LESSON 11: How could a fossil get to the top of Mt. Everest?

PREVIOUS LESSON

We updated our Gotta-Have-It Checklist and reviewed and tracked similarities and differences across three consensus models that explain the different types of plate movement. We constructed explanations to account for the interactions between the mantle and the plates that explain earthquake patterns and landforms. We revisited our DQB to track our progress in the unit and we discussed possible next steps.

THIS LESSON

ANCHORING PHENOMENON, INVESTIGATION

1 day

We read a transcript of an interview with a geologist about fossils found on Mt. Everest. From this interview, we learn that these fossils are from tropical sea creatures that were alive 400 million years ago. We use this information to revisit our consensus model to explain how and why fossils of sea creatures could be found at the top of Mt. Everest. This leads to new questions that we add to our DQB.

NEXT LESSON

We will examine fossil evidence from around the world. We will study how fossils form through a video and reading, and find out that finding fossils from soft-bodies organisms without bones is rare. We will use rock layer evidence from Utah, to predict whether specific locations may have once been covered by water. Using our knowledge of mountain uplift, we will explain how older rock layers, and buried fossils, end up at higher elevations.

BUILDING TOWARD NGSS

MS-ESS1-4, MS-ESS2-1, MS-ESS2-2, MS-ESS2-3

WHAT STUDENTS WILL DO

Ask questions to refine a model of how Mt. Everest is changing over time using evidence of fossils from sea creatures found at the top of the mountain.

WHAT STUDENTS WILL FIGURE OUT

- Fossils of tropical sea creatures have been found on top of Everest.
- The fossils found at the top of Everest are older than the Himalayas.
- The northern part of India used to be closer to the equator 400 million years ago.

Lesson 11 • Learning Plan Snapshot

Part	Duration	Summary	Slide	Materials
1	2 min	**NAVIGATION** Revisit ideas for other sources of evidence scientists use to study Earth's surface and how it changes over time.	A	
2	15 min	**READ AN INTERVIEW WITH A GEOLOGIST** Read a transcription of an interview with a geologist about fossils that were found on Mt. Everest.	B-C	*How did fossils get on the top of Mt. Everest?*, sticky notes
3	20 min	**REVISITING OUR CONSENSUS MODELS & DQB** Add to the class consensus model(s) to explain how a fossil could be found at the top of Mt. Everest. Add new questions we have to the DQB.	D	sticky notes, *How did fossils get on the top of Mt. Everest?*, Class Consensus Model poster(s), Large World Relief Map, markers, Plate Movement Poster from Lesson 7
4	3 min	**NAVIGATION** We wonder *how* fossils of sea creatures got to the top of Mt. Everest	E	

End of day 1

Lesson 11 • Materials List

	per student	per group	per class
Lesson materials	• *How did fossils get on the top of Mt. Everest?* • science notebook • sticky notes		• Class Consensus Model poster(s) • Large World Relief Map • markers • Plate Movement Poster from Lesson 7 • sticky notes

Materials preparation (15 minutes)

Review teacher guide, slides, and teacher references or keys (if applicable).

Make copies of handouts and ensure sufficient copies of student references, readings, and procedures are available.

Lesson 11 • Where We Are Going and NOT Going

Where We Are Going

This is the first lesson of the second lesson set of the unit. In the first learning set, the focus was on what is occurring below the surface that results in the changes seen on the surface. In this lesson, we read an interview with a geologist who shared a discovery about fossils of sea creatures from 400 million years ago being found at the top of Mt. Everest. The Earth model developed in the first part of the unit can't explain these fossils and therefore, new questions arise about other sources of evidence that scientists use to study the Earth and how it changes over time.

Where We Are NOT Going

This lesson introduces fossils as a source of evidence for studying how the Earth changes. Students will continue to investigate what fossils are, how they form, and how they can be used to date the Earth and explain changes to the Earth. Fossils are used in this unit as a way to do relative dating of different areas on Earth. Absolute dating, such as radiometric dating, is not used, as this is above grade band.

