UNIT PLANNING TEMPLATE

Title: Evolution and the changes in life on Earth

Teacher(s):	Grade(s):	School(s):
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Purpose of this unit:
The purpose of this unit is to have the students understand the theory of evolution, the role of natural selection in evolution, understand how the genetics of populations change through the process of natural selection in evolution, and be able to support their understanding by demonstration and with evidence as well as relate these ideas' effect on life on the Earth and more specifically the Hawaiian Islands. They should have an understanding of the some of the factors that influence natural selection, both internal and external, as well as understanding the ideas of fitness, founder effect, gene pool, gene frequency, genetic drift, and genetic bottleneck and their role in evolution and natural selection.

What standards does this unit address?
All of the following are HCPS 3 standards:
Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process. (Benchmarks 1.1-1.9)
Standard 2: The Scientific Process: NATURE OF SCIENCE: Understand that science, technology, and society are interrelated. (Benchmark 2.2)
Standard 3: Life and Environmental Sciences: ORGANISMS AND THE ENVIRONMENT: Understand the unity, diversity, and interrelationships of organisms, including their relationship to cycles of matter and energy in the environment. (Benchmark 3.4)
Standard 4: Life and Environmental Sciences: STRUCTURE AND FUNCTION IN ORGANISMS: Understand the structures and functions of living organisms and how organisms can be compared scientifically. (Benchmarks 4.4, 4.6)
Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms. (Benchmarks 5.1, 5.2, 5.4, 5.5)

Other pertinent information:

Stage 1: Classroom Community Profile

Prompt 1: ***What are the physical factors of the school and classroom?***

The unit will be taught at Radford High school, in a fully self contained biology class with predominantly 10th grade special education students, with 1-2 upperclassmen, who might be placed as a repeat or because of a transfer to the school. This area of study was recently released as part of the 4th quarter biology curriculum requirements across the state. This is required class for a diploma. Class size is limited to 13, although with transfers, the current class size is 11, and 9. Additionally, Radford has implemented a school wide policy of using the Cornell note format for all classes, including those in special education. This is an effort to address the 50% failure rate among college freshman due to the inability to take effective notes.

Radford operates of a rotating 6 period schedule, which allows for two seventy-five minute periods, one fifty minute period, and 1 forty-five minute period per week.

Classroom layout:
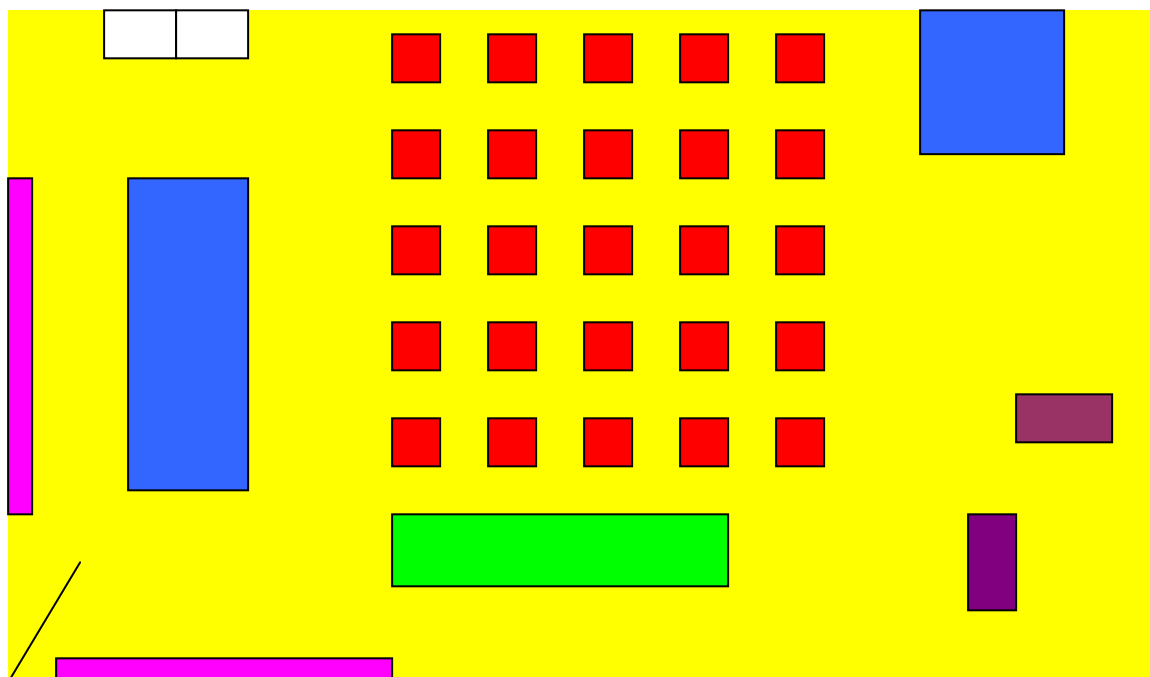
Student desks: red   storage cabinet: white   TV: orange

