LESSON PLAN: EVIDENCE FOR EVOLUTION AND FOSSIL RECORD

Date: Monday 4/11/16 Period(s): 1, 4, 5 Class: S138 – Honors Freshman Biology

Central Focus:

- Evolution is supported by multiple lines of evidence that are consistent, thorough, and complement each other.
- The fossil record provides evidence about when species appeared or went extinct, when anatomical features first developed. Fossils can be dated accurately by two means. Transitional fossils show features from both of two now distinct lineages.

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 6b: Evidence for Evolution

Learning Objectives:

- Students can define scientific theory and explain why the "theory of evolution" is generally accepted as true.
- Students can explain the importance of the fossil record as evidence for evolution.
- Students can create a model to demonstrate how half-life measurements are used for radiometric dating of fossils and can explain a model of relative dating.
- Students can give an example of a transitional fossil and explain the importance of transitional fossils as evidence of evolution.

Assessments: *Formative:* "Just a Theory" cartoon discussion, observations during lab time, Transitional Tetrapod Fossil guided viewing, observations and probing questions during stations

Summative: Half-life of M&Ms mini-lab, fossil record worksheet, Case Study: Whale Evolution worksheet

Instructional Resources and Materials:
For students:

- "Evidence of Evolution Part 1: Fossil Record" Powerpoint notes student version (document A, Schoology)
- Half-life of M&Ms mini-lab (document B, Schoology)
- Transitional Tetrapod Fossil video link (https://www.youtube.com/watch?v=HyJAV-Jf9do)
- Transitional Tetrapod Fossil guided viewing sheet (document C, Schoology)
- Fossil record and relative dating worksheet (documents D/E = page 1/2, Schoology)
- Whale Evolution transitional fossils worksheet (document F, Schoology)

For teacher:

- "Evidence of Evolution Part 1: Fossil Record" Powerpoint teacher version (document G)
- Lab materials: big bag of M&Ms, big bag of Skittles, 15-20 zip lock bags
- Transitional Tetrapod Fossil video link (https://www.youtube.com/watch?v=HyJAV-Jf9do)

Instructional Strategies and Learning Tasks
"Just A Theory": A Cartoon Discussion (clarify meaning of scientific theory)
Notes: Intro to Evidence for Evolution and the Fossil Record
Radiometric dating M&M mini-lab: modeling half-life
Transitional Tetrapod Fossil video guided viewing
Fossil record and relative dating worksheet

Whale Evolution transitional fossil worksheet

<u>Introduction:</u> 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 0:00-1:00 1:00-3:00 3:00-5:00	"Just A Theory": A Cartoon Discussion • Ask kids what they think "theory" means in science – at least 3 opinion • Give them examples on next slide: gravity, cell theory, etc. • Think about these examples, then discuss with a friend: do they change what you think a "scientific theory" is? • Share ideas with class and define scientific theory • <u>Scientific theory</u>: a unifying explanation of an aspect of the natural world that has been repeatedly tested and confirmed by experiments and observations

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

Instruction Time Frame	Instruction Activity Description
5:00-10:00 10:00-25:00 25:00-30:00 30:00-48:00	Notes: Intro to Evidence for Evolution and Fossil Record • Students take guided notes on their powerpoint copy iPads • 1 slide intro to types of evidence • 4 slides on fossil record and dating Radiometric dating M&M mini-lab: modeling half-life – data collection Notes continued: Transitional fossils (one slide) NOVA: Tetrapod Transitional Fossil – guided viewing of video (~3:30) Fossil stations: • Fossil record and relative dating worksheet • Tetrapod Transitional Fossil guided viewing sheet • Whale Evolution transitional fossil worksheet • Complete M&M mini-lab For stations, students can work in groups of up to 4. AT LEAST 2 stations must be completed and shown to Ms. Gill by the end of the period. Any students who do not complete 2 stations by the end of the period will not be able to choose their own groups tomorrow. All stations are due at the beginning of class tomorrow. I will be circulating to answer questions, keep groups on track and on time, and check group work when they finish stations. This will allow me to do formative checks with the students before the period ends so I can assess whether students understand the day's material and know what misunderstandings I need to address in further lessons.

<u>Closure:</u> How will you tie the lesson together and reemphasize the concepts presented? How will you know whether your students "get it" by the end of your lesson?

Closure Time Frame	Closure Activity Description
48:00-50:00	Sprint recap: • Many types of evidence support the theory of evolution. • The fossil record is an important type of evidence. • Fossils tell us when species existed and went extinct, how they lived, and when traits first developed. • We can find ages by radiometric or relative dating. • Transitional fossils demonstrate "links" between distinct lineages