LEARNING PLAN for LESSON 11

1 · NAVIGATION

2 min

MATERIALS: None

Revisit students' ideas about other types of evidence scientists could use to study the Earth's surface. Display **slide A** and say, *We have figured out a lot about what happens underneath the Earth's surface that leads to earthquakes, volcanoes, and sometimes changes to the landforms on the Earth's surface. This led us to brainstorm what other sources of evidence scientists use, besides earthquake and volcano data, to study how the Earth's surface changes. We had a lot of ideas for what some of these sources of evidence could be. Can someone remind us of what some of these ideas were?*

Have a couple of students share what they remember and/or read off from the list of student ideas recorded at the end of the last lesson.

2 · READ AN INTERVIEW WITH A GEOLOGIST

15 min

MATERIALS: *How did fossils get on the top of Mt. Everest?*, science notebook, sticky notes

Set the stage to analyze a written record of an interview with a geologist. Say to students, *Up until now, we have been focused on what is going on underneath the surface of the Earth that results in Mt. Everest being formed. Yet, when we investigated our site locations, we also noticed that different areas on Earth look different. Now we want to begin looking at what **else** causes changes to the landforms we see on Earth. One idea we had was to look for fossils as sources of evidence that scientists use to study the Earth and how it has changed.*

Share with students a transcription of an interview with a geologist who studies how the Earth changes over time. Say, *There is an interview that was done with a geologist who studies how Earth changes over time. We will not watch the interview, instead, I have a transcription of the interview. A transcription is a written record of what is said in an interview.*

ADDITIONAL GUIDANCE	The text students are interacting with comes from an interview with Mike Searle, a European geologist. The whole clip can be found at https://www.youtube.com/watch?v=tzAAHycKNUM . The interview transcript is from the first 1:33. Analyzing the interview transcript gives students time to process the details of the interview and assimilate these new findings with what they have already figured out about how the Earth changes.

Pass out a copy of *How did fossils get on the top of Mt. Everest?* **to each student.** Project **slide B.** Take a few minutes to set a purpose for reading about the interview and ask students how this might help us more fully explain what has been happening to cause Mt. Everest to form. Point out to students that as they read, there is space to the right of the text where they can record any wonderings they have as they read the interview. Tell them that we will collect new questions we have on our DQB later in this lesson, so they should be sure to record any that have as they read.

Display **slide C**. Give students a few minutes to read the interview on their own. When they have finished reading, students should tape this interview into their science notebooks on the next blank page and record 1-2 questions they have on a sticky note.

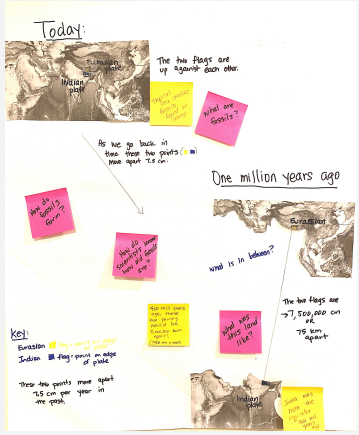
3 · REVISITING OUR CONSENSUS MODELS & DQB

20 min

MATERIALS: sticky notes, science notebook, *How did fossils get on the top of Mt. Everest?*, Class Consensus Model poster(s), Large World Relief Map, markers, Plate Movement Poster from Lesson 7

Convene in a Scientists Circle. Display **slide D.** Ask students to come together in a Scientists Circle with their notebooks and questions on sticky notes.

Say to the class, *We have figured out a lot about what is going on below the surface that causes changes above the surface. Let's use what we read from the interview and see if we can use our class model(s) to explain how fossils could be found at the top of Mt. Everest. Looking at our models, think about what parts of our model can be used to explain fossils on top of Everest and what is missing from our model. Then we can use these ideas to brainstorm how we might want to revise our model in the future.*



Suggested prompt	Sample student response
What are some things from the interview that we will want to make sure are represented in our model?	*There are sea creature fossils on top of Everest.* *The fossils are from tropical creatures, but Everest is not tropical.* *These creatures are from a tropical beach that used to be near the equator at sea level, not 8,500 meters up.* *India and Asia are colliding.* *The northern area of India used to be near the equator.* *The fossils are 400 million years old.* *These creatures lived at sea level.*
Can we use our model to explain how fossils of sea creatures from a tropical sea are on top of Mt Everest?	*No...right now Mt. Everest is very cold! There is not a sea at all at the top of the mountain.* *Maybe...we figured out that the plates that are in this area are moving towards each other causing the mountains to continue to get taller. So maybe long ago, when they were further apart, there was a sea?*

