Biological Evolution

LESSON OBJECTIVE
- Students will understand relative age dating and look at changes in fossil appearance over geologic time

GRADE
- 8

STANDARDS
- Life Science
- ELA

TIME REQUIRED
- 45-60 min

VOCABULARY
- Evolution
- Relative dating
- Law of Superposition
- Index fossils
- Intermediate fossils

MATERIALS
- Student handout (2 pages per student)

RECOMMENDED ASSESSMENT
- Student drawings

introduction

Students will learn about the law of superposition, relative dating, and how fossils are used to show patterns in evolution. They will draw a sequence of fossil layers as events happen at a location and draw an evolutionary chain for a real or imaginary creature of their choosing.

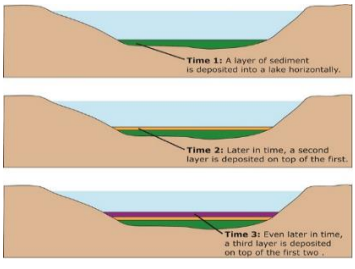
State Standards

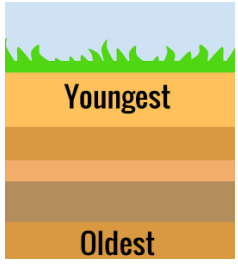
MS-LS4-1:Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
8.RN.2.1: Analyze what a text says explicitly as well as draw inferences from the text through strong and supportive textual evidence.
8.RN.2.2: Analyze the development of a central idea over the course of a text, including its relationship to supporting ideas; provide a detailed, objective summary of the text.

Lesson Plan

Background Knowledge –
Students should have an understanding of the rock cycle and the types of rocks. This lesson builds upon previous knowledge of sedimentary rocks and delves into *stratigraphy*, a branch of geology concerned with the study of rock layers and their relationship to the geologic time scale.

Activity –
1. Teach students about the Law of Superposition. *The Law of Superposition states that a sedimentary rock layer is older than the layers above it and younger than the layers below it as long as the layers are not disturbed.* An easy way to think about this is a laundry hamper. When your clothes are dirty, you throw them into the hamper. The clothes on the bottom of the hamper have been there the longest and are therefore the "oldest". The clothes on top have been more recently deposited and are "younger". The deeper we dig into our pile of clothes or into the earth, the further back in time we go.





Relative Dating means that we order the rocks in sequence without providing actual dates to them. We can simply say that one rock unit is older or younger than another.

Fossils are formed when a living organism dies and is quickly buried by sediment. We can use the fossils we find in sedimentary rocks to help us figure out how old the rocks are. *Index fossils are fossils found over a wide region and only during a narrow time range.* Since that organism was only around for a short period of time, we can use it to say that all rocks that contain that fossil must be from that time period.

We can take this idea further and look at the layers of rocks and what fossils are present to see how life has evolved into more complex forms as time has gone by (sort of like how your fashion sense may have evolved as you grew up and deposited new clothes in the hamper). An *intermediate fossil* (also known as *transition fossil*) is one that seems to be an evolutionary transition between two groups of organisms. Intermediate fossils will have traits common to both an ancestral group and its later descendants, so we should be able to see the process of evolving from one form into another.

2. Relative Dating Practice: Student Worksheet. Have students draw graphics that show what event is being described in the caption below it (see student handout).

3. On the last student handout page, students can get into groups of 4 to draw a creature evolving as time goes by. The first student will draw an ancient creature on their paper and then everyone will pass their papers to the right. The second student will draw the "modern-day" creature. The third student will draw the intermediate creature that would have features of both. The fourth student will draw the future evolution of their creature.

Post Activity –
Create a stratigraphic sandwich to show how layers are deposited but sometimes disturbed! Give students supplies to create a sandwich. Each ingredient can represent a specific type of rock (ex: bread = limestone, sliced ham = sandstone, pickles = mudstone). Each student group can be a different location. All locations will have the same rock type (ingredient) deposited at the same time, but some ingredients may get eroded ("eaten") by the students at some locations. Rocks can only be eroded if they are on the surface and aren't buried! Students can practice the Law of Superposition and correlate how old their layers are with other groups in the room.

Discover Further

Extending the Lesson –
Students can share their creatures with the class and explain what features their intermediate creatures and future creatures need to have in order to fit into the evolutionary chain.

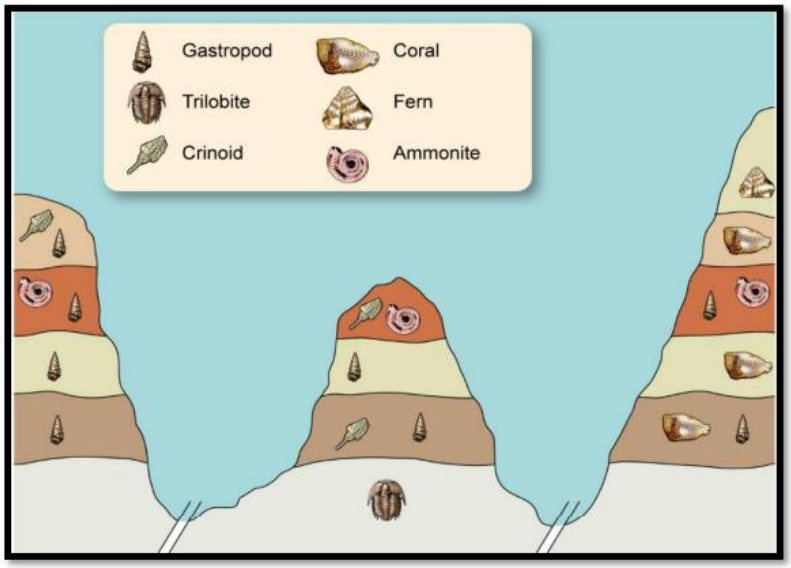
Learn More –
Evolution is what helps animals adapt to survive in their environment. It took millions of years for giraffes to have such long necks, but now that they do, they can reach food no other animal can. The next time you visit the zoo, look at the animals and think about what their ancestors looked like and why they evolved to look the way they do. Learn more about the animals at the Fort Wayne Children's Zoo at kidszoo.org.

Biological Evolution

Name: _____

Relative Dating Practice

The Grand Canyon was carved out by water millions of years ago exposing many layers of sedimentary rock. Occasionally, scientists find fossils in the various layers. They never find fossils of mammals buried underneath fossils of trilobites or other small marine creatures. They also never find fossils of ancient creatures like dinosaurs in the same rock layers as modern creatures like rabbits. Scientists find the same patterns and sequences of fossils around the whole world, so even though relative dating isn't a way to get an exact age, it's a pretty good way to figure out how old something is.



1. Which fossil species seems to be the oldest?

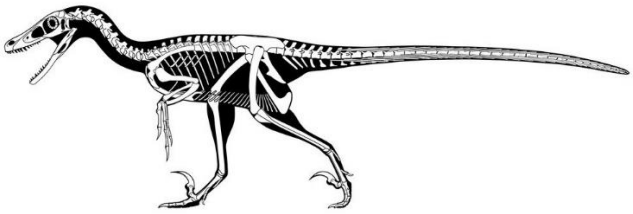
2. Which species seems to have evolved more recently?

3. Which species evolved first: ammonite or crinoid stem?

4. Summarize in your own words why relative dating is good evidence for the theory of evolution. Use at least one example from the diagram to support your answer.

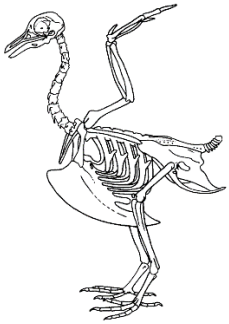
5. How can we study fossils to understand evolution?

6. An *intermediate fossil* (also known as *transition fossil*) is one that seems to be an evolutionary transition between two groups of organisms. Intermediate fossils will have traits common to both an ancestral group and its later descendants, so we should be able to see the process of evolving from one form into another. The images below show the bones of a velociraptor (a feathered reptile), an archaeopteryx, and a modern chicken (bird). Explain what features the archaeopteryx has that we know it is an intermediate fossil showing the evolution from reptile ancestors to birds.



Velociraptor

Archaeopteryx



Chicken

7. Using the picture, describe what is happening to the appearance of the fossils in terms of evolution.