

Unit 3.1: Why do I see so many squirrels but I can't find any stegosauruses?

Enduring Understanding – *Students will apply the following ideas to explain phenomena or design solutions to problems they experience in their environment:* Species can **survive** hundreds of millions of years because organisms in that species are either very **adaptable to changes in the environment** (including changes in climate and changes in the other organisms) or because of **wide diversity** among them. We know about some extinct species by recreating prehistoric environments using **fossils** and what we know about extant organisms.

Generalization(s)

Survival depends on change (**adaptation**).

Change in the environment causes change in populations of organisms.

Integration Planning

The Squirrel Unit's 6 Learning Sets include 29 Lessons representing the equivalent of 39 fifty-minute class sessions. Of the 29 lessons, guidance is provided to **integrate part or all of 19 lessons in class time devoted to literacy (13 lessons; 17 50-min class sessions) or math (6 lessons; 7 50-min class sessions)**. (See blue text for instructional minutes for each lesson)

LS 1 What do squirrels need to survive?

Students will **observe squirrels and develop and revise a model of how a squirrel meets its needs and survives in the environment** (systems and system models, structure and function, cause and effect).

In this learning set, students are introduced to the driving question and that they need to know how animals survive in today's environment to learn about environments in the past. Students figure out how a squirrel survives outside. They observe squirrels outside doing field research, analyze their data, ask questions and read about how a squirrel survives. Then students make and revise models of the squirrel surviving.

L1.1 What does your family know about squirrels, prehistoric organisms, and fossils?

(One 50 min lesson; OR this 50-min lesson could be split into many mini sharing sessions; send home and then allow students to share throughout the unit, for example, during morning meeting or other times of the school day) (Equity) Students are introduced to the DQ; writing about and communicating what their families know about squirrels, animals similar to squirrels, dinosaurs, and fossils; and asking and adding questions to the DQB.

L1.2 What do we already know about squirrels today and in the past? (50 min)

Students revisit the DQ, watch a movie representing prehistoric times, then ask and organize questions on the DQB and free write or draw an initial response to the DQ.

L1.3 Do any organisms today look like those from the Jurassic period? (50 min)

Students go outside to look for organisms that they saw in the prehistoric video. They compare what they saw outside with photo stills from the video, then record their reflections in their science notebooks.

L1.4 What can we observe about squirrels and how they survive outside? (50 min)

Students collect and organize data from field work, discuss what they noticed, and use their observations to think about how the squirrel survives outside.

L1.5 How can I make a model to explain how a squirrel survives outside? (50 min)

Students use research and observations to create an initial model of a squirrel meeting a basic need for survival. They explain their model in writing.

L1.6 How does a squirrel survive as it grows up, escapes from predators, and lives through the

winter? (Portions or all of this 100-min lesson could be integrated within the Literacy Block)

Students ask questions (life cycle, seasons, predator) that they will research (shared/partner reading), then write answers to the questions they generated, and share their findings.

L1.7 What can we learn from each other by sharing and revising our models? (50 min)

Students collaborate to share their ideas, new knowledge from text, explain their models to each other, give suggestions for revising the models, and revise them based on the suggestions. Students reflect on and identify “Bid Ideas” and “Take Aways” from Learning Set 1.

LS2 How is the squirrel’s structure unique and important?

Students will develop claims and a model using mathematical reasoning that the squirrel’s structures are related to its survival in its environment. (through the lens of structure and function, patterns, and cause and effect).

In Learning Set 2, students are figuring out that the structures of a squirrel are perfectly adapted for the life of a squirrel and are different from those of humans. They figure out that these structures are important to keep in mind when considering how an animal survives, or does not survive, in its environment.

Throughout this learning set students are engaging in investigations, including one with text and one with math and measurement to develop claims that will ultimately become a model.

L2.1 How does a squirrel use its teeth to survive outside? (50 min)

Students investigate a problem that the squirrel solves with its teeth and jaw as specialized structures, how to open a nut. They observe the skeleton and develop a claim that the squirrel’s teeth and jaw allow the squirrel to meet a need for survival. They make a claim that one could look at the bones of a squirrel and figure out what it ate.

L2.2 How does a squirrel balance? (60 min)

Students watch a video of the squirrel balancing and put together a model (plan) for how they (and the squirrel) balance, and then they try it out. They make a claim about how the squirrel balances, how the structures of the squirrel help it balance, and that it needs to balance to survive. Students analyze information about the marmot and contrast its body structures and needs with that of the squirrel.