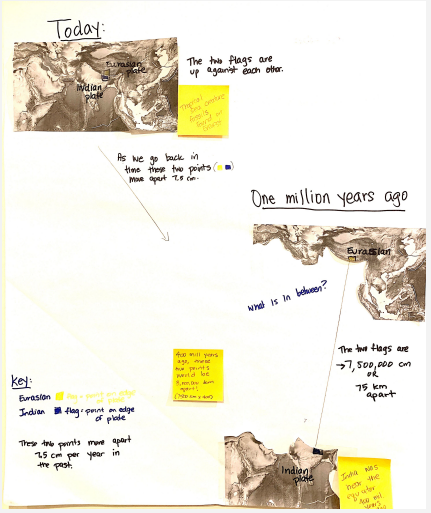
✱ SUPPORTING STUDENTS IN ENGAGING IN ASKING QUESTIONS AND DEFINING PROBLEMS

At this point in the unit students have a model for how Earth's crust can move over time. The purpose of this new generation of questions is to refine the model to account for the long periods of time in which these processes play out. These questions will also likely include questions about the fossil record and other sources of evidence scientists use to study the way in which Earth's crust changes over millions of years.

Suggested prompt	Sample student response
Okay, let's revisit our models we have for how the plates have moved over time. What have we figured out about how the land and plates have moved in this area?	*We have figured out the plates are moving all the time and that the Indian plate is moving northeast and the Asian plate is moving south.* *And, the geologist in the interview said that the land at the north of India used to be at the equator, which our model can support because we showed how the Indian plate would move backwards (or southwest) if we went back in time.*
So can we use our model to represent how India could have been at the equator?	*Yes! In Lesson 7, we figured out that the plate India is on has been moving about 6 cm northeast over time. So if we were to move it back in time for 400 million years, maybe it would be at, or close to the equator.*
How might we want to revise our model to capture this idea?	*We could use the same scale we used in Lesson 7 to add a new time to the model for 400 million years.*
If we add on another timeframe to represent 400 million years ago, besides using our map scale (the two points move apart 7.5 cm for every year), what else would be important to represent in our model?	*The geologist in the interview said India was near the equator 400 million years ago...so maybe once we add on this new time point, we should label the equator.*
Okay, so we have some ideas about how this land could have been near the equator if we trace it back in time. But, can our model explain how creatures found in a tropical sea are found at the top of the mountain?	*Hmm...not really. Unless there can be tropical seas on the tops of mountains?*

Say to students, *It sounds like we have some new questions to add to our DQB to help us explain how the earth changes. We are going to take a few minutes to add these to our Driving Question Board. If you feel your questions fit more on one of our class models instead of the Large Relief Map, then place it on the poster instead of the DQB map.*

Tell students that we will take a few minutes to capture any new questions we now have on our DQB. As students are sharing their new questions, these can be added to the new part added to the model poster from Lesson 7, that was just revised in addition to the current DQB. There most likely won't be enough time left to hear from everyone. If this occurs, then tell students to add their questions to the DQB as they return to their seats.



4 · NAVIGATION

3 min

MATERIALS: None

Pose a question to students to consider and brainstorm ideas. Display **slide E**.

Say, *Okay I think we figured out that the Himalayas began forming about 50 million years ago. So if that is the case, then it makes sense that if we were to trace this part of the Earth's surface back in time even further than 50 million years, then it could be near the equator. But I am still a little confused...if we trace this land that has mountains on it back in time and find that it would have been closer to the equator, how is it that there was a tropical sea there? There isn't a sea on Mt. Everest today. So how could there have been a sea long ago?*

Ask students to Turn and Talk to consider, *What could have happened to cause fossils of sea creatures to be found at the top of Mt. Everest?*

Additional Lesson 8 Teacher Guidance

SUPPORTING STUDENTS IN MAKING CONNECTIONS IN ELA	CCSS.ELA-LITERACY.RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue. Students will read a transcript from an interview to engage with the information shared by an expert geologist. By engaging with the transcription of the interview, students are using a new media format to collect information and form questions about other sources scientists use to study the earth.