Work table: blue   teacher desk: purple   2 shelf bookcase: pink

Check daily table: green   Door: lower left

 white boards: 2 at front (bottom), 1on left wall, 2 on back wall (top)

I use the front boards for daily lecture notes, the back boards for unit strategies (KWL), projects, interesting websites etc. The left board has both a daily agenda, and weekly plan. The room has internet capability and 1 computer available for student use on the upper blue work table.

I allow students to sit in any of the first three rows after the first quarter and I have learned their names. I do monitor the groupings that occur, and if any group gets disruptive, I will split them up. With my small class size, I can allow this, and I think it lets the kids have some autonomy.

Radford operates under the principles of discipline, respect and responsibility, which carry into each classroom and are virtually identical to my personal philosophy, so these are the terms that best identify the classroom rules. Students are to show the discipline to be on time, do their work on time and behave as young adults at all times. They are to show respect toward each other, toward the school, towards property and not least to all staff and adults. It is the policy that students are responsible and accountable for everything they say and do, and mine as well. Students are not allowed to have cell phones in use during school, and the use of music players is very restricted. Personally, I do not allow them until the daily agenda has been completed, and then they can work on their book work with the music on low.

The daily routine begins where the students enter. I greet them by name as much as possible, and ask how their day, weekend, or life is going. They go to the check daily table and look in the period out box for their past work, and check for worksheets or other materials they will need for the day. I usually have a weird picture on the TV, like Sam, who was the world's ugliest dog, or a person with over three hundred face piercing, or hairless cats or my favorite, warnings on product labels. It is just something to make them laugh, and get them in a good mood. They then look to the side board for the Do now question for a quick write exercise. It is related to the topic we are addressing, but generally is their personal opinion. This has two purposes, first it gets them thinking openly, knowing there is no "right" answer as every opinion has a voice, and secondly it opens up the higher level thinking and their personal buy-in to the subject. They generally have about 5-7 minutes for this, and then we move into the review, which now includes reviewing any "muddy point cards" turned in the day before, then into the new material and finally a Q and A session. If time allows they can check the back board for the unit reading and do the work in the text. I use the text as a supplement, not as my primary learning tool. Finally the students fill in a "muddy point" card for areas they are still unclear about.

Prompt 2: What are the intellectual and academic development levels of this class?

My class is special education. The students read at 5-6th grade level, with writing skills varying from about third grade to seventh. Most are SLD for reading and/or writing. There are a few students with IQ's in the upper 60's, or a form of PDD. I have a few students with ADD and ADHD, and one or two with emotional disturbance.

Analytically, few are near grade level, but are somewhere around a fifth grade level. They can make basic comparisons, obvious contrasts and comparisons, explanations and judgments without scaffolding. The challenges in this area are higher level thinking problems, at least to start with. By the point of this unit I have successfully moved to basic comparisons and short essay responses for entire tests for the first time all year, but had to make sure the students knew all the concepts or ideas and the similarities and or differences between them. I could then ask questions to get them to write the essay in their own words.

Creatively, they again are not at grade level, but are nearer to grade level. They can imagine creatively if given certain parameters, but cannot create their own lab to solve a problem, for instance. The challenges are to enable them and push them to their creative limits without overwhelming them and giving them a sense of failure.

Their strength is practical thinking. When given a problem with hands on application, they jump to it and can then correlate the actions with the problem. They can connect the activity to the concepts with comprehension. The challenges in this area are getting them to effectively express what they have learned. When I did a learning styles survey, 2/3 came out kinesthetic learners, which is best placed in the practical, or hands-on thinking area.

The area of prior knowledge may be their weakest area. They have extremely poor vocabulary skills, and knowledge. The challenge in this area is that biology is a vocabulary driven science, and without the vocabulary they cannot succeed. They also suffer from poor basic science knowledge, in areas of general science, physical, space and life sciences. Without the knowledge, they have difficulties in the biological applications of the principles that should have been learned in these other classes. The challenge is that it is impossible to build on a non-existent foundation, so a lot of re-teaching and scaffolding is required.

