TEACHING GUIDE

For ages 7 to 9 years

ENGLISH • STEM • ENVIRONMENT • SOCIAL STUDIES • CITIZENSHIP
engage
LEARNING

Vol 1, Issue 3, Level 2

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Dear Educator,

Welcome to the third issue of **engage** magazine! We continue to make changes, making each issue better than the last one. For example, in this issue, you will find a QR Code integrated into each of the three articles. Download a free QR Reader on your smartphone. Hold the phone over the code and it will automatically show a video related to the story. This extends the learning and allows students to integrate information from videos with their reading. It will help you teach 21st-century learning skills.

You will also see a change in this Teaching Guide. We now include a section that directly tells you how each article relates to your curriculum. This will help you apply the articles to what you are already teaching. You can use each article to introduce, review or teach content and to teach nonfiction reading strategies. These are also called out in this guide. Finally, you will note a curriculum connection has been added to each article in the magazine itself.

The three articles in this issue teach physical science, life science and Earth science. In *Fossil Finds*, students learn about some animals that lived long ago and are no longer alive. They also learn about some ancient organisms that once lived in India. In *Meet the Mola Mola*, students meet Tierney Thys, a marine biologist who studies the mola, a unique fish. While reading about the mola, students also learn that plastic pollution is harming the ocean. In *Sky Lights*, students read about some properties of light, and how auroras, rainbows and other sky lights form.

We hope you enjoy teaching this issue.

MEET THESE OUTCOMES

Language Arts

- Students will construct original sentences.
- Students will write several sentences to form a paragraph that synthesizes information they read.
- Students read for meaning, demonstrating both understanding and personal response to what is read. They use reasoning strategies and background knowledge to solve complex problems related to the text.

Physical Science

- Students will understand that white light is made of seven different colours

Life Science

- Students will understand that a variety of organisms live in different habitats.

Earth Science

- Students will understand that fossils provide evidence that plants and animals lived long ago. Some of these organisms are now extinct.

Citizenship

- Students will learn that they can make positive changes by properly disposing of plastic items.

FOSSIL FINDS

SCIENCE OUTCOMES

Students will understand that fossils are evidence that dinosaurs and other plant and animal life existed on Earth many years ago, even though the animals are not alive today.

ENGLISH LANGUAGE OUTCOMES

Students will construct original sentences.

CURRICULUM CONNECTIONS

EARTH SCIENCE

This story has a couple of connections to the science curriculum. First, it provides examples of natural processes that change slowly over time. You can introduce this topic by first explaining that there are fast and slow changes. A fast change can happen in minutes or a few years. Slow changes can take tens, hundreds or even millions of years. For example, an erupting volcano is an example of a fast change. The forming of a mountain or the formation of a fossil are examples of slow changes, but a dinosaur dying is a fast change.

The second connection to the curriculum is about plants and animals that lived in the past. Some examples of these plants and animals are still around today. For instance, dinosaurs died out about 65 million years ago. But sharks, which also lived before and during the Age of Dinosaurs, are still seen today.

When teaching about plants and animals that lived in the past, mention that some of these organisms left remains that we can find today. We call these remains fossils. There are several kinds of fossils. For example, scientists find fossil bones and fossil footprints. These fossils tell stories about how ancient plants and animals lived. To introduce this concept, conduct the activity on page 20 of **engage** magazine. Students will make a model of a fossil.

BEFORE READING

BUILD BACKGROUND

Hand out copies of **engage** magazine. Ask students to open their copies to pages 2-3. Ask them to identify the animal shown in the photo. (*While the photo shows a T. rex, students should be able to identify it as a dinosaur.*)

Discuss what students already know about dinosaurs. Ask them if they think dinosaurs are real and if dinosaurs exist today.

Ask: If dinosaurs lived so long ago, how do we find out about them today? (*Fossils.*)

Conduct the following **activity** with your students to show them how they can tell if something or someone was present through items that they have left behind.

You need:

- a notebook (with grade marked)
- a spectacle case
- a set of bicycle keys
- hair clips

To do:

1. Get the students to sit in a circle. Inform them that there has been a mystery visitor to the class, but you do not know who he was. However, he left behind a few things which will help us find out more about him.
2. Place the items in the centre of the circle and say to the students: “Let's become detectives and study the clues left behind by our mystery visitor. Can we find out more about him?”
3. Write the names of the items on the board as the students go through them.
4. Discuss the clue each item could provide. For

example, if they notice hair clips, you could ask: "Could this visitor be a girl?" Ask students if they can spot a name on the notebook. It might tell them the grade in which the visitor is studying.

5. Similarly, inspect other clues and demonstrate how scientists can reach conclusions about events in the past by looking at evidence left behind.
6. Palaeontologists, scientists who study prehistoric life, investigate clues to learn about plants and animals that lived millions of years ago.
7. Write the word 'palaeontologist' on the board. Explain that a palaeontologist is a scientist who studies prehistoric life, and studies clues to learn about plants and animals that lived millions of years ago.

