FOSS
Next Generation
for Middle School
NSTA 2017-18

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FOSS Curriculum Developer

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FOSS Professional Development

FOSS is a K-8, modular, research-based, NGSS-aligned curriculum developed at the Lawrence Hall of Science (UC Berkeley) with support from the National Science Foundation.

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FOSS Next Generation

FOSS Next Generation is a research-based science curriculum designed to support the Framework and Next Generation Science Standards for grades K-8.

Each course provides instructional sequences and pedagogical strategies to support three dimensional instruction.
## Scope and Sequence

<table>
<thead>
<tr>
<th>Grade</th>
<th>Integrated Middle Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>6–8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical Interactions</td>
</tr>
<tr>
<td></td>
<td>Weather and Water</td>
</tr>
</tbody>
</table>

*Half-length courses
- Physical Science content
- Earth Science content
- Life Science content
- Engineering content
Features of FOSS Next Generation

- Notebooking embedded in curriculum
- Embedded assessment including three-dimensional performance assessments
- Benchmark assessments online
- Student Resource Book with embedded strategies to support Common Core ELA
- FOSSweb:
  - Online activities, simulations, videos
  - Digital Teacher Guide and eSRB
  - Modifiable teacher slides
  - Teacher prep videos

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Instructional Support

Teacher Resources online at www.fossweb.com

Chapters on sense-making discussions, Common Core integration, and more

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Investigation 1: The History of Life

The History of Life introduces the guiding question that drives this course: *How can we explain the diversity of life that has lived on Earth?* The course starts with a tour of the fossil record, looking for evidence of the existence, diversity, and transitions in life throughout Earth’s history.
NGSS Performance Expectations in Investigation 1

**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.

**MS-LS4-2:** Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
Biodiversity

1. What is an organism?
2. How many organisms can you think of?

In your group, make a list of all of the organisms you came up with.

3. What is the same about the organisms listed? What is different?
Biodiversity
Biodiversity
Pink Fairy Armadillo

Chlamyphorus truncatus

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Dog-Vomit Slime Mold

Fuligo septica
Tinkerbell Fairy Fly

Tinkerbella nana

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Orange Penicillium Fungus

Penicillium vanoranjei

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Alien Orchid

*Dendrobium spectabile*

© 2018 Regents of the University of California
Blobfish
Psychrolutes microporos

© 2018 Regents of the University of California
E. Coli Bacteria
Escherichia coli

© 2018 Regents of the University of California
Water Bear (Tardigrade)

Hypsibius dujardini
Saiga Antelope

Saiga tatrica

© 2018 Regents of the University of California
Parrotfish

Scaridae

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Potoo Bird

Nyctibius griseus

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Life has become diverse through adaptation, which is each organism slowly over time, develops the traits necessary to live in a particular environment with the other organisms. Traits are passed down from generation to generation, the good ones going on and the bad ones leaving.
How can we explain why there is so much diversity of life on Earth today?

Investigation 1: Evidence of common ancestry and diversity

Investigation 2: Inheritance and Variation of traits

Investigation 3: Adaptation and Natural Selection

THEORY OF EVOLUTION

p. 2 in your notebook
Observe fossil replicas

Write observations of just one of the fossil replicas at your table on p. 5. (Students write observations of all of them.)

Take a look at the others and discuss what you think they are with your tablemates.
Focus question

- What does the fossil record tell us about the history of life on Earth?
Add to your fossil observations as you watch the slide show. Be sure to include:

- Time data
- What the organism was
- The environment the organism lived in
- Any questions you have

View Fossils slide show

pp. 6–7 in your notebook
Resources by Investigation

Waves
Next Generation
Resources by Investigation

Investigation 1: Make Waves

Investigation 2: Wave Energy

Investigation 3: Wave Interactions
Students explore properties of light waves. They start by using mirrors to explore reflection. Students use spectroscopes to analyze spectra of visible light and learn more about the electromagnetic spectrum. They use filters to change the spectrum of a light source and to learn about color. Finally, they determine how refraction changes the path of light rays as they travel between media.