Overall the challenge in this area is to find a way to balance the lessons, addressed growth needs, and utilizing strengths and differentiating on different skill and ability levels. There are three basic groups of students in my class: first, the students with ADD and/or ADHD, the SLD students and finally the low IQ and PDD students. Each presents a different challenge that all need to be addressed. If the lesson does not move quickly or isn't varied enough the ADD students will disengage and become disruptive as they seek stimulation. If the lesson is writing or reading based, the SLD student detached and become the problem. This can be true with intensive lecture lessons as well. Finally if the day's routines aren't adhered to, the autistic students are lost, and if the lesson moves too quickly or into higher level thinking challenges, the lower IQ students can be left behind without any sign from them.

Prompt 3: What are the collective language development characteristics of this class?

All the students speak English with no ESL in my classes, although the military students have a far greater mastery of English than the locals, which does influence their reading and writing skills, and they usually are the better readers and writers in my class. I have a few kids who are truly bi-lingual, but most know only the profanities in other languages. The challenges in English are that without being specific in spelling and definition, the local students generally cannot make self corrections based on the rules of English. Specifically, their vocabulary skills impact spelling, and their lack of knowledge of word and sentence structure means that their writing skills are very poor. They do not have grade level knowledge of syntax or grammar so sentence construction is poor as well. Their ability to connect sentences into paragraphs is poor at best. The challenge is to ring the lower level students up without losing the better ones.

Prompt 4: What are the social dynamics of this class?

Considering the three general groups I have in my class, the ADD students are usually the most prolific talkers, and will answer the most questions. They have the tendency to mentally wander off-topic and will ask those types of questions. I will generally answer them, if the question is valid, and not just a bid for attention. The SLD students are the middle of the road generally, who will participate, but only when directly asked. Finally the lower IQ and autistic students will occasionally ask a question, but are usually quiet.

Socially the class is 85% male and 15+ years old which leads to the inevitable conflict of young immature males, testosterone issues, problems with girlfriends, and their search for their own identity. Add in the problems of alcohol, gangs, and drugs to a child with less than average coping skills, or the general SPED persecution and self-defeatist complexes and behaviors, and the social dynamics are always in flux. Day to day things change, and it's almost like a soap opera at times.

That said, most of the students are respectful, although there is a significant tendency for profanity. I address that immediately, and in realistic ways. I tell the boys that girls generally don't like men who use profanity, that as an employee, their employers don't like it and as a matter of respect to me, I don't like it.

In every class there is one constant, what I call the "beta" male. This is the male student who wants to be the center of attention, and will become loud, profane and disruptive to be the center of attention. I know the real reason is control, if he controls the class, he gets the laughs, and he is "cool." He is no longer a student who has the potential and wastes it, or is the "stupid" kid. In fact he'd rather be called bad, disruptive and disrespectful than receive a compliment on his intelligence and then be held accountable. His comfort zone is the principle's office, where he is not at fault for doing poorly, because the teacher threw him out. I give him a job, a task that requires doing, and puts him in authority, such as taking attendance, passing stuff out, reading directions, or anything that seems appropriate. This gives him the control he desires, yet doesn't disrupt the class, and when I need to get them to work, he is far more likely to be cooperative.

Prompt 5: What socio-economic and cultural factors characterize this class?

Radford is 70% military, and 30% local. The local students generally come from low to lower middle income families, and overall the majority of local students are in a single parent family. Both groups also have the usual preconceptions about each other, with locals resenting the non-locals, and military students looking down on the locals. The key skills they do possess are that they are willing to work under high expectations, if they are given respect and hope.

Stage 2: Enduring Outcomes

Prompt 1: What Standards will this Unit Address?
Although standards 1-4 are addressed in some aspect in this unit, the standard that is being taught is:
Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms. (Benchmarks 5.1, 5.2)
What I mean by that is that there are lab exercises that will address standard 1, and the other standards are incorporated to some degree in the subject matter, but the focus and new material is in evolution and natural selection, benchmarks 5.1, and 5.2 specifically.

