

LESSON PLAN: EMBRYOLOGY, BIOGEOGRAPHY, AND LIZARD EVOLUTION LAB DAY 1

Date: Thursday 4/14/16 **Period(s):** 1, 4, 5 **Class:** S138 – Honors Freshman Biology

Central Focus:

- Evolution is supported by multiple lines of evidence that complement each other
- Molecular evidence supports evolution because all life has a common genetic code and biochemistry
- Comparison of DNA and protein sequences for common genes can determine how closely related various species are
- Integration of many types of evidence leads to more strongly supported hypotheses about relationships between species

Standards: NGSS HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of evidence.

District 211 Critical Learning Standard 6d: Evolution of Populations

District 211 Critical Learning Standard 6e: Evidence for Evolution

Learning Objectives:

- Students can explain why the common genetic code and common biochemistry are evidence for evolution.
- Students can infer evolutionary relationships and create phylogenetic trees based on DNA or protein sequence differences between species, and can explain why this is an acceptable way to measure evolutionary relatedness.
- Students can integrate biogeographic, geological, anatomical, and molecular genetic evidence to make an argument about the phylogeny of the *Gallotia* lizards of the Canary Islands.

- **Assessments:**

Formative: “How Are Those Asses Related?: Biogeography and Phylogeny of Horses, Zebras, and Asses”, Predicting Evolutionary Relationships worksheet, observation and discussion during lab time

Summative: lab packet due Friday (tomorrow!)

Instructional Resources and Materials:

For students: “How Are Those Asses Related?: Biogeography and Phylogeny of Horses, Zebras, and Asses” (Document K, paper), “Evidence for Evolution Part 4: Molecular Evidence” Powerpoint – student copy (Document L), Molecular Evidence – Predicting Evolutionary Relationships – NOVA (Document M), Canary Island Lizard Evolution Lab (Document H, Schoology, from yesterday), Lizard Lab DNA Sequences (Document N, Schoology)

For teacher: “Evidence for Evolution Part 4: Molecular Evidence” Powerpoint – teacher copy (Document O)

Instructional Strategies and Learning Tasks

- How Are Those Asses Related?: Biogeography and Phylogeny of Horses, Zebras, and Asses
- Notes: Molecular Evidence
- Predicting evolutionary relationships with cytochrome c protein sequences
- Canary Island Evolution Lab: Parts 3 and 4

Introduction: How are you going to get the students to recall yesterday's lesson and how it relates to what you are doing today? How will you capture student attention?

Introduction Time Frame	Introduction Activity Description
0:00-5:00	"How Are Those Asses Related?": Biogeography and Phylogeny of Horses, Zebras, and Asses Collected for formative assessment

Instruction: Include time estimates for each of your activities and also plan for regular checks for understanding.

Instruction Time Frame	Instruction Activity Description
5:00-12:00	Evidence for Evolution Part 4: Molecular Evidence powerpoint
12:00-20:00	Molecular Evidence – Predicting Evolutionary Relationships worksheet Students will work in groups of 4, but each student must complete the worksheet on Schoology for completion credit (formative grade)
20:00-48:00	Canary Island Lizard Evolution Lab Day 2 Parts 3 and 4 data collection must be done in class. Entire lab is due tomorrow. While students work, I will be walking around to check whether students have completed parts 1 and 2 for a homework grade. I will then be circulating to observe, assist, and ask probing questions.

Closure: How will you tie the lesson together and reemphasize the concepts presented? How will you know if your students "get it" by the end of your lesson?

Closure Time Frame	Closure Activity Description
48:00-50:00	Mini recap of molecular evidence, remind kids that the entire lab is due tomorrow!