Unit 3B:
Fossils and Extinction

Science Grade 3

This unit begins by focusing on fossils. The students explore how fossils give us information about what the world was like millions of years ago. The students will understand that traits and environmental factors have caused some species to become extinct over time, and that many plants and animals that once lived on earth no longer exist. At the end of the unit students will develop a public service announcement to help a local plant or animal that is endangered or threatened.

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Background information on unit development: In order to help others who are interested in this topic understand a bit more about what you created, we will write a short introduction to each unit and provide some images, in addition to posting the completed units on the Cape Cod Regional STEM Network website (www.capecodstemnetwork.org). Please help us by answering the question below after you have completed your unit.

1. Please provide us some background information on the unit development

Who helped to create this unit?

Names	School (Grade/course taught)
Molly Hood	Oakridge School, Sandwich
Pam Dallaire	Oak Ridge School,Sandwich
Paula Chambers	Oak Ridge School, Sandwich
Cheryl Rider	Oak Ridge School,Sandwich
Joan Doyle	Oak Ridge School, Sandwich
Christina Cooney	Oak Ridge School, Sandwich

What were some sources of inspiration for this unit?
We wanted to connect Cape Cod animals and plants to the new Massachusetts Science Frameworks to make it relevant to the children's prior knowledge and interests.

What's the most important lesson you learned as you created this?
We were amazed by the fact that there are so many plants and animals species that are threatened and endangered right here in Massachusetts.

2. Please also provide information about the unit that will help us write a brief introduction to your unit: (please respond to at least two of the following)

In your own words, what are you hoping students learn—big picture—through this unit?

We hope that our students will understand the importance of preserving nature. We hope that they will recognize that there are things we can all do to help plant and animal species that are in danger of becoming extinct.

What real world experiences did you incorporate? What science standards or requirements were you trying to emphasize?
We tried to keep a focus on plants and animals that are right here on Cape Cod. In lesson 6, Phragmites in the Salt Marsh, the students explore how this invasive species is threatening the salt marshes here on Cape Cod. Through an interactive game they explore how the phragmites destroy local vegetation that exists in the salt marsh and the animals that are affected.

Our culminating activity requires the students to work together to create a public service announcement (poster, video, google slides, etc.) to spread awareness about an endangered or threatened animal or plant that is local to Cape Cod.
Science Standards: LS4-1, LS4-3, LS4-4

How would you say that this unit "matters" to the STEM community? Or to our community on Cape Cod? Or to the larger community?
This unit matters to our community on Cape Cod because the plants and animals that are studied and explored all focus on organisms local to Cape Cod and Massachusetts. It matters to our larger community because we are teaching students about ways in which humans affect the environment and how that affects the plants and animals that live there.

What will students be most excited about at the end? (Will they have completed something, created something, etc.?)
The students will be excited about the prospect of being able to spread awareness to the community about a locally threatened or endangered species by creating their public service announcement.

3. Anything else you would like fellow teachers or others to know about this unit?

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Stage 1 Desired Results

MA STE Standards

3-LS4-1. Use fossils to describe types of organisms and their environments that existed long ago and compare those to living organisms and their environments. Recognize that most kinds of plants and animals that once lived on earth are no longer found anywhere.

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.

3-LS4-3. Construct an argument with evidence that in a particular environment some organisms survive well, some survive less well, and some cannot survive.

3 - LS4-4 Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.

3-LS4-5 (MA). Provide evidence to support a claim that the survival of a population is dependent upon reproduction.

Local Report Card Standards

Uses evidence to explain species survival and extinction

ESSENTIAL QUESTIONS

What happens to organisms when they cannot meet their needs?

What can we learn from fossils?

How do/can changes in the environment affect the ability of organisms to live in a specific habitat, survive and reproduce?

UNDERSTANDINGS

Students will understand that fossils provide evidence of adaptations linking organisms from long ago (extinct) and present day (extant).

Students will understand that plants and animals depend on each other and their environment for continued survival.

Students will understand that fossils provide evidence that organisms no longer in existence (extinct) once lived on earth

Students will understand that extinction of one species or organism can impact a habitat.

Students will understand that some changes to an environment can lead to reduction in the ability of an organism to survive, which can lead to the extinction of that organism.

