) and explain how their fantasy creatures may continue speciation.
Critical Content:	<ul style="list-style-type: none"> ● The impact of geological events and natural disasters on a species ● The difference between genetic dominance vs. suppression ● The concept of carrying capacity 	
Key Skills:	<ul style="list-style-type: none"> ● Explain how species originate from different species ● Analyze an environment to determine which factors might shape speciation ● Explain how drastic environmental changes lead to extinction 	
Critical Language:	Disease, diversity, speciation, extinction, capacity, dominance, suppression, climate, analyze, identify	

Learning Experience # 8

The teacher may provide students with evidence of physical and behavioral attributes so that students can evaluate human ancestry.

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Generalization Connection(s):	Similar traits of modern organisms and their predecessors provide evidence for evolution	
Teacher Resources:	http://www.history.com/videos/homo-erectus#homo-erectus (homo-erectus video) https://www.youtube.com/watch?v=k7Nn2UVJgnc (Homo Habilis Documentary: Part 1 “Into Our Past” Shows skulls throughout time) https://www.youtube.com/watch?v=5YEiJVQdI-Q (Discovery of Australopithecus Sediba video) http://documentaryheaven.com/human-evolution-clash-of-the-cavemen/ (“Human Evolution: Clash of the Caveman” long but very detailed) http://humanorigins.si.edu/evidence/human-family-tree (Interactive website covering the Human ancestors.) http://www.nsta.org/publications/news/story.aspx?id=49036 (evolution activities for physical attributes) http://evolutionatccms.weebly.com/dna-sequencing.html (“DNA Sequencing as Evidence for Evolution”) facstaff.gpc.edu/~jredmond/becoming_human_part2.ppt (“Becoming Human and the Fossil Record”) http://realhistoryww.com/world_history/ancient/Homo_habilis_erectus_neanderthal.htm (“Ancient Man and His First Civilizations”) http://www.talkorigins.org/faqs/homs/specimen.html (Prominent Hominid Fossils) http://www.livestrong.com/article/542877-the-average-height-of-humans-over-time/ (article) http://humanorigins.si.edu/resources/intro-human-evolution (“What Does it Mean to be Human” Lessons, fun facts, glossary, etc.,)	
Student Resources:	http://humanorigins.si.edu/evidence/human-evolution-timeline-interactive (“What Does it Mean to be Human” Lessons, fun facts, glossary, etc.,) https://www.youtube.com/watch?v=bJ_utURBEyY (“The Origins of Man” video) http://evolutionatccms.weebly.com/dna-sequencing.html (“DNA Sequencing as Evidence for Evolution” exploration) http://jaydambrosio.tripod.com/earlyhumans.html (“Early Humans” cyber museum) http://www.funtrivia.com/playquiz/quiz315911242a850.html (Origins of Man trivia) https://www.youtube.com/watch?v=9jUD-A8tGF0 (evolution and skull comparison short clip) http://earlyhumans.mrdonn.org/cromagnon.html (interactive) http://www.becominghuman.org/node/human-lineage-through-time (“Human Lineage Through Time” interactive documentary) http://www.pbs.org/wgbh/nova/earth/global-population-growth.html (“Human Numbers Through Time” article and interactive)	
Assessment:	The student will write a story describing the complete ancestry/evolution of homo erectus, homo habilis, australopithecine, cro-magnon from the perspective of an alien observing Earth, noting how the environment influenced the change(s) in these species. The story must contain: <ul style="list-style-type: none"> ● One paragraph describing each ancestor listed above 	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	Teacher may assign a specific ancestor to write about.	Students may create a picture book or comic strip. Students may write about one ancestor only.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	Students may write an additional paragraph predicting how environment will impact future descendants of the human lineage.
Critical Content:	<ul style="list-style-type: none"> ● Human ancestors (homo erectus, homo habilis, australopithecus, cro-magnon) 	

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Key Skills:	<ul style="list-style-type: none"> Sequencing the human ancestors
Critical Language:	Species, cro-magnon, ancestors, homo erectus, homo habilis, australopithecus, sequence

Learning Experience # 9

The teacher may compare and contrast artificial and natural selection so that students can begin to understand how humans impact the trajectory of evolutionary changes (e.g., selective breeding, antibiotic resistance).

Generalization Connection(s):	Organisms with certain traits have a higher potential for survival and reproduction within specific environments where those traits are favorable
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Teacher Resources:	<p>http://www.indiana.edu/~ensiweb/lessons/BornToRun.html (artificial selection unit include power point, video, images, and lab)</p> <p>http://tinyurl.com/lzgjzv (Neanderthal DNA in modern Man... Medical Daily article)</p> <p>http://www.dnaftb.org/1 (DNA from the Beginning can be used as a tutor or reading component)</p> <p>https://sites.google.com/site/gw7science/Home/genetics-webquest (multiple web quest for biology of DNA)</p> <p>http://alreadyanswered.org/q/misc/evolutionary-worldview-and-its-effect-on-american-values/ ("Evolutionary Worldview and its effects on Americans Values)</p> <p>http://www.pbs.org/wgbh/nova/education/activities/3103_dogs.html (</p> <p>http://www.vtaide.com/png/cloning.htm (Genetics and cloning web resources and details)</p> <p>https://www.youtube.com/watch?v=6Sf-sZEj1HA (artificial vs natural selection video)</p> <p>http://www.pbs.org/wgbh/evolution/library/10/4/l_104_03.html (antibiotic resistance articles)</p> <p>http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2937522/ (article "Origin and Evolution of Antibiotic Resistance")</p> <p>http://learn.genetics.utah.edu/content/genetherapy/gtdoctor/ (Extraterrestrial gene therapy lab)</p>
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Student Resources:	<p>https://sites.google.com/site/gw7science/Home/genetics-webquest (web quest using worksheet and teach.genetics.utah.edu)</p> <p>http://www.dnaftb.org/1 (DNA from the Beginning can be used as a tutor or reading component)</p> <p>http://kidshealth.org/teen/your_body/health_basics/genes_genetic_disorders.html (genetic disorders reading component)</p> <p>http://lightyears.blogs.cnn.com/2011/10/03/best-evidence-so-far-that-humans-are-still-evolving-scientists-say/ (multiple link to articles modern human evolution)</p> <p>http://outreach.mcb.harvard.edu/animations/resistance7.swf (antibiotic resistant animation)</p> <p>http://www.abpschools.org.uk/page/modules/infectiousdiseases_medicines/medicines3.cfm?coSiteNavigation_allTopic=1 (animation of mutation)</p> <p>http://learn.genetics.utah.edu/content/genetherapy/ (interactive and articles on challenges of gene therapy)</p>
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Assessment:	<p>The student will (in groups) research an animal or plant so that they may create a comic strip, poster, or digital presentation explaining the history of that organism both prior to and after the effects of humans. Examples of organisms may include:</p> <ul style="list-style-type: none"> • felines • canines • hoofstock (horses, cattle) • grasses/grains (wheat, corn) <p>The student's presentation should include a discussion of a general timeline of when changes occurred and what benefits humans have experienced due to our influence.</p>
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Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may assign the organism. The teacher may assign groups. The student may work alone.	N/A
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	N/A	The presentation should include predictions about future impacts of artificial selection on a species.
Critical Content:	<ul style="list-style-type: none"> ● The technique of gene therapy ● Hybridization 	
Key Skills:	<ul style="list-style-type: none"> ● Analyze benefits/disadvantages to humans due to our influence on organisms. 	
Critical Language:	Artificial selection, selective breeding, gene therapy, antibiotic resistance, genetic engineering, hybrid, clone, ethics	