L2.3 and L2.4 How can a squirrel jump so far? Math: How does a line plot help me understand how squirrels jump?

L2.3 Part 1 (90 min -- This lesson could be integrated within the Math Block)

L2.4 Part 2 (60 min -- This lesson could be integrated within the Math Block)

Students engage in a jumping contest (measuring) to see how far they can jump, and compare to the squirrel. They analyze the skeleton of the squirrel and making a claim to how far it jumps and its structure and also make the claims that the squirrel needs to jump to survive and also that you could tell that an organism jumps by looking at its skeleton.

L2.5 How do the squirrel’s structures help it meet its needs and survive in its environment? (70 min -- Portions (40 min) of this lesson could be integrated within the Literacy Block)

Students engage in text about squirrels’ ankles and how their ankles help the squirrel survive. Then they develop a shared model of each of the structures and how they are related to survival.

LS3 What other organisms live in the squirrel’s environment, and does the squirrel need them to survive?

Students will develop a model to explain how all organisms together form what is known as the environment (habitat) and that many of them are interrelated in complex ways (through the lens of systems and systems models and structure and function).

In this learning set, students are figuring out that an organism’s environment (habitat) includes the

other organisms that live there. Students learn about the organisms' structures and that these structures are different from those of the squirrel, but enable survival in the same environment. Students model how the squirrel is directly and indirectly dependent on (connected to) these various organisms for survival.

Students ask questions and then investigate organisms that live in the squirrels' environment and impact the squirrel's survival. Students read and communicate information about other organisms in the squirrels' environment. Last, they will develop a model to explain how all the organisms are connected.

L3.1 *What other organisms live in the squirrel's environment?*

(50 min -- This lesson could be integrated within the Literacy Block)

Students read texts and make claims and a model about the other organisms in the environment and how they interact with squirrel in terms of how they survive.

L3.2 *What is unique about other organisms in the squirrel's environment and how do they help the squirrel survive?*

(L3.2 describes two 50 min lessons -- These lessons could be integrated within the Literacy Block)

Students engage in text to investigate organisms that live in the squirrel's environment and impact the squirrel's survival. They develop a model to explain how various organisms have structures that help them survive in the same environment and how the squirrel is directly or indirectly dependent on these various organisms for survival.

L3.3 *Are there a lot more trees in some communities than in others? (Equity)*

(50 min -- This lesson could be integrated within the Literacy Block)

Students examine the relationship squirrels have with trees, then analyze aerial photos of communities and make predictions about whether there would be more squirrels (and biodiversity) in some areas than others. They figure out that phenomena in the natural world can be observed critically from an equity perspective.

LS4: How do scientists use evidence from the past and present to find out about the prehistoric organisms?

Students will analyze data from fossils, and argue from evidence that the environments from a long time ago were comprised of different plant and animal communities and that the climate and geographic features were different from today (through the lens of stability and change, structure and function and scale, proportion and quantity).

In this learning set, the students learn about how scientists use fossils to recreate past environments and communities of plants and animals. Using information about organisms living today and how they interact with each other and meet their needs for survival, like scientists, the students describe the interactions among living and nonliving components of prehistoric environments.

Students are doing the work of scientists: they are using fossils to give them clues about environments of long ago, analyzing data, using math, constructing explanations, engaging in texts, and arguing from evidence.

L4.1 *How can we use a timeline to think about the past? (Math)*

(60 min -- This lesson could be integrated within the Math Block)

Students are analyzing data and using math to make claims about when events occurred relative to each other.

Alternate L4.1 does not include the math lessons with specific reference to first humans.

L4.2 *What were past environments like?*

(60 min -- Portions (30 min) of this lesson could be integrated within the Math Block)

Students are analyzing large photos of prehistoric environments to ask questions and develop claims about the Eutherian mammal and the stegosaurus, and where they may have fit in.

L4.3 *What are fossils and how do they help us understand prehistoric organisms and environments?*

(50 min -- Portions (15-30 min) of this lesson could be integrated within the Math Block; fossil sorting and video done in math or other centers)

Students are analyzing fossils and making claims about the evidence fossils provide of different climates and environments from long ago. They make claims about how one organism may have looked, based on its fossil and on the period and climate in which it lived.

L4.4 *Which organisms could live in prehistoric environments?*

(50 min -- This lesson could be integrated within the Literacy Block)

Students are engaging with texts and making claims to construct arguments about what the differences in environment mean to the organism (fossil) they looked at in L4.3, the Juramaia, the stegosaurus, and the squirrel.