Investigation 3, Part 1: Mirrors

Investigation 3, Part 2: Spectra

Investigation 3, Part 3: Color

Investigation 3, Part 4: Refraction

Investigation 4: Communication Waves
Investigation 1: The History of Life

Students are introduced to the big question that drives the course: How can we explain the diversity of life that exists on Earth? They take a tour of the fossil record, looking for evidence of the existence, diversity, and transitions in life-forms throughout Earth’s history.

Investigation 1, Part 1: The Fossil Record

Students watch a slide show that suggests the diversity of life on Earth that exists today. They consider how that diversity came to exist and then start exploring fossils. They observe a collection of fossils and find out more about the organisms and when they lived. Students consider how scientists date fossils. They construct a time line of Earth’s history and assign dates to the fossil samples. They add to the time line a set of events that extends their understanding of the history of life on Earth.

- Investigation 1 - Teacher Prep Video
- Focus Question 1.1
- Teaching Slides 1.1 (Modifiable PPT)
- Teaching Slides 1.1 (PDF)
- Teacher Master A
- Teacher Master B
- Biodiversity Slideshow
- Fossils Slideshow
- Shale Formation
- Embedded Assessment Notes
- Assessment Record—Survey
- Entry Level Survey
Fossils

<table>
<thead>
<tr>
<th>Fossil No.</th>
<th>Name</th>
<th>First Appears in Fossil Record</th>
<th>Life Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Snail</td>
<td>145 mya</td>
<td>sea</td>
</tr>
</tbody>
</table>

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Step 8
<table>
<thead>
<tr>
<th>Fossil No.</th>
<th>Name</th>
<th>First Appears in Fossil Record</th>
<th>Life Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Snail</td>
<td>145 mya</td>
<td>sea</td>
</tr>
<tr>
<td>Fossil No.</td>
<td>Name</td>
<td>First Appears in Fossil Record</td>
<td>Life Environment</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------</td>
<td>-------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>2</td>
<td>Shark tooth</td>
<td>23mya</td>
<td>Sea</td>
</tr>
<tr>
<td>Fossil No.</td>
<td>Name</td>
<td>First Appears in Fossil Record</td>
<td>Life Environment</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------</td>
<td>--------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Leaf Imprint</td>
<td>350 mya</td>
<td>Forests, near freshwater</td>
</tr>
<tr>
<td>Fossil No.</td>
<td>Name</td>
<td>First Appears in Fossil Record</td>
<td>Life Environment</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------</td>
<td>--------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>4</td>
<td>Fish (freshwater)</td>
<td>56 mya</td>
<td>lakes</td>
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<table>
<thead>
<tr>
<th>Fossil No.</th>
<th>Name</th>
<th>First Appears in Fossil Record</th>
<th>Life Environment</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>Echinoid</td>
<td>150 mya</td>
<td>sea</td>
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</table>

© 2018 Regents of the University of California
<table>
<thead>
<tr>
<th>Fossil No.</th>
<th>Name</th>
<th>First Appears in Fossil Record</th>
<th>Life Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Oyster (mollusk)</td>
<td>250 mya</td>
<td>sea</td>
</tr>
<tr>
<td>Fossil No.</td>
<td>Name</td>
<td>First Appears in Fossil Record</td>
<td>Life Environment</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
<td>--------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>7</td>
<td>Trilobite</td>
<td>525 mya</td>
<td>Sea floor</td>
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</table>

© 2018 Regents of the University of California
<table>
<thead>
<tr>
<th>Fossil No.</th>
<th>Name</th>
<th>First Appears in Fossil Record</th>
<th>Life Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Ammonite</td>
<td>190 mya</td>
<td>sea</td>
</tr>
</tbody>
</table>
Homework

Read “Fossil Dating” in FOSS Science Resources on page 3.
Discuss reading

THE PRINCIPLE OF SUPERPOSITION

- The first layer deposited is the one on the bottom. It is the oldest layer.
- The layers above the first layer are younger as you go up the sequence.
- The fossils in a layer of rock are the same age as the rock.
Discuss fossil record