Prompt 2: What Big Ideas Characterize This Unit? (Include big ideas for science content, inquiry, and nature of science)
Content:
   Evolution states that all present forms of life on Earth come from earlier, more primitive forms.
   Natural selection is the process where those individuals most fit will generally live and produce the most offspring, driving evolution.
   Through evolution the genetic makeup of a population or gene pool will shift as the gene frequency changes.
   There are internal and external factors that affect natural selection and drive evolution, and that these factors are not always a benefit to the individual organism. External factors can include climate, habitat, predators, food, or changes in any of these among others. Internal factors include genetic and sex drive among others.
   The founder effect occurs when a few individuals from a species relocate to a <u>new</u> location/habitat and create new populations that may or may not be several different species.
Inquiry:
   Evolution be accurately simulated or predicted given that it takes place over thousands of years, and many generations.
   Natural selection be simulated or predicted accurately.
   We can simulate natural selection where so many variables are interconnected and unknown.
   We can demonstrate the changes in genes in a population to show the effects of natural selection?
   Hawaii and the Galapagos Islands both show evidence is there for the founder effect?
Nature of Science:
   Evolution cannot be proven with numerical or other empirical data, and occurs over long time spans, yet is accepted because of the idea of parsimony.
   Evolution and natural selection were considered temporary by Darwin, as he expected a more accurate theory to replace his, and did not view evolution as the same as one of Newton's Laws of physics.
   Darwin tied together the evidence from geology (Lyell- Earth's age is in many million of years, processes

can take place over millions of years), physics (Newton and laws governing nature), social studies (Malthus and social theories of fitness) and genetics (Mendel and heredity) in synthesizing the theory of evolution.

DNA has enabled genetic studies of species to more accurately relate different species than the observational and morphological method in Darwin's time.

Darwin's meticulous records and specimens gave credibility and the support to his theory of evolution when it was first released.

Prompt 3: What Enduring Outcomes will Students Acquire? (Include a connected set of memory, analytical, creative and practical outcomes)

Memory:
Define evolution, natural selection, gene frequency, genetic frequency, fit and founder effect.
Identify three external and two internal factors in natural selection.

Analytical
Compare internal and external factors and their influence on natural selection.
Explain how natural selection and evolution are related.
Explain how factors in natural selection affect gene frequency. (use the terms gene pool and genetic drift)
Compare and contrast a bottleneck and the founder effect.

Creative:
Predict the factors will be involved in a sample natural selection process.
Create a creature to fill a specific niche on another planet given certain natural selection parameters.
Predict the final gene frequency of a population after 5 generations where the homozygous allele type is fittest. Repeat with heterozygous allele as most fit.
Predict the gene frequency of a population 5 generation after a founder effect from a baseline main population with a 50/50 allele frequency.

Practical:
Connect the principles of evolution and natural selection to the Hawaiian Islands. Look at both pre and post human arrival. Identify some of the factors involved in both cases.
Find examples in the fossil record that demonstrate natural selection.
Relate the founder effect, gene frequency and the baseline starter population.

Stage 3: Evidence

Prompt 1: What evidence and applicable tasks will indicate the outcomes have been met? (Complete the table)

Enduring Outcomes	Appropriate Evidence	Applicable Tasks	D	F	S
Memory:					
Define natural selection, evolution, fit, gene frequency, gene pool , genetic drift, bottleneck, founder effect	Short answer response	Test	x		x
Identify some internal and external factors in natural selection	List in analysis/exploration part of lab report	Ant lab	x		
Analytical:					
Explain how natural selection and evolution are related	Essay	Test			x
Compare internal and external factors that influence natural selection	Written response as part of analysis/exploration part of lab report	Woolybooger lab		x	
Explain how factors in natural selection influence population gene frequency	Written response as part of analysis/ exploration part of lab report	Ant lab	x		
		Woolybooger lab		x	
		Xeno lab			x
Compare and contrast a bottleneck and founder effect	Essay response	test			x
Creative:					
Predict what factors will be involved in a lab natural selection process	Hypothesis/prediction	Ant lab	x		
		Woolybooger lab		x	
		Xeno lab			x
Create a creature that could survive on another planet given certain parameters of natural selection	Drawing/ narrative	Project		x	
Predict the final gene frequency of a population after 5 generations where the homozygous genotype is fittest, or where the heterozygous genotype is fittest.	Hypothesis/ prediction	Xeno lab			x
Predict the gene frequency of a population 5 generations after a founder effect of 5 individuals randomly drawn from a base population with gene frequencies of 50/50.	Hypothesis/ prediction	Xeno lab			x
Practical:					
Connect the principles of evolution and natural selection to the Hawaiian Islands	Journal	Personal research		x	
Find examples in nature that demonstrate evolution and natural	Journal	Personal research			x

selection using the fossil record					
Do a founder effect gene frequency and relate to base population	Lab report analysis/ exploration	Xeno lab			x

Prompt 2: Identify diagnostic, formative, and summative assessments. (Attach actual assessments)

Define natural selection, evolution, fit, gene frequency, gene pool, genetic drift, bottleneck, founder effect.