TRANSFER

Students will create a public service announcement for a local endangered species. Students will include information about the animal's traits, the effect of changes in their environment on their survival, and what can be done to help their survival. They will support their ideas with evidence from the unit and additional research that they gather. The Public Service Announcement could be presented in a variety of forms such as a poster, powerpoint or google slide presentation, video, etc.

	Cross-Curricular Connections 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.

Stage 2 Evidence

Formative Assessment Ideas:

Lesson 1: Science Notebook entry
Lesson 2: Notebook /discussion on student ideas about organisms their fossil might be related to.

lesson 5: Student Data Table and Questions

Summative Assessment Ideas: Students will create a public service announcement for a local endangered species. Students will include information about the animal's traits, the effect of changes in their environment on their survival, and what can be done to help their survival. They will support their ideas with evidence from the unit and additional research that they gather. The Public Service Announcement could be presented in a variety of forms such as a poster, powerpoint or google slide presentation, video, etc.

Introductory Lesson	**Constructing Lesson**	**Practice Lesson**	**Assessment Lesson**
Lesson that introduces the content. More teacher directed	Lessons that engage students in building and linking together understanding. Guided/collaborative. Student/teacher or partners/small group	Lessons or activities that students can complete relatively independently	Formative: Check-ins along the way to see if students "get it" Summative: Students showing what they know, when you feel they are ready

Stage 3 Learning Plan

Summary of Key Learning Events and Instruction

Lesson Name	**Type** (Introductory, Constructing, Practice, and Assessment)	**Content Addressed**	**Standards Included (by number)**
1 What is a fossil?	I and A	The students explore how a fossil is created and what information a fossil can provide about the environment.	LS4-1
2 Exploring Fossils	C and A	Students tour several stations and look at fossils , they sketch them and then discuss where they might have come from and whether or not they are alive today.	LS4-1
3 Why Study Fossils	P	Students learn how scientists use fossils to tell what the environment was like when the organism was alive.	LS4-1

4 Phragmites in the Salt Marsh	I and A	Students play outdoor games and learn how reproduction and traits influence survival	3-LS4-3 3-LS4-4
5 Hunting	I and A	students play a game with chips and look at how predation and reproduction affect survival rates	LS4-3 LS4-5
6 The amazing Horseshoe Crab	P	Comparing the survival of a horseshoe crab to the extinction of a dinosaur and identify traits that helped it to survive	LS4-3 LS4-4

CEPA	SUMMATIVE ASSESSMENT	Students create a public service announcement(poster, video or slide presentation) about a local endangered species	LS 4-1, 2, 3, 4 and 5

Lesson 1: What is a Fossil?

This lesson is an adaptation from a stemscopes lesson.

Overview of the Lesson: What will students be doing? The students explore the idea that the earth contains fossils. Fossils can tell us how the world has changed through time.

Time (minutes): 45 minutes

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-1

Essential Question(s): What essential questions will be addressed in this lesson?

- What can we learn from fossils?
-

Science Objectives

- Analyze and interpret information
-

Language Objectives and/or Targeted Academic Language

- Fossils
- Environment

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials

- Living Fossils Clues To the Past by Caroline Arnold
- 1 Can of non-stick cooking spray (per class)
- 1 White paper plate (optional) (per student)
- 1 Container of modeling clay (per group)
- Small objects to make the fossils, such as fake plant parts; flowers, stems, leaves, small plastic animals/insects, small seashells, feathers

Assessment: How will you know that the students got it?

The students will draw their fossil in their science notebooks and write a description about what the fossil represents and what environment the fossil would need to live in to survive.

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)
2. **Developing and using models**
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. **Constructing explanations (for science)** and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Lesson Opening (Engagement Strategy/Pre Assessment):

On the board write the following questions

What are fossils?

What can become a fossil?

How do fossils form?

Have the students turn and talk about these questions and then share out ideas.
Read: page 6, Living Fossils, Clues to the Past by Caroline Arnold to give some further background information about fossils.

During the Lesson

The students will make a model of a fossil.