1. What do the echinoid, snail, and shark tooth fossils have in common?
2. Why don’t we have fossils of their soft parts?
3. Why don’t we have fossils of every organism that ever lived?
Construct a model time line

- Write the name of the fossil on a self-stick note.
- Write how many years ago it first appeared and draw a vertical arrow.
- Place the note on the time line with the arrow pointing to the age.
<table>
<thead>
<tr>
<th>Group No.</th>
<th>Event</th>
<th>How long ago?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>oldest known fossils</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>first fossils of land plants</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>oldest true mammal fossils</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>oldest dinosaur fossils</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>oldest fish fossils</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>oldest insect fossils</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>oldest rock</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>oldest human (Homo sapiens) fossils</td>
<td></td>
</tr>
</tbody>
</table>
Read “Mass Extinctions” on page 73.

Mass Extinctions

The fossil record shows millions of species appearing and disappearing throughout Earth's history. When the last organisms of a species no longer exist, we say the species has gone extinct. Scientists estimate that about 99.9 percent of all species that have ever existed on Earth are now extinct.

Species go extinct at a slow rate at one time, but Earth has also seen a few mass extinctions. During a mass extinction, more than 5 percent of all species go extinct within several million years. Geologists estimate that Earth's 4.5 billion years have seen about 10 mass extinctions. Evidence from the fossil record points to at least five mass extinctions. What does it take to wipe out most of the life on the planet?

Organisms whose structures include hard parts, like bones and shells, are most likely to leave their mark in the fossil record. These began to appear about 540 million years ago.
Review vocabulary

Spend a few minutes reviewing the vocabulary for this part. Update the vocabulary index and table of contents in your notebook.

- biodiversity
- extinct/extinction
- fossil/record
- organism
- paleontologist
- superposition
- sediment
- tetrapod
Answer the focus question

- What does the fossil record tell us about the history of life on Earth?
A current area of scientific inquiry is how **vertebrates** made the **transition** from water to land.
• Why would water-dwelling fish make the move on to land?
• What might have caused some fish to develop legs and feet over millions of years?
• Where can we look for evidence about how vertebrates made the transition from water to land, from fish to animals with legs?
Focus question

• What does the fossil record tell us about how life has changed over time?
Study “Transitions” on page 78.

Go ahead and turn there...
**FOSS Science Resources**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Time Period</th>
<th>Habitat</th>
<th>Length</th>
<th>Fins/Limbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungfish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eusthenopteron</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acanthostega</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pederpes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Choose one to add in your notebook (students do all)

p. 12 in your notebook
### Study and compare organisms

**Transitions: Acanthostega**

- **Defining characteristics:**
  - Paddle-like limbs with digits (first true fingers and toes)
  - No defined wrists or ankles
  - Primarily aquatic
  - About 60 cm long

- **Note the digits**
- **Paddle:** One bone/two bone structure plus digits

- **Fossils 360 million years old**

- **First discovered:**
  - 1881 (Quebec)

**Transitions: Eusthenopteron**

- **Defining characteristics:**
  - Completely aquatic
  - Fins a mix of amphibian and fish characteristics
  - Considered a “lobe-finned” fish
  - About 1.5 m long

- **Fossils 380 million years old**

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Steps 4-7
View video

Fish with Fingers

This video is a PBS discussion with Dr. Jennifer Clack; FOSS was able to interview Dr. Clack – see the SRB.
Study Pederpes

TRANSITIONS: PEDERPES

Fossils 350 million years old
Defining characteristics:
• True feet with fingers and toes
• Considered the first true terrestrial tetrapod
• About 1 m long

Limb: One bone/two bone/many bones structure plus digits ("many bones" missing from fossil)

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Step 9
Compare the organisms

Draw a time line like the one here.

Add information to the marks:
• Organism name
• Fin or limb structure
• Probable environment

400 mya  390 mya  380 mya  370 mya  360 mya  350 mya

p. 13 in your notebook
Speculate gap-filling organism

Look at the 20-million-year gap between *Acanthostega* and *Eusthenopteron*.
Speculate gap-filling organism

1. What kind of organisms might have lived in the 20 million years between them? What might they have looked like? What kind of limbs or fins might they have had?