L4.5 *What do fossils tell us about which organisms were here a long time ago, which are still here, and which are new?*

(70 min -- The shared reading portion of this lesson (20 min) could be integrated within the Literacy Block)

Students are analyzing and comparing two structures, one of the Juramaia fossil, and the other of the squirrel and making claims about what they see as differences, and initial arguments for what the differences might mean about the animal and the animal's survival.

LS5: How can we use fossils to figure out how organisms changed over long periods of time?

Students will construct claims with evidence that as Earth environments changed, organisms and the interactions among organisms changed too (through the lens of stability and change, systems models, and scale, proportion and quantity).

In this learning set, students are figuring out that they, like scientists, can compare fossils from different times and come up with claims for how organisms changed and how both the existence and nonexistence of some fossils provide evidence of how the environments were changing.

Students are doing field work, analyzing data, and using math to construct claims about which organisms changed over time, which ones stayed the same, and which died out. They model their claims in an interactional Jurassic model.

L5.1 *Can we find some plants and animals outside that look like organisms from the past?*

Equity: *How can I use my community-based knowledge to build classroom science knowledge?*

(65 min)

Students are engaging in text, media, and field work to ask questions and develop claims about which plants and animals might resemble each other and how scientists figure this out.

L5.2 *How can we use fossils as evidence to figure out what happened to the plants from the Jurassic?* (50 min)

Students are analyzing data and engaging in texts to make claims about which plants and animals may have existed in the Jurassic and which plants did not exist using fossils (or lack thereof, as evidence).

L5.3 *How have animals from the past changed?* (60 min)

Students are analyzing data and engaging in texts to make claims about which plants and animals may have existed in the Jurassic period and which plants did not exist using fossils (or lack thereof, as evidence).

L5.4 *How did our prehistoric organism interact with the other organisms in its environment?*

(80 min -- This lesson could be integrated within the Literacy Block)

Using fossils, students have collected a lot of information about other organisms in the Jurassic period. Now they are analyzing and using that new evidence to argue and to revise their claims about how the Juramaia survived, what its needs were, and how it interacted with other organisms.

L5.5 **Math:** *Can we imagine how big these animals were? How would it look if they were next to each other?*

(65 min -- This lesson could be integrated within the Math Block)

Students are using data and math to create replicas of the stegosaurus and the Juramaia and compare their sizes.

L5.6: *Where have scientists and other citizens found fossils from the Jurassic period?* **SEL focus:**
What do I want to know more about?

(45 min -- This lesson could be integrated within the Literacy Block)

Students read a text about one of the most successful female paleontologists, Mary Anning, and her discovery of Jurassic Era fossils. They use the story of Mary Anning to brainstorm how they could find more information about questions they find very interesting regarding squirrels or Jurassic Era fossils.

LS6: Why did some animals die out and some live?

Students will communicate information and develop and revise a model to argue that the extinction event of the stegosaurus was caused by the changing environment making it impossible for it to meet at least one need (through the lenses of systems and system model and cause and effect).

In this final learning set, students figure out that the climate and the environment changed during the Jurassic period and may have caused some animals to die out and others to survive. The reasons for some animals not surviving have to do with the animals' needs, how they meet those needs, and the changing environment (including populations of other organisms), which kept them from meeting at least one basic need (cause and effect).

Students are synthesizing all of what they have learned in the unit to create a story (in writing and on a model) of the extinction of the stegosaurus and the adaptation, and continued survival of the squirrel-like organism.

L6.1 *Can we bring everything we know together to answer our driving question?*

(Portions or all of this 60-min lesson could be integrated within the Literacy Block)

Students are creating a story, sharing and discussing their stories about the extinction of the stegosaurus and the adaptation, and continued survival of the squirrel-like organism.

L6.2 *How can we use our model to explain our thinking about what happened to the stegosaurus?*

(Portions or all of this 100-min lesson could be integrated within the Literacy Block)

The students are sharing their models, and making sure that they understand each other's models; they ask questions and make suggestions (argue) for revision. Then each group makes one revision and explains why (what evidence) caused them to decide to revise.

L6.3 *How can we apply our knowledge to understand a different change to the environment?*

(60 min -- This lesson could be integrated within the Literacy Block)

The students are figuring out that the changing world and the adaptations to change is predictable and can be used to predict an imaginary future of interactions between environment and adapting organisms.