1. Instruct the students roll some modeling clay into a ball. Flatten the ball like a pancake.
2. The students will choose an object to press into the modeling clay. Spray the object with a cooking spray such as PAM so that the object will not stick.
3. Press the object into the modeling clay so that it's print remains and remove the object from the clay
4. Discuss:
    - What organism does your fossil represent?
    - Where would this plant or animal have lived?
    - What type of environment would it need to survive?

Closing

The students will draw their fossil in their science notebooks and write a description about what the fossil represents and what environment the fossil would need to live in to survive.

Instructional Tips/Strategies/Suggestions for Teacher: What other ideas would you like to highlight? What grouping strategies are important? What are adjustments for struggling learners, enrichment, or for students who are English Learners?

Lesson 2: Exploring Fossils

Overview of the Lesson: What will students be doing? The students will have a hands-on experience using fossils. The students will observe a variety of fossils and read about the fossils in a field guide. Students will draw pictures of their fossils and relate fossils to animals/plants that are still alive today.

Time (minutes): 45 minutes

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-1

Essential Question(s): What essential questions will be addressed in this lesson?

- ***What can we learn from fossils?***

Science Objectives

- Evaluating information

Language Objectives and/or Targeted Academic Language

-

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials/Resources/Tools

Endangered Species and Dinosaur/Fossil Kit from Green Briar Nature Center

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- Fossils Worksheet
- Student Worksheet: Fossil worksheet
- Field Guides (included in the Fossil Kit from Green Briar Nature Center)

Slides that show types of fossils

Assessment: How will you know that the students got it?

The students will be able to compare their fossil to organisms living today

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. **Engaging in argument from evidence**
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Lesson Opening (Pre-assessment)

Preparation:

- Find and display pictures of several extinct species (could include things such as a dinosaur, dodo bird, saber-toothed tiger, or woolly mammoth)

Discuss: What do all of these species have in common?

Lead a discussion where the students come to the realization that all these animals are extinct.
Ask questions such as what do you think caused some of these animals to become extinct?
Can you think of animals alive today that are similar to these animals?

Optional: show extinct and endangered species video on brainpopjr.com

During the Lesson:

In small groups the students will observe a variety of fossil samples. The students will read about the fossils in their field guides and draw a picture of the fossils on their fossil worksheet.

Lesson Closing :

The students will discuss the question on the fossil worksheet, "Do you think any of the fossils you looked at today are related to something still living? What do your fossil and its living relative have in common?" and write the answer in their science notebooks.

Read excerpts from Living Fossils, Clues to the Past by Caroline Arnold. pages 21-23

Lesson 3: Why Study Fossils?

Overview of the Lesson:
The students explore the idea that the earth contains fossils. Fossils can tell us how the world has changed through time.

Time (minutes): 45 minutes

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-1

Essential Question(s): What essential questions will be addressed in this lesson?

- What can we learn from fossils?

Science Objectives

- Analyze and interpret information

Language Objectives and/or Targeted Academic Language

-

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials

- **Fossil Slides** (requires a java script enabled browser such as Internet Explorer to view)
- alternate Power Point on Fossils Scholastic
- Video: The Grand Canyon- evidence of the past

Assessment: How will you know that the students got it?

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models
3. Planning and carrying out investigations
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. **Constructing explanations (for science)** and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Opening:

Review questions: What is a fossil?, How are fossils formed?, What can become a fossil?

During the Lesson:

Tell students that today they will begin to understand what scientists can learn by studying fossils. Explain that fossils are a record of the plants and animals that lived a long time ago.

Display the Fossil Slides As you look at each fossil, discuss the following questions: Is this a plant or an animal fossil?; What do you think this plant or animal looked like when it was alive?

Tell the students that fossils can tell us more than just what the plant or animal looked like but it can also tell us what the world looked like long ago.

Ask the students how many of you think that parts of the United States used to be completely covered by ocean?

The students watch this 3 minute video about the Grand Canyon. The video describes how the habitat in the Grand Canyon has changed over time and the fossils that we find there provide that information for scientists. The Grand Canyon- evidence of the past

Closing:

Discuss as a class what can fossils tell us about the past?

Instructional Tips/Strategies/Suggestions for Teacher: What other ideas would you like to highlight? What grouping strategies are important? What are adjustments for struggling learners, enrichment, or for students who are English Learners?