2. If you were a paleontologist, what age rocks would you look for to find an organism between these two?
View video

Great Transitions: The Origin of Tetrapods

Notebook sheet 2, “Great Transitions”

Questions
1. Explain why the one bone/two bones/many bones/digits limb pattern is important in explaining the origin of tetrapods.

2. What can you infer about how these organisms might have been related (belonging to the same group or family)?
Discuss present-day vertebrates

- Do vertebrates living on land today have the same basic limb structure as the vertebrates that moved to land millions of years ago?
Owl pellet dissection

Notebook sheet 3, Modern Limb Search

p. 16 in your notebook

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Steps 15-18
Owl pellet dissection

Steps 15-18

Digits

Many bones

Two bones

One bone
Answer the focus question

• What does the fossil record tell us about how life has changed over time?
Investigation 1

A student showed her friend some pictures that she had of the limbs of some ancient extinct organisms.

- Theropod dinosaur leg
- Tiktaalik leg
- Pterosaur dinosaur wing
- Frog arm
- Bat wing
- Human arm

Her friend said, "Hey, those look like limbs I have seen from some modern organisms!" He showed her the pictures he had.

Use what you know about limb structure to explain to the friend why all the limbs appear similar.
Compare biodiversity to the fossil record

• How does the fossil record help us explain why there is so much diversity of life on Earth?
Guiding question

- What evidence is there in the fossil record for the existence, diversity, extinction, and changes in life-forms throughout Earth’s history?
Sense-making discussion

Write in your notebook:
• evidence students would have seen in the fossil record for the existence, diversity, extinction, and changes in life-forms throughout Earth’s history.

Be prepared to:
• provide the evidence you gathered to support your conclusions.
## SENSE-MAKING DISCUSSION PLANNING GUIDE

<table>
<thead>
<tr>
<th>Course</th>
<th>Heredity and Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investigation 3: Evolution</strong></td>
<td>Part 2: Natural Selection</td>
</tr>
<tr>
<td><strong>Course driving question:</strong> How can we explain the diversity of life that has lived on Earth?</td>
<td><strong>Focus question:</strong> (How do populations change over time?)</td>
</tr>
</tbody>
</table>

### NEXT GENERATION SCIENCE STANDARDS

<table>
<thead>
<tr>
<th>Focus DCI(s)</th>
<th>Focus SEP(s)</th>
<th>Focus CCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS3.A and B</td>
<td>Developing and using models; constructing explanations; engaging in argument from evidence; obtaining, evaluating, and communicating information</td>
<td>Patterns, cause and effect, systems and system models, stability and change</td>
</tr>
<tr>
<td>LS4. A, B, and C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Questions and What to Listen for

#### Steps 17–18

**What to ask**
- *How can we explain the diversity of life that has lived on Earth? (Step 17)*
- *How do the observations that you and scientists have made provide evidence for your explanation? (Obtaining, evaluating, and communicating information; patterns)*
- *What evidence have you included in your model or explanation for the diversity of life that has lived on Earth? (Obtaining, evaluating, and communicating information)*
- *What evidence have you included in your model or explanation for the diversity of life that has lived on Earth? (Obtaining, evaluating, and communicating information)*

**What to listen for**
- *The diversity of life that has lived on Earth reveals relationships between populations and species.*
- *Some changes happen to genes on a cellular level, such as changes in DNA and because of sexual reproduction.*
- *Organisms that have adaptations suited to an environment have a greater chance of surviving to reproduce.*
- *Natural selection occurs when changes in the environment lead to changes in the traits in populations.*
- *If populations become separated by geography or behavior, over time, they can become new species, a process called speciation.*

### Scaffolding questions

- *What patterns from the fossil record point to relationships between ancient and modern organisms?*
- *What evidence from the fossil record demonstrates how life has changed over millions (and billions) of years?*
- *What role do inheritance and genetics play in the diversity of life?*
- *How do mutations in DNA and inheritance lead to variation?*
- *What factors lead to natural selection?*
- *What kind of time frame are we thinking about when we think about how life has changed over time?*

### Application questions

- *Will life continue to change in the future?*
- *How are environmental pressures such as climate change affecting evolution?*
- *How can humans affect evolution? (This is a leading question to the next Part)*

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How can we explain why there is so much diversity of life on Earth today?

