MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.			
PE Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.]	DCI • The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	CCC • Scale, Proportion, and Quantity – Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.	Practices Constructing Explanations and Designing Solutions – *Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.* Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did and the past and will continue to do so in the future.
Activity Small Groups: Sort through the Grand Canyon rocks and fossils. Rocks can be set aside, and fossils can be set on the respective fossil information card as they are identified.	Question Where do we find fossils?	Objectives / *Next Steps* • Rocks are found in sedimentary strata, or layers of sedimentary rock. Layers may be distinct or blended. • Successful fossil identification requires both good resources and problem-solving skills. *What can fossils tell us?*	Notes Grand Canyon rock/fossil models can be downloaded for 3D printing. They can be placed in "ant farms" for students to observe strata order, or the color order can be provided for "pre-collected" fossils.

Small Groups: Verify fossil identification with an expert. Then, use the fossil maps on each card to identify the name of each colored layer.	What can fossils tell us?	• Fossils show what types of life existed when that rock formed. The types of life at any one point in time are distinct.	A larger fossil strata diagram is available for student notes, and a Grand Canyon fossil strata answer key is available.
Whole Class: With the help of the small groups, review the correct correlation between colored layers and named Grand Canyon strata. As each layer is positively identified, ask students to identify distinctive changes between types of life.	*How have fossils shaped our perception of time?*	• Fossils also show how life has changed over time. The Geologic Time Scale (GTS) is shaped by events which have affected the types of life preserved in the fossil record). • While we may see some defining events in our strata, the GTS is global. Not all changes used to divide geologic time are found at the Grand Canyon. Events used to separate geologic time are chosen by scientists (the International Commission on Stratigraphy). *Who finds fossils? [Optional]*	The Temple Butte Limestone layer shows fossils of organisms which did not previously exist. This is the start of the Devonian Period. Coconino Sandstone and Hermit Shale layers reveal terrestrial fossils, which shows a change in environment and what was living locally. During most of the Permian Period, this area was above water. At the start of the Triassic Period, this area is underwater again.
Whole Class: Ask students who might dig up rocks most often. Who might have the most opportunity to find fossils? How can fossils help miners find the best rock?	Who finds fossils? [Optional]	• Fossils are most often found by miners, who value rock economically as well as academically. • Because the types of life at any point in time are distinct, fossils can help identify layers of economically-valuable rock. *Why is science often taught through simulation rather than the real thing? [Optional]*	

Whole Class: Ask students to compare and contrast their experience with what real-world geologists do. How is this simulation realistic? How is it not realistic?	Why is science often taught through simulation rather than the real thing? [Optional]	• Plastic fossils are easier to come by than more-fragile, real-world fossils. • Fossils are not easy to identify without help or experience. Only parts of some organisms may be preserved, and individual organisms may differ from characteristics which describe most members of their class / family / genus / species. • Geologists might use different tools to examine fossils in rock. • ...	