Lesson 4: Are you sure that's what a dinosaur looked like?

Overview of the Lesson: What will students be doing? The students will be engaged in an interactive read-aloud about how scientists use information from fossils to tell what a plant or animal looked like. The students will collect evidence from the text as the teacher reads aloud. The teacher will determine various points in the story for discussion and turn and talk. **Time (minutes):45**
Standard(s): What standards (s) will be the focus of the lesson? ● 3-LS4-1
Essential Question(s): What essential questions will be addressed in this lesson? ● ***What can we learn from fossils?***
Science Objectives ● analyzing and interpreting data
Language Objectives and/or Targeted Academic Language ●
Anticipated Student Pre-conceptions/Misconceptions (optional)
Instructional Materials/Resources/Tools ● "Boy, Were We Wrong About Dinosaurs!" Kathleen V. Kudlinski ●
Assessment: Teacher observations and notes from the discussion both during and after the interactive read aloud.

As well, the student's sticky notes that cite evidence from the text as to how scientists collect information from fossils

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Lesson Opening (Engagement Strategy/Pre-assessment)

Show pictures or models of several different dinosaurs. Pose the question to students, How do we know that dinosaurs looked like this?

Have the students do a quick write in their science notebooks and then discuss.

During the Lesson

On a piece of chart paper write How do scientists use fossils to tell what dinosaurs looked like? Read the question to the students and ask them to think about that question as you read the book. Give students several sticky notes to write some of their ideas down. If time allows, it helps to be able to read the story more than one time.

The teacher will read aloud the story, Boy, Were We Wrong About Dinosaurs by Kathleen V. Kudlinski. The teacher should determine various times during the read aloud for discussion and turn and talk to further elicit ideas from the text.

Lesson Closing

Students share out their findings after reading the story and add their sticky notes to the chart.

Instructional Tips/Strategies/Suggestions for Teacher: What other ideas would you like to highlight? What grouping strategies are important? What are adjustments for struggling learners, enrichment, or for students who are English Learners?

Lesson 5: Phragmites in the Salt Marsh

This lesson is adapted from a stemscopes lesson

Overview of the Lesson:
Playing a game to show how an invasive species affects other organisms in an environment.

Time (minutes):45 minutes

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-4
- 3-LS4-2

Essential Question(s): What essential questions will be addressed in this lesson?

- ***What happens to organisms when they cannot meet their needs?***
- ***How big of a change to the environment causes an organism to go extinct?***

Science Objectives

- analyzing and interpreting data
- Making a graph to record the data

Language Objectives and/or Targeted Academic Language

- Invasive species
- Habitat

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials/Resources/Tools

Teacher information about phragmites
Data Tables and Directions for students
Further reading and information about the phragmites

Assessment: How will you know that the students got it?

A class discussion about the results of how an invasive species can change an environment and be very harmful to the plants and animals of that habitat. Change to a habitat can simply mean that a new species arrived. This discussion will be done after the game is finished. The students will answer the questions at the bottom of the data table sheets after the discussion.

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models
3. Planning and carrying out investigations
4. **Analyzing and interpreting data**
5. **Using mathematics and computational thinking**
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:
The students are engaged in an investigation to model what happens when an invasive species is introduced into an environment.

Lesson Details, including but not limited to:

Lesson Opening (Engagement Strategy/Pre-assessment)--
Tell the students that today they are going to be playing a game to investigate what happens when an invasive species is introduced into a habitat. The phragmites are invasive species here on Cape Cod that are threatening the salt marshes.
Read the information on the first page of the following link Further reading and information about the phragmites

The rest of the information could be read after the exploration of how the phragmites invade an environment.

If possible get a stalk of phragmites to bring into the classroom. They grow to be about 7 feet tall.

Tell the students that phragmites are an invasive species because they are not native to Cape Cod. It can survive here because it's environment is similar to where it came from

During the Lesson:

1. Find a large area outside or a gymnasium or other open space (recommended 30 x 30 feet).
2. Choose three students to be the phragmites. The rest of the students are local vegetation, such salt grasses, cattails and other native plants.
3. Set a timer for one minute. Tell the students that for safety reasons they must walk and not run. During that time the phragmite students are going to try to tag the other students. When a student is tagged they must link arms with the phragmites.