Investigation 1: Evidence of common ancestry and diversity

Investigation 2: Inheritance and Variation of traits

Investigation 3: Adaptation and Natural Selection

THEORY OF EVOLUTION

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NGSS Three Dimensions

- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Constructing explanations
- Obtaining, evaluating, and communicating info

LS4.A: Evidence of common ancestry and diversity
ESS1.C: The history of planet Earth

- Patterns
- Scale, proportion, and quantity
- Structure and function

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# The History of Life

8. View the video *Fish with Fingers*

Tell students that the story of the discovery of *Acanthostega* is interesting. The first *Acanthostega* fossils were discovered in the 1930s, but the paleontologists who found them just boxed them up and put them away. It wasn’t until another paleontologist, Jennifer Clark, in the 1980s found pieces of the fossils in drawers at her university in Cambridge, England, that the story of this organism began to be pieced together.

Project the online video, *Fish with Fingers* (duration 4 minutes). Ask students to think about Clark’s hypotheses about how fishes made the transition to land.

> How are Dr. Clark’s ideas the same or different than yours?

> Upon what evidence does she base her conclusions?

After viewing the video, have students reflect on their own hypothesis and discuss how their thinking is similar to Dr. Clark’s ideas or may have changed. Discuss the evidence the two for her conclusions.

Summarize the story.

Apparently, limbs and feet and fingers or toes appeared before vertebrates left the water as seen in Acanthostega. They developed and were used in the water as paddles or to crawl along on the bottom. Limbs such as these later enabled vertebrates to make the transition to land. This is different than the earlier lobe-finned fishes with lobed fins first started moving around on land.

Give students a few moments to record any new information on their content goals.

9. Study *Pederpes*


*Pederpes* is thought to be one of the first true land vertebrates. This fossil was discovered in Scotland in 1877. It was initially identified as a fish, along the lines of Eusthenopteron. In 2010, it was reclassified as a primitive land-dwelling tetrapod by Jennifer Clark.

Have students trace what they noticed and recorded. If needed, ask:

> How long ago did *Pederpes* exist? [350 mya.]

> What characteristics of *Pederpes* do you notice? [It has identifiable feet, no real fins at all. Its head is flat.]

> Why might it have those characteristics? [It may have walked on land.]

10. Compare the organisms

Give groups a moment to look in their notebooks and on FOSS *Science Resources* to compare the ages, the fins, the limbs, and the body structures of all four organisms. Tell them to look for any information about what kinds of environments the organisms lived in and how the fossil record helps tell how vertebrates transitioned from water to land.

Draw a horizontal time line about a meter long (precision is not important) on the board. Mark the left end “400 mya” and the right end “350 mya.” Divide the line into five approximately equal sections and label the divisions 350, 360, 370, and 380 mya. Point out where this time line fits on the long class time line and note that the scale is not the same.

Ask students to work in their groups and draw a time line like the one on the board and add information to each of the marks based on what they have learned so far. They should write the organism names, what kinds of fins or limbs they had, and their probable environments.

Once the groups have made their time lines, use the information from one of the groups to complete the time line on the board. The final time line should look something like the one here. At the end of the day, leave it on the board for discussion in the next session.

![Time Line of Vertebrate Evolution](image-url)
Formative Assessment

22. Assess progress: response sheet
Distribute a copy of notebook sheet 4, *Response Sheet—Investigation 1*, to each student. Ask students to read the text and work independently to respond to the ideas presented.

After students have completed the response sheets, collect them.