READY TO READ

➛ Read the story 'Fossil Finds' using voice modulation and pronunciation.

➛ Draw students' attention to the various land forms on the pages 4-5 (forests, deserts, oceans and mountains). Ask students to describe each landform and explain the differences between them. Then discuss the following information on how landforms change.

➛ Earth changes every day. Sometimes the changes are small and sometimes big. Both natural forces and human activity can bring about these changes. Some changes occur over a period of time while others happen quickly. Changes due to natural forces include floods, landslides, volcanic eruptions, earthquakes, soil erosion, melting of glaciers, rain and drought.

➛ Floods, landslides and earthquakes can change landforms in seconds. Floods destroy houses and buildings. Large amounts of land are submerged under water. They also carry soil away and deposit it at other places.

➛ Soil erosion can also create new land. Wind and water carry rock and other sediment away. These forces then drop the sediments in a different location, forming new landforms.

➛ Waves and wind slowly turn rocks into sand. They turn mountains into hills. Ocean waves and rivers constantly push into the sides of cliffs, slowly carving the land. Over time, water can get into a rock and, as it freezes, it can break the rock into pieces. Heat, cold, rain, climate, pollution, acid rain, water, ice and waves are all forces that slowly break down rocks over time.

➛ Flowing lava slowly forms mountains.

➛ A drought can slowly cause forests to dry up, forming a desert. Deserts can also form when storm clouds run into wind or mountains and drop rain in one area, leaving other areas dry. For example, storm clouds blow off the Indian Ocean over India. But the Himalayas act like a roadblock, stopping the clouds. So, India receives lots of rainfall but the land on the other side of of the mountain does not. That land forms the Gobi Desert.

AFTER READING: EXTENSION ACTIVITIES

STEM CONNECTION

SESSION FOCUS: WHAT IS A FOSSIL?

• Discuss the animals that lived on Earth many years ago but are extinct now. These could include dinosaurs, mammoths, sabre-toothed tigers, giant panthers and others. When a kind of animal or plant doesn't exist anymore, it is extinct.

• *Ask students*: Has anyone ever seen these animals? How do we know about these animals now? (*They left traces in the form of fossils.*)

• Explain to students that some of these animals lived a long time ago and no human being has ever seen one alive, so we have to rely on fossils to tell us how they acted and what they looked like.
Summarise by explaining:
— We know these animals existed because of fossils.
— *Write the word 'fossil' on the board*. Fossils are the preserved remains of plants or animals that lived a long time ago.
— Fossils are made in two ways: either an animal or plant is buried and turns into rock, or the imprint of an animal or plant is preserved.

• Point at the pictures on page 6 which show algae and an ant fossil.

ACTIVITY: Making a Plant Fossil

In this activity, students will learn how some fossils form. You can use this activity or a similar one in **engage** magazine.

You need:

- paper bowls
- plaster of Paris
- natural objects to fossilise – for example, twigs, leaves, shells, flower petals, or plant stems.

To do:

1. Give each student a shallow paper bowl filled with wet plaster of Paris.
2. Have students take any one of the natural objects and press them into the plaster.
3. Once the impressions have been made, ask them to remove the objects from the plaster.
4. Remind the students to be careful not to disturb the plaster, as it will need time to dry and harden.
5. When the fossils are dry, have students attempt to identify from the impressions the plants and objects used to make each fossil.

STEM CONNECTION

SESSION FOCUS: FOSSIL EXCAVATIONS

Set up a fossil excavation site by choosing one or both of the two activities given below.

Inform students that they will become palaeontologists and carry out excavations. The place where palaeontologists go to dig is called an **excavation site.** Remind them that palaeontologists take great care in searching for and removing fossils from archaeological sites. Similarly, they too must carefully uncover fossils.

ACTIVITY 1: Dino Dig

Fill a tub with sand and bury small objects such as plastic dinosaur toys, sticks, nuts, leaves, plastic eggs or other small objects in the sand. Provide toothbrushes, paintbrushes or plastic spoons to students and instruct them to gently dig to uncover fossil evidence in the sand.

ACTIVITY 2: Chocolate Chip Cookie Excavations

Provide each student with a chocolate chip cookie, a toothpick and a napkin. Have students place the cookie on the napkin and excavate them using the toothpick to break away the cookie without breaking the chocolate chips. Have students compare how many chips or fossils their cookie contained.

SCIENCE & LANGUAGE ARTS CONNECTION

SESSION FOCUS: ABOUT DINOSAURS

- Ask students to name some movies in which they have seen a dinosaur, and to share information about the dinosaurs they saw.

- Share with them that palaeontologists use clues to develop theories about dinosaurs by studying fossils of dinosaur bones, dinosaur footprints, dinosaur teeth, and even dinosaur eggs.