4. At the end of the minute have all students freeze. Count the number of phragmites compared to the number of local vegetation and record it in the data table (students can copy the data table later or use your table to make their own graph)
5. Continue playing the game in one-minute intervals and recording data until all of the local vegetation have been taken over by the phragmites.
6. Discuss: What happened to the salt marsh as the phragmites continued to grow?
7. Students will create a double bar graph in their science notebook to show what happened to the local vegetation in the salt marsh as the phragmites continued to grow.

Lesson Closing:
Discuss: What will happen to the salt marsh if the phragmites continue to take over?
What animals might be affected by the phragmites?
Birds and fish. Also the phragmites create a fire hazard. (see more information in teacher resources)
Further reading and information about the phragmites

Instructional Tips/Strategies/Suggestions for Teacher: What other ideas would you like to highlight? What grouping strategies are important? What are adjustments for struggling learners, enrichment, or for students who are English Learners?

Lesson 6: Hunting

This lesson is adapted from a stemscopes lesson.

Overview of the Lesson: What will students be doing?

Students model how over-hunting and reproduction can affect a population.

Time (minutes) :45

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-5

Essential Question(s): What essential questions will be addressed in this lesson?

- ***What happens to organisms when they cannot meet their needs?***

Science Objectives

- collecting and recording data
- analyze and interpret data

Language Objectives and/or Targeted Academic Language

- Reproduction
- Species

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials/Resources/Tools

- **Student Data Table and Questions (one per student)**
- **50 Colored Tiles or bingo chips (red, blue, green, and yellow or any variety of colors) (per group)**

Assessment: How will you know that the students got it?

Completion of the questions:

-Was there a species that did not survive? Why?

-How would the population be affected if instead of having one baby the yellow species had multiple (example 10) babies?

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)
2. **Developing and using models**

3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. **Using mathematics and computational thinking**
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Preparation

Place a variety of colored tiles or chips in a bag. Give a different amount of chips for each color (10 yellow, 15 blue, etc.)

Before

Facilitate the following discussion to activate students' prior knowledge.

Can most organisms reproduce on their own?

Can one species reproduce with another species?

Teacher opens by explaining to students that Last class they looked at what happens when one organism reproduces really quickly and overtakes an area . It can cause problems for other organisms living in that area. What do we call the invading creature? (Invasive Species) Today we will look at what happens when there is no invading species, but there are predators. We are exploring all of the different things that can cause a species to take over or go extinct.

During the lesson:

1. Break the kids up into small groups (recommended 3-4) and give each group a bag of tiles. Have the students spread the tiles out on the floor or table in front of them so that each member of the group can reach the tiles.

2. Tell them: “When I tells you, begin picking up tiles, and then stop when I tell you to. (Give them 10 seconds to pick up tiles). The tiles you picked up have been “hunted” and are no longer in the game. Put the remaining tiles in pairs according to their color (example 2 yellow go together, 2 blue, etc.). For every two tiles that have been put together they can reproduce so a tile can be added back into the game. Count the number of tiles remaining and record it in the chart. Continue to play and record the number of tiles after each round.”
3. Hint: You might want to model how this will work for all students and have a couple of students model it for all other students before beginning as they sometimes become confused as to which tiles are put back into the game. If only one blue tile remains it cannot reproduce.

Closing:

Answer the questions included in their data table. Discuss if any species became extinct?

Discuss the implications if one species was able to have more than one baby at a time? How would this affect the population?

Lesson 7: The Amazing Horseshoe Crab

Overview of the Lesson: What will students be doing? The students will be comparing the survival of the horseshoe crab to that of the extinction of the dinosaur. Students will identify traits that helped the horseshoe crab survive .

Time (minutes):

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-3
- 3-LS4-4

Essential Question(s): What essential questions will be addressed in this lesson?