Natural selection: _____

Evolution: _____

Fit: _____

Gene frequency: _____

Gene pool: _____

Genetic drift: _____

Bottleneck: _____

Founder effect: _____

ANWER KEY

Define natural selection, evolution, fit, gene frequency, gene pool, genetic drift, founder effect. (memory)

Natural selection: <u>the process or mechanism that drives evolution.</u>

Evolution:<u> the theory that species undergo changes over time</u>

Fit: <u>best suited</u>

Gene frequency: <u>the percentage of a specific allele being in any individual in a population</u>

Gene pool: <u>All the genes alleles in a population</u>

Genetic drift: <u>the theory that as gene frequency in a population changes due to natural selection, it can drift or move away from the base population it was once part of</u>

Bottleneck: <u>the repopulation of an area or niche after a species has been reduced to a few individuals</u>

Founder effect: <u>the populating of a new geographic area by a few individuals of a species.</u>

*Prompt 3: By what criteria should the assessment product be evaluated; and what levels of mastery should be used to determine quality, proficiency, performance, or understanding? (*Attach rubrics and/or other applicable evaluation criteria)

Explain how factors in natural selection influence population gene frequency. (Analytic)

	4	3	2	1
Informed:	Analysis/ exploration uses concepts natural selection, factors, fit and gene frequency correctly	1 element missing	2 elements missing	3 elements missing
Logical	Analysis/exploration addresses: individual data, data trends, data as a whole, data anomalies	1 element missing	2 elements missing	3 elements missing

Organized	Analysis/exploration identifies and explores at least 2 internal and 2 external factors	1 element missing	2 elements missing	3 elements missing	
Balanced	Analysis/exploration addresses alternative explanation supported by theory and data	Alternative explanation mentioned supported by theory or data	Alternative explanation mentioned but supported poorly by data (1 example) or theory	Alternative explanation mentioned but not supported	

Create a creature that could survive on another planet given certain parameters of natural selection. (Creative)

	4	3	2	1
Informed	Creature addresses principles of fitness, natural selection, evolution, and justified	Creature attempted according to principles but justified with minor errors	Creature attempted according to principles but justified with major errors	Creature attempted according to principles but not justified or with significant errors
Novel	Creature has 3+ novel adaptations that are within reason	Creature has 2 novel adaptations that are within reason	Creature has 1 novel adaptations that are within reason	Creature matches an similar Earth creature
Compelling	Creature is believable and compelling	Creature believable and with interesting elements	Creature believable	Creature attempted
Task appropriate	Creature addresses all given parameters	Creature addresses 4-5 given parameters	Creature addresses 2-3 given parameters	Creature addresses 1 given parameters

Stage 4: Design Your Instructional Blueprint
(Expand boxes to whatever space you need to record information for each lesson in your unit)

Lessons* (Attach complete Lesson Plans for major lessons)	Student Learning Objectives	Essential Questions	Instructional Strategies/Tasks to Support Differentiation (Include a balance of *analytical, creative,* and *practical* activities)	Formative Assessments
1 **Unit pre-test/ Basic related/ vocabulary review/ Ant lab**	To understand that a species can change over time	What happens in this lab? How did the ant populations change? What caused the changes?	Virtual lab/ journal writing 1-Unit pre-test 2- Review past learned vocabulary 3- Read lab procedure 4- Class brainstorm 5- Lab (on computer and TV) 6- Essential questions 7- journal writing	Muddy point card Journal exit pass: lab book- lab data, 3 essential questions, 3 original questions
2 **Lab review/ evolution and natural selection/ Evolution and fossils**	To correlate the experience of the lab with the theory of evolution and process of natural selection Identify and explain fit, evolution, natural selection	What is fit? What ant was fittest? Why? What is evolution? How did the ants evolve? Did individual ants evolve? What is natural selection? What was the effect of natural selection on the ants?	Virtual lab/ lecture/discussion/ journal 1- review/ finish lab if needed 2- muddy points 3- answer personal exploratory questions from day 1 4- group discussion essential question from day 1 5- introduce new concepts- Cornell note style a. evolution b. natural selection 6- essential questions 7- journal writing HW: Find a modern animal and trace its ancestry in the fossils New questions you have in the lab	Muddy point card Journal exit pass: lab book-lab exploration natural selection and evolution questions Note book- Cornell notes
3 **Lab review/ Factors in evolution/ evolution genetics**	To understand there are internal and external factors that drive natural	What alleles disappeared in the lab? Why? How does this relate to gene	Virtual lab/ lecture/discussion/journal 1- review evolution/ natural selection/ muddy points 2- Group discussion essential questions from day 2 3- Introduce new concepts- Cornell note style a. external factors 1. climate	Muddy point card Journal exit pass: lab book- lab exploration

	selection and the evolutionary process and how they connect to lab

Identify and explain 2 external and internal factors on natural selection | frequency and the ant gene pool?

What internal/ external factors were involved in the lab?

What happened to the gene frequency of an ant population when a homozygous form was most fir? Heterozygous form?

What can cause populations of the same species to "genetically drift" apart? | 2.   Habitat
         3.   niches available
         4.   food
         5.   predators
   b.   internal factors
         1.   genetics
         2.   sex
   c.   evolution genetics
         1.   gene pool
         2.   gene frequency
         3.   genetic drift
4-   Journal writing | internal/ external factors and genetic questions

Note book- Cornell notes |
| **4 Review/ Types of evolution/ homologous/ analogous vestigial structures** | To understand the types of evolution and how physical structures in animals and plants change in response to natural selection factors

Be able to explain radiative, divergent convergent and co-evolution

Be able to explain | Why do dolphins, ichthyosaurs, and sharks all look so similar?

Why do whales have hips?

Why do bees and butterflies have the same type of mouth?

A dragonfly wing and a bat wing both help the animal | PowerPoint/ lecture/ discussion/journal
    1.   review evolution/ natural selection/ factors in natural selection/ evolution genetics/ muddy points
    2.   Group discussion essential questions from day 3
    3.   Powerpoint with Cornell notes
    4.   Worksheet on PP
    5.   Journal writing | Muddy point card

Journal Exit pass:

Note book- Cornell notes

Journal write: In 1 million years what might humans have evolved into? What might be vestigial then? |

	analogous, homologous , and vestigial structures

Be able to explain gradualism and punctuated equilibrium

Understand role and use of bell curves to explain the evolutionar y process | fly but are different approaches to the same function. Why does this happen? What is it called? What are the wings called?

What are some vestigial structures in humans?

How do these processes impact or effect the gene pool and gene frequency of a population?

What is a bell curve?

How do we use bell curves in evolutionar y studies? | | Worksheet |
| **5 Review/ Darwin and the science of the times** | Understand Darwin's theories were not "stand alone" but influenced and linked to other ideas in science and sociology

Identify key scientific ideas that influenced Darwin | What were the new ideas in science Darwin time?

How did Darwin tie them all together? | Lecture/ graphic organizer/ journal
1- review factors in evolution and evolution genetics/ forms of evolution/ structures/ muddy points
2- Group discussion- what was Darwin's time like?
3- Introduce contemporary theories of Lyell (geology), Malthus (sociology), Mendel (genetics), Newton (physics) students fill in graphic organizer
4- Group discussion – based on the graphic organizer, what do you think the impact was on Darwin as he developed his theories?
5- Journal writing
6- Reminder- fossil lineage due Monday | Muddy point card

Journal Exit pass:

Note book: Graphic organizer

Journal write: In your own words, connect Darwin's theory to the others in his time. |
| **6 Woolyboo ger lab** | Apply terminology | What factors of | Lab
1. Review last week's concepts/ week's muddy points | Muddy point card |

	and concepts introduced to develop understanding Identify and explain factors in a simulated natural selection Identify and explain changes in gene frequency and a population gene pool in a simulated natural selection	natural selection are involved? How did this cause the woolyboogers to change? How were the internal factors related to the external ones? What happens to the population gene pool and gene frequency?	2. Hand in fossil lineage 3. read lab procedure 4. make predictions of factors and gene frequencies 5. lab 6. Essential questions 7. Journal writing HW: 3 personal questions	Journal exit pass: Lab book: lab prediction, data, exploration (start), essential questions written down
7 **Lab discussion/ Create a creature intro**	Apply terminology and concepts introduced to develop understanding Be able to apply a given set of natural selection parameters to create a creature that will survive	What problems did you encounter? What can you do to make the lab better?	Discussion/ analysis/ 1. Introduce create a creature project/ muddy point 2. Review lab/ muddy points 3. Group discussion on predictions/ essential questions 4. Personal questions and discussion 5. Essential questions 6. Journal writing	Muddy point card Journal exit pass: Lab book- exploration essential questions written down
8 **Review/ Darwin, the Beagle, and the Galapagos**	Understand that Darwin's theories were based on direct observations	How do seashell fossils get up on top of mountains? The earthquake demonstrated what to Darwin? The animals of the Galapagos showed	PowerPoint/ video/ journal 1. review essential questions of lab/ muddy points 2. group discussion of essential questions 3. Video 4. PP Galapagos finches and tortoises- Cornell notes 5. Essential questions 6. Journal write	Muddy point card Journal exit pass: Journal book: Cornell notes essential questions Journal write: What problems do you see in Darwin's theories?

		Darwin what kind of evolution. What factors were involved? What factors were NOT involved?		

9
Galapagos and Hawaii
	Understand the founder effect. Understand bottleneck.	How are the Galapagos and Hawaii similar? Different? What happens with both a bottleneck and in the founder effect in regards to population genetics?	Discussion/ journal
			1- review Darwin and the Galapagos/ muddy points
			2- Read <u>Cheetah Genetics and Distemper</u>
			3- Small group questions : Introduce bottleneck and founder effect- Cornell notes
			    A. How are the Galapagos and Hawaiian Islands similar?
			    B. How are the Galapagos and Hawaiian Islands different?
			    C. What were some key species differences between the Hawaiian and Galapagos Islands?
			    D. What were some unique adaptations for each set of islands?
			    E. What are some key differences in the way that humans interacted with the native species on the Galapagos and Hawaii?
			    F. Looking at the cheetah and Galapagos finches, both now exist after the population was reduced to a few individuals. What are some key differences in both the cause of the population reduction, and resulting repopulation?
			4- Roundtable discussion bottleneck and founder effect.
			5- Journal write
			6- Reminder create a creature presentation tomorrow
				Muddy point card
				Journal Exit pass:
				
				Journal book:
				 Cornell notes
				
				Small group discussion questions
				
				Journal write:
				 What is the difference between a bottleneck and the founder effect?

10 **Create a creature presentation**	Develop peer and self assessment techniques. Meets Hawaii state GLO 1, 3, 4	Does the animal show knowledge of the principles of evolution and natural selection? Does the creature address these principles in a	Peer/ self-assessment based on rubric 1. Review bottleneck/ founder effect/ muddy points 2. review rubric 3. presentations 4. self-evaluations 5. Roundtable: create a food web of creatures	Muddy point card Journal Exit pass: hand in assessments

		creative or new way? Is the creature believable and compelling? Does the creature address all the task parameters?		
11 **Xeno lab**	Apply learning thus far to: Make predictions for evolutionary processes and results Identify, compare and contrast factors in natural selection	Can you predict genetic futures of a population? Can you predict the genetic frequency of 5 individuals from a population with a 50/50 allele frequency? Can you predict the genetic frequency of a population 5 generations from a founder population?	Lab 1. Review concepts/ muddy points 2. Read lab procedure 3. Essential questions 4. do lab 5. Journal write HW: 3 personal questions for exploration	Muddy point card Journal Exit Pass: data/, prediction, essential questions,
12 **Lab discussion/ review**	Apply learning thus far to: Make predictions for evolutionary processes and results Identify, compare and contrast factors in natural selection	How accurate were your predictions to the data you gathered? Why? Was there an unknown that could have influenced the results?	Finish lab if needed, review exploration thus far 1. Review lab/ muddy points 2. Complete lab if needed 3. review essential questions from day 11 4. Review personal questions from day 11 5. Essential questions 6. Test review	Muddy point card Journal exit pass: exploration continued

		What problems did you encounter? What could you do to make the lab better?		
13 Unit Exam	N/A	N/A	N/A	N/A
14 Unit tie up/ hand in unit journal/ exam review	Self-assessment on effort and learning in unit	What was your muddy point? What did you learn? What worked for you? What didn't help you understand?	Discussion 1- Test review 2- Test analysis 3- Group discussion	Exit pass: Unit review