What to Look For

- **Students point out the one bone/two bones/many bones/digits similarities in all the examples and relate that to the tetrapods they investigated.**

- **As tetrapod vertebrates have changed over time, their limbs have maintained a similar structure.**

- **Similar bone structure implies relatedness.**
Benchmark Assessment

- Entry-Level-Survey
- I-Checks
- Posttest
- FOSSMap and Online Assessment
# FOSS 6–8 Life Science Conceptual Framework

<table>
<thead>
<tr>
<th>Module or course</th>
<th>Structure and Function</th>
<th>Complex Systems</th>
</tr>
</thead>
</table>
| **Heredity and Adaptation** (grades 6–8) | • Reproduction is essential to the continued existence of every kind of organism.  
• Plants, algae, and many microorganisms use energy from light to make sugars from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen.  
• Animals obtain food from eating plants or eating other animals. | • An ecosystem is a web of interactions and relationships among the organisms and abiotic factors in an area.  
• Food webs are models that demonstrate how matter and energy transfer between producers, consumers, and decomposers. |
| **Populations and Ecosystems** (grades 6–8) | • All living things are made of cells (unicellular or multicellular). Special structures within cells are responsible for various functions.  
• Cells have the same needs and perform the same functions as more complex organisms.  
• All living things need food, water, a way to dispose of waste, and an environment in which they can live (macro- and microlevel).  
• Plants reproduce in a variety of ways, sometimes depending on animal behaviors and specialized features for reproduction. | |
| **Diversity of Life** (grades 6–8) | | • Adaptations are structures or behaviors of organisms that enhance their chances to survive and reproduce in their environment.  
• Biodiversity is the wide range of existing life-forms that have adapted to the variety of conditions on Earth, from terrestrial to marine ecosystems. |
### Conceptual Framework specific to Heredity and Adaptation

<table>
<thead>
<tr>
<th>Structure and Function</th>
<th>Complex Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The chronological fossil record documents the existence, diversity, extinction, and change of life-forms throughout the history of life on Earth.</td>
<td></td>
</tr>
<tr>
<td>• The fossil record is incomplete because of the nature of fossilization.</td>
<td></td>
</tr>
<tr>
<td>• Structural similarities between ancient and modern organisms are one piece of evidence from which we can infer relatedness.</td>
<td></td>
</tr>
<tr>
<td>• Embryological development can be used to identify relationships not evident in adults of different species.</td>
<td></td>
</tr>
<tr>
<td>• Genes on DNA encode proteins that are responsible for an organism’s traits. Alleles are different versions of the same gene, one of each pair inherited from each parent.</td>
<td></td>
</tr>
<tr>
<td>• Sexual reproduction results in offspring with genetic variation. Mutations in genes can lead to changes in proteins that can change organisms’ traits.</td>
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<tr>
<td>• An adaptation is an inherited trait that increases an organism’s chances of surviving in an environment long enough to pass on its genes.</td>
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<tr>
<td>• Natural selection is a process by which individuals best adapted to their environment tend to survive and pass their traits to subsequent generations.</td>
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<tr>
<td>• Change in populations by means of natural selection is the basis for the theory of evolution, which best explains the biodiversity on Earth.</td>
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<tr>
<td>• Humans use genetic technologies to influence inheritance.</td>
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</tbody>
</table>
FOSS Next Generation

✓ FOSS supports three dimensional instruction, and provides detailed pedagogical support for notebooking, assessment, literacy, and engineering.

✓ FOSS courses build concepts through a course and across grades with a conceptual framework for grades K-8.

✓ FOSS integrates scientific knowledge with the practices of science and engineering.
Connections to the Framework

Specific connections to the K-12 Framework **Disciplinary Core Ideas**, **Scientific and Engineering Practices**, and **Crosscutting Concepts** can be found in multiple locations:

- Overview Chapter
- Framework Chapter
- Online at [www.FOSSweb.com](http://www.FOSSweb.com)
What do you get?

- Investigations Guide
- Materials for 5 classes
- FOSSweb – Online activities
- Student Books with ELA and ELL support
- Teaching Slides (editable)
- Teacher Prep Videos

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Next Steps

• Want to learn more?
  – Visit the Delta booth on the exhibit floor to ask about pilots and sample materials
  – Log on to FOSSweb to explore the courses using your temporary access code
  – Check out FOSSConnect, our online newsletter, at

www.deltaeducation.com/FOSSConnect