- ***What happens to organisms when they cannot meet their needs?***
- ***What can we learn from fossils?***
- ***How big of a change to the environment causes an organism to go extinct?***

Science Objectives

- construct explanations
- ask questions
- evaluating and communicating information
- engage in argument from evidence

Language Objectives and/or Targeted Academic Language

- Survival
- Extinction

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials/Resources/Tools

- Crab Moon by Ruth Horowitz
- High Tide For Horseshoe Crabs Lisa Kahn Schnell

Assessment: How will you know that the students got it?

Class discussion and observations. Th e students ability to answer the questions on the provided worksheet.

Science and Engineering Practices included (in bold):

1. **Asking questions (for science)** and defining problems (for engineering)
2. Developing and using models

3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. **Constructing explanations (for science)** and designing solutions (for engineering)
7. **Engaging in argument from evidence**
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Lesson Opening (Engagement Strategy/Pre-assessment):

Tell the students that we are going to look at an organism that is alive today and think about how likely it is that it will soon become extinct like some of the other organisms we have been looking at.
(at the conclusion of the lesson you could talk about how it is unlikely to go extinct- but it may cause the extinction of some other species)

Read Crab Moon by Ruth Horowitz. Discuss how the horseshoe crabs have been around since the time of the dinosaur.

During the Lesson:

Using pictures of horseshoe crabs or horseshoe crab fossils or molted shells make observations about the animal. What features do you notice that might have allowed the horseshoe crab to have survived?
Show the video: Horse Shoe Crabs Video

Here is the link to the worksheet that the kids can use to record the information they observe.
Horse Shoe Crab Worksheet

Other books that you might want to include High Tide for Horseshoe Crabs by Lisa Kahn Schnell

Lesson Closing

Discuss: What adaptations does the horseshoe crab possess that has helped it survive while other animals such as the dinosaurs became extinct.
Instructional Tips/Strategies/Suggestions for Teacher: What other ideas would you like to highlight? What grouping strategies are important? What are adjustments for struggling learners, enrichment, or for students who are English Learners?

CEPA: Saving Cape Cod's Endangered Animals- Assessment/PBL

Overview of the Lesson: What will students be doing? The students will create a public service announcement about a local endangered or threatened species.
Investigating in small groups a particular Cape Cod Animal or Plant.
Students will find out the life Cycle, the traits , why they are endangered,
How long has this animal/plant been around? What traits are helping them? Which traits are hurting them?
what we can do to help save them.
Time (minutes):

Standard(s): What standards (s) will be the focus of the lesson?

- **3-LS4-1.** Use fossils to describe types of organisms and their environments that existed long ago and compare those to living organisms and their environments. Recognize that most kinds of plants and animals that once lived on earth are no longer found anywhere.
- **3-LS4-2.** Use evidence to construct an explanation for how the variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.
- **3-LS4-3.** Construct an argument with evidence that in a particular environment some organisms survive well, some survive less well, and some cannot survive.
- **3-LS4-5 (MA).** Provide evidence to support a claim that the survival of a population is dependent upon reproduction**3-LS4-2.** Use evidence to construct an explanation for how the variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.
- **3-LS4-3.** Construct an argument with evidence that in a particular environment some organisms survive well, some survive less well, and some cannot survive.

- **3-LS4-5 (MA).** Provide evidence to support a claim that the survival of a population is dependent upon reproduction

Essential Question(s): What essential questions will be addressed in this lesson?

-

Science Objectives

-

Language Objectives and/or Targeted Academic Language

-

Instructional Materials/Resources/Tools

Students can conduct research by using the following kid friendly search engines

- **kidrex.org**
- **kidzsearch.com**
- **googlejunior.com**

ORGANISMS TO CHOOSE FROM:

- HORSESHOE CRAB
- BLUE WHALE
- EEL GRASS
- HERRING - ALEWIFE
- LADY SLIPPER
- SHORT EARED OWL
- BEES
- PIPING PLOVER

- Teacher background information on HERRING: apcc.org
- The herring life cycle; http://www.maine.gov/dmr/science-research/searun/alewife.html
  FYI:
- If the herring are to survive they need to overproduce, outlast competitors for food and survival from predators, they have to have enough variations among the members of the species, and they have to be able to withstand environmental changes .(there is over production- 60-110,000 eggs per female!