- Show students pictures of dinosaurs and share the following information.
  - The name dinosaur means 'frighteningly big lizard'. Remind students that scientists used to think that dinosaurs were lizards, but are now more closely related to birds.
  - According, to the research by scientists, there were more than 700 different types of dinosaurs that lived on Earth for over 150 million years.
  - Some dinosaurs were carnivores or meat eaters, and others were herbivores, plant eaters.
  - Some dinosaurs walked on two legs, while others walked on four legs. Some had horns and spikes, others had thick bumpy skin, and some even had feathers.
  - We often think of dinosaurs as huge animals, but they actually came in a variety of shapes and sizes.
  - Most dinosaurs hatched from eggs. Some, but not all, dinosaurs watched over their eggs and cared for their hatchlings.

- Point at the artwork of the protoceratops and velociraptor fossil. Explain that this artwork was based on an actual fossil find in which a tangle of bones showed the two animals fighting. Since velociraptor was a meat eater, scientists think that it attacked the protoceratops.

PROTOCERATOPS

Protoceratops is Greek for 'First Horned Face'. These dinosaurs had bird-like beaks, teeth in their cheeks, and frills that extended from the backs of their skulls. They were herbivores. Their strong jaws would have helped them chew their food. They had large eyes. Their legs were short for an animal their size and their feet had five toes.

Palaeontologists have found a number of nests at the bottom of a cliff and this provided evidence that these dinosaurs may have nested in colonies and laid eggs. Numerous skeletons found together suggest that they travelled in herds.

VELOCIRAPTOR

The name velociraptor means 'swift seizer'. The velociraptor is thought to have killed its prey with sickle-shaped claws on its rear feet. The velociraptor was a fairly small dinosaur.

- Point at the artwork of the protoceratops and velociraptor on page 7 of **engage** magazine and ask students whether velociraptor is bigger or smaller than protoceratops.

- Inform students that velociraptor was around 1.8 metres long from the tip of its tail to its nose and was around 1 metre tall. It weighed around 14 kilograms. This dinosaur walked on two feet (bipedal) and could run up to 64 kilometres per hour. It had 80 sharp teeth and sharp claws on its feet and hands. Of all the dinosaurs the velociraptor had one of the largest brains when compared to its size. It was likely one of the most intelligent dinosaurs. It had hollow bones like a bird, making it fast and lightweight. Scientists think that feathers may have covered the velociraptor. It is most famous for its role in the movie Jurassic Park. However, its size as shown in the movie is much larger than its actual size.

YI QI

- Draw students' attention to the picture of the Yi qi dinosaur on page 8 of the magazine. Point at its bat-like wings.

- Inform students that a farmer discovered this dinosaur in rural China in 2007. Palaeontologists named it Yi qi, which means 'strange wing'. It was about the size of a large pigeon, with unusual feathers and an elongated bone, the styliform, that jutted out from its wrist. This bone helped support the wing membranes. They are among the smallest dinosaurs known. They ate smaller animals.

- Ask students what term is used to describe a meat eater (*Carnivore*).

- Show students the video **A New Dinosaur – Flying Without Feathers** https://www.youtube.com/watch?v=fF_FOay9d5c

SPINOSAURUS

- Next, turn students' attention to spinosaurus. Point out the sail-like structure jutting out of water on the body of spinosaurus on page 9.

- Explain that palaeontologists believe that spinosaurus may have used its sail as a warning signal to intruders. The sight of the sail jutting out of the water told other animals to back off. Some scientists say that the sail was used to attract mates.

- Further explain that it was named spinosaurus because of its 7-metre-long spines. Point at the webbed feet and explain that the webbed feet would have allowed the animal to swim.

- Discuss other unique features like its nostrils. Explain that the nostrils were further up on its snout than the nostrils of other dinosaurs. This would have allowed the animal to breathe even with most of its snout submerged in water. It had crocodile-like teeth which helped the dinosaur to catch fish. The reptile's dense bone also helped it float in water.

- Discuss how dinosaurs became extinct. The last dinosaurs died approximately 65 million years ago. Although the cause of their extinction is still a mystery, there are many theories.
  Discuss the following theories:
  — A big meteorite crashed into Earth, changing the climatic conditions so dramatically that dinosaurs could not survive.
  — Ash and gas spewing from volcanoes suffocated many of the dinosaurs.
  — Diseases wiped out entire populations of dinosaurs.
  — Food chain imbalances lead to the starvation of the dinosaurs.

ACTIVITY 1: Research Project

Ask students to research velociraptor and a dinosaur found in India named Rajasaurus. Have them use the internet to conduct the research. After finishing their research, have the students draw each dinosaur on a sheet of paper and then label the drawings so that they can compare and contrast the two.

(*Please ensure that the students are monitored when they visit websites for research.*)

ACTIVITY 2: Quiz Show

Divide the class into groups. Then pair the groups. Both groups will develop ten questions to ask the other group. Challenge the groups to test their dinