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| **Subject:** Science | **Grade:** 6 | **Unit ID:**  |
| **Unit 2:** Inside Earth’s History | **Length:** 2-3 weeks |
| ***Stage 1: Desired Results*** |
| **Standards:****Content Standards:****6. MS-ESS1-4** Analyze and interpret rock layers and index fossils to determine the relative ages of rock formations that result from processes occurring over long periods of time.Clarification Statement: Analysis includes Laws of Superposition and Crosscutting Relationships limited to minor displacement faults that offset layers. Processes that occur over long periods of time include changes in rock types through weathering, erosion, heat, and pressureState Assessment Boundary:Strata sequences that have been reordered or overturned, names of specific periods or epochs and events within them, or the identification and naming of minerals or rock types are not expected in state assessment.**6. MS-ESS2-3** Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence that Earth’s plates have moved great distances, collided, and spread apart.Clarification Statement: Maps may show similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). similar to Wegener's visuals. State Assessment Boundaries:Mechanisms for plate motion or paleomagnetic anomalies in oceanic and continental crust are not expected in state assessment. **6. MS-LS4-1** Analyze and interpret evidence from the fossil record to describe organisms and their environment, extinctions, and changes to life forms throughout the history of the Earth.Clarification Statement: Examples of evidence include sets of fossils that indicate a specific type of environment, anatomical structures that indicate the function of an organism in the environment, and fossilized tracks that indicate behavior of organisms.State Assessment Boundary: Names of individual species, geological eras in the fossil record, or mechanisms for extinction or speciation are not expected in state assessment.**6. MS-LS4-2** Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms.Clarification Statement: Evolutionary relationships include Include (a) Some organisms have similar traits that serve similar functions because they were inherited from a common ancestor, (b) some organisms have similar traits that serve similar functions because they live in similar environments, and (c). some organisms have traits inherited from common ancestors that no longer serve their original function because their environments are different than their ancestors’ environments.**Practice Standards/Concepts & Skills:**1.Asking questions (for science) and defining problems (for engineering)2.Developing and using models4.Analyzing and interpreting data7.Engaging in argument from evidence8.Obtaining, evaluating, and communicating information  |
| **Overview:**[***Guide***: *This is a brief description of the unit. It explains the unit's focus and/or theme and provides a summary of what students will learn. - delete*]**FOCUS LANGUAGE GOALS:*** Engage in sustained, complex and successful scientific inquiry.
* Engage in public discourse of scientific and technical issues in the news or the community.
* Analyze the implications of earth as a set of interconnected systems -- atmosphere, hydrosphere, geosphere, and biosphere -- when making personal and civic decisions. (ess)
* Use principles of the physical world and genetic programming to analyze living systems. (ls)
* Make personal and civic decisions that respect how living systems maintain balance and stability, minimizing impact on factors that disturb stability. (ls)
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| **Understandings*** The geological time scale interpreted from rock strata provides a way to organize Earth’s history.
* Earth’s systems continually interact at different rates of time, affecting the Earth locally and globally, including changes in rock types caused by weathering, erosion, heat and pressure.
* Earth’s continents have moved over time, which is supported by fossil evidence, type of rock, and plate and seafloor structure.
* Fossils provide evidence to support that Earth’s environment has changed over time causing extinctions and changes to various life forms.
* Anatomical structures support evolutionary relationships among and between fossil and modern organisms.
 | **Essential Questions*** How do rock layers tell us about Earth’s history?
* How do scientists study Earth’s past?
* How do Earth’s surface features change over time both locally and globally?
* How does environment affect the structure and function of living things?
* Why is it important to understand that different organisms share similar body structures?
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| **Knowledge:** *Students will ...***Content:*** relative dating of rock layers requires the law of superposition and index fossils
* the fossil record is used to create Earth’s geologic time scale
* processes that change Earth’s rocky surface include weathering, erosion, heat and pressure
* Earth’s continents have collided and spread apart again
* Wegener’s theory of Continental Drift is supported by fossil and geological evidence
* evolution is the change in organisms over time
* the fossil record shows how adaptations of organisms have evolved to make them better suited for their environment and provides a record of extinction events
* common traits and structures can be a result of similar function, environment, and/or common ancestor