- There is variation in their traits- ALL SPECIES HAVE VARIATION IN TRAITS. Some are –size, number of eggs, temperature they can withstand, if we could go to hatchery we could also look at color, measure them… and research on fish traits There is also HUGE competition for survival AND changing environments
- http://www.mass.gov/eea/docs/dfg/dmf/publications/tr16-anad-p2-appendix.pdf
- Evolution of the fish: https://www.youtube.com/watch?v=DjthfvB47Mc
- Herring fact sheet: http://www.nmfs.noaa.gov/pr/pdfs/species/riverherring_detailed.pdf
- Student Fact Sheet: https://docs.google.com/document/d/1p9VfjMCA9vxtbGj-jj0QWEKUdf0wOVSt5a8y6CklrA4/edit?usp=sharing
- Farting fish- a trait for communication...
- https://www.youtube.com/watch?v=OcwCYIfm6eA

Assessment: How will you know that the students got it?

- Assessment Rubric: https://docs.google.com/document/d/1hBJNOyq_YIbTBUM_gAo_yQNDTQOA5ZTOBDjcgQoQHyE/edit?usp=sharing

Science and Engineering Practices included (in bold):

1. **Asking questions (for science) and defining problems (for engineering)**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. **Constructing explanations (for science) and designing solutions (for engineering)**
7. **Engaging in argument from evidence**
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:
Depending on the students and the direction of their research some will focus on particular practices more than others.

Lesson Details, including but not limited to:

Lesson Opening (Engagement Strategy/Pre-assessment):

During the Lesson:

Students will research for 5 days. **Final Product - 2-5 days .** **Lesson Closing**
Instructional Tips/Strategies/Suggestions for Teacher: What other ideas would you like to highlight? What grouping strategies are important? What are adjustments for struggling learners, enrichment, or for students who are English Learners?

List of Unit Resources (in lesson sequence)

What additional resources can support the teaching and learning of this unit? What resources can support the teacher in implementing the unit?

The Paleontology Portal

Learning from the Fossil Record

Optional Additional Lesson: What's In a Beak?

Overview of the Lesson: What will students be doing?

Students model how an inherited trait can aid in the survival of a species and how changes to an environment can affect a population.

Time (minutes):45

Standard(s): What standards (s) will be the focus of the lesson?

- 3-LS4-2
- 3-LS4-4

Essential Question(s): What essential questions will be addressed in this lesson?

- ***What happens to organisms when they cannot meet their needs?***

Science Objectives

- create tables and graphs
- analyze and interpret data

Language Objectives and/or Targeted Academic Language

- inherited traits

Anticipated Student Pre-conceptions/Misconceptions (optional)

Instructional Materials/Resources/Tools

- **Watch only the first 4 minutes of the video Natural Selection Video**
- **Beak Simulation Activity worksheet**
- spoon, chopsticks, tweezers (1 set per group)
- Marbles, toothpicks, pennies
- Cups
- Timer
-

Assessment: How will you know that the students got it?
The students will answer questions regarding the investigation and after analyzing and interpreting the data.

Science and Engineering Practices included (in bold):

1. Asking questions (for science) and defining problems (for engineering)
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. **Using mathematics and computational thinking**
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

Notes about Science and Engineering Practices included:

Lesson Details, including but not limited to:

Introduction:

Ask students what they know so far about what may cause species to survive and/or go extinct?

Watch the first 4 minutes of the video to give some background about natural selection .

Natural Selection Video

During the lesson:

1. Split the class into groups of 4. Give each group a set of materials.
2. One student will be the timer and recorder. The other three students will be "birds" and each has one of the following "beaks": spoon, chopsticks, tweezers. Each "bird" will have a cup of marbles.
3. The birds must pick up as much of their food as they can with their beak and place it on the table in 30 seconds. The timer/recorder will keep track of time.
4. After time is up the timer/recorder will mark down how many pieces of food each bird was able to pick up.

5. Repeat the process with toothpicks and pennies.

Closing:

Discuss and answer the questions at the bottom of the worksheet.

1. Which beak collected the most of which food item?
2. Why do you think certain beaks were able to collect more of each type of food?
3. What would happen if there was only one type of food available for a species of bird?
4. How do you think beaks play a role in natural selection?