**Language:*** list language knowledge

**Vocabulary:** [**(see definition of CCSS tiered vocabulary)**](https://drive.google.com/open?id=0B1oO5U3iU008Q1ZGaEpFeFpLVnc)

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| **Tier 1** | **Tier 2** | **Tier 3** |
| Everyday words introduced | Words that differ by context | Words specific to content area |

 | **Skills**: *Students can ...***Content:*** constructing explanations and designing solutions - using evidence (e.g., measurements, observations, patterns) to support a relationship between fossils and rocks in the dating process. (MS-ESS1-4)
* developing and using a model to describe Wegener’s theory of continental drift (MS-ESS2-3)
* using maps and associated skills to determine the distribution of fossils and rocks, and continental shapes (MS-ESS2-3)
* writing arguments to support claims with clear reasons (MS-ESS2-3) e.g. - how fossils of the same organism appear on different continents
* constructing explanations of how species that are closely related have similar evolutionary histories (MS-LS4-1)
* using evidence from the fossil record to draw conclusions about evolution of life on Earth (MS-LS4-1 and 2)(MS-ESS2-3)
* giving examples of homologous structures and explaining their importance to evolution (MS-LS4-1 & 2)(MS-ESS2-3)
* writing arguments to support claims with clear reasons (MS-LS4-1 and 2)(MS-ESS2-3)
* identifying the importance of fossils as evidence of evolution (MS-LS4-1 and 2)

**Language:*** list language knowledge
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| ***Stage 2: Assessments*** |
| **CURRICULUM EMBEDDED PERFORMANCE ASSESSMENT (PERFORMANCE TASKS)**CEPA:[Our Changing Planet-Project Based Learning Activity](https://sites.google.com/a/melroseschools.com/earth-system/) **OTHER EVIDENCE**: Formative Assessments:* research notes/science notebooks
* draft of argumentative essay
* responses to guiding questions (verbal and written)
* lab reports
* observations and completed work samples from group work
* homework

Summative Assessments:* unit test
* Quizzes
* [Compelling Evidence for Continental Drift](https://docs.google.com/document/d/1rL4AKDHKdMKWfk-9V5N8TwztIgtHBn5ZAsvyYUAhtEE/edit?usp=sharing)

**Self-Assessment:** * [Self Assessment](https://docs.google.com/document/d/1FwQySUrtqee_5s4FqCAdyPByQciQlonC0I3GD93F7yM/edit?usp=sharing)
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| ***Stage 3: Learning Plan*** |
| **Pre-Assessments of Requisite Knowledge, Possible Pre- or Mis-conceptions****Pre-Assessment*** [PreTest: Earth’s Dynamics](https://docs.google.com/document/d/1nufCxhJKALGyTEr8peL06Ae1kgRlAalmnOts1rO-25E/edit?usp=sharing)

**Hook Activities:*** [Great Fossil Find Background information](http://evolution.berkeley.edu/evolibrary/teach/ensi/ensi_great_fossil_find.html)
* [Mystery Bones Pre-Unit Activity](http://mjksciteachingideas.com/pdf/MysteryBones.pdf)

 **Possible misconceptions*** Fossils are petrified remains of dead animals and plants.
* Fossils of tropical plants cannot be found in cold or dry areas.
* Fossils only represent bones and shells of extinct animals. Soft tissues can never be fossilized.
* Geologic time can be described using hundreds of years ago. (As concrete learners, students have a hard time grasping the large time frame of the geological time scale.)
* All rocks and planets were formed at the same time.
* We know everything that has happened since the beginning of time
* There is a difference between accuracy and precision.
* Oldest sedimentary rock layers are not always located below younger sedimentary rock layers.
* Plate movement is slow (millimeters or centimeters per year) that the forces generated by this movement do not affect rock

**Learning Events:****Question**: What are fossils?**Hook:** [Fossil Song](http://safeyoutube.net/w/NV6c)**Fossils (Suggested length = 2 Weeks (55 minutes a day X 5)** Engage students with activities to discover that fossils are traces or remains of living things found in sedimentary rock and explore how they are formed. **6. MS-ESS1-4 (MA)**Fossils tell about how organisms and environments have changed over time **6. MS-ESS1-4 (MA)**Resources for Lesson 1:* Slideshow: [Coninental Drift](https://docs.google.com/presentation/d/1pI-ux9il4Anj7rEc-ss-c5VW1G8vW-0PNv2hoKj-uT4/edit?usp=sharing)
* [Cookie Fossil Dig](https://drive.google.com/file/d/0B5VAWVjvl8irR1NXTjRtT3YzaEk/view?usp=sharing)
* [Trace Fossil Activity](https://www.teacherspayteachers.com/Product/Fossils-Experiment-Freebie-2141605) - Teachers Pay Teachers
* [Sedimentary Rock Layer Puzzle](https://www.amnh.org/explore/curriculum-collections/dinosaurs-activities-and-lesson-plans/solve-a-sedimentary-layers-puzzle/)
* [Dating the Fossil Record Activity](https://docs.google.com/document/d/18rlo4tm4pA282PWdisD9Pz_v5AjcKTUPuOwULTMPbn0/edit?usp=sharing)

**Relative Age and Geologic Time (Suggested length = 2 Week (55 minutes a day X 5)** Engage students with activities to discover how scientists determine the relative age of rocks. Rock layers can be determined by the law of superposition, clues from igneous rock and the use of index fossils**6. MS-ESS1-4 (MA)**The geologic time scale and fossil record show how earth and organisms have changed over time. **6. MS-ESS1-4 (MA)**Resources for Lesson 2:Introduce the concept of relative age and and the law of superposition.* [The 4.5 billion-year history of life on Earth compressed into 2 minutes video clip](http://www.huffingtonpost.com/2012/11/29/evolution-of-life-on-earth-video-45-billion_n_2212926.html)
* [Understanding Geologic Time Webquest](http://www.ucmp.berkeley.edu/education/explorations/tours/geotime/index.html)
* [Slides on law of superposition](https://docs.google.com/presentation/d/1RgTWVvLjCYWRz7uWhaw_mDyy68PWx7bS6Y8EGFsfGj0/edit?usp=sharing)

Students answer a series of questions using scholarly websites to gain further knowledge * [Getting into the Fossil Record webques](https://docs.google.com/document/d/1N7gX2oL4kpk7-BjqSkGkoHr-P5ikJQ24HEOCKTIBrJk/edit?usp=sharing)t
* [Stories from the Fossil Record Webquest](https://docs.google.com/document/d/1j8W4sl8tRoGdB4d_-S0gOtLMD3eCqUemRLlFETV0pNY/edit?usp=sharing)

**Hook: Did ancestors of whales walk?****Fossil Evidence of Evolution (Suggested length = 2 Weeks (55 minutes a day X 5)** **2yuyuq**Engage students in activities that show that species with similar evolutionary histories are more closely related.Evolution is the gradual change in a species over time **6.MS-LS4-1 (MA**)Fossils provide evidence that organisms have changed over time **6.MS-LS4-1 (MA)**The fossil record shows that many different organisms have lived on Earth at different times. **6. MS-LS4-1 (MA)**Resources for Lesson 3:* [The Fossil Evidence for Evolution](https://mass.pbslearningmedia.org/resource/tdc02.sci.life.evo.lp_fossilevid/the-fossil-evidence-for-evolution/#.WYn2LNMrK7o)

Groups of organisms have changed over time or have become extinct.**6**.**MS-LS4-1 (MA)**Homologous, analogous and vestigial structures provide evidence of common ancestry  **6.MS-LS4-2 (MA)*** [Comparing Homologous Structures Activity](https://drive.google.com/file/d/0B6-r9o4PQupUTkRkQXFKNXFrMk0/view?usp=sharing) - Student Lab
* [Homologous Structures activity](http://betterlesson.com/lesson/637263/homologous-structures-evidence-for-evolution) - Teacher Resource

**Hook: How is it possible for a palm tree to be found on the coast of Alaska?*** **Plate Tectonics (Suggested length = 2 Weeks (55 minutes a day X 5)**

Engage students in activities that show fossil distribution, continental shapes, and seafloor structures, which provide evidence to support Wegener’s theory of continental drift **6. MS-ESS2-3 (MA)**Resources for Lesson 4:* NOVA four part series: The Making of North America (Part 1- Fossils and Continental Drift)

Class Discussion with PowerPoint on Continental Drift * [PowerPoint on Continental Drift](https://docs.google.com/presentation/d/1KIYbGObraD93Wdveylga0sIr6fmeljS3a4UVYsIZKos/edit?usp=sharing)
* [Continental Drift Key Terms and Ideas](https://docs.google.com/document/d/1SC2jKOSz2wnTF-961M-Pzg5WnYhvVexJaLXhfBRrsYg/edit?usp=sharing)
* [Analysis of Continental Drift Article and Class discussion](https://docs.google.com/document/d/1CU2gqpI2ht7JmPh74hwCDSh9o12Wa243NImKvwBL9vw/edit?usp=sharing)

Students participate in a series of activities using evidence to support Wegener’s theory of continental drift.* [Wegener's Puzzling Evidence Continental Drift Activity (from USGS)](https://volcanoes.usgs.gov/vsc/file_mngr/file-139/This_Dynamic_Planet-Teaching_Companion_Packet.pdf)
* [Wegener’s Puzzling Continents Lab](https://www.npsd.k12.nj.us/cms/lib04/NJ01001216/Centricity/Domain/221/Pangaea%20lab%20activity%202016.pdf)

Engage student in activities that show that the Earth’s plates have moved great distances, collided, and spread apart.* [Plate Tectonics Graham Cracker Lab](https://docs.google.com/document/d/18UP7pdmYPOPvpPg4vaI_dAgy-4svVcd2FUnzd9djJ74/edit?usp=sharing)
* [Plate Tectonics News Report and Rubric](https://docs.google.com/document/d/1079DjwMzkUb2o_DM_YATDXkoT_o4S6yjCmci4I3ctxA/edit?usp=sharing)
* [Slip, Slide, Collide Interactive](http://www.open.edu/openlearn/science-maths-technology/slip-slide-collide)
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| **Instructional Notes:****Sociocultural implications**[***Guide****: think about the interaction of the student (including his/her identity, knowledge, culture, proficiency in English and home languages, literacy level, academic readiness, beliefs, values, and experiences) with the given academic contexts (including register, genre/text type, and task/situation, and the student’s relationship to other participants’ identities and social roles) - delete*]**Connections to Prior Knowledge*** list

**Connections to Future Knowledge*** list

**Common Misconceptions*** list

**Instructional Strategies*** list
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| **Resources:****Open Resources:** [**Next Generation Science Standards**](http://ngss.nsta.org/)  [OER Commons](https://www.oercommons.org/)**Videos:** * [Continental Drift Song- Wegener](http://safeyoutube.net/w/6uDb)
* [Continental Drift Song and Dance](http://safeyoutube.net/w/nJDb)
* [Bill Nye-Fossils](http://safeyoutube.net/w/8uDb)
* [Mummies Alive](http://www.smithsonianchannel.com/videos/this-5300-year-old-corpse-was-found-by-accident/36308)

**Books:****Fossil (DK Eyewitness Books Series)** by Paul Taylor* **Layers of the Earth** by Christa West
* **Rocks and Fossils** by Margert Hynes

**Teacher Resources:*** [powerpoint notes on weathering](http://www.slideshare.net/duncanpatti/notes-on-weathering)
* [powerpoint notes on erosion and deposition](http://www.slideshare.net/MMoiraWhitehouse/weathering-erosion-deposition-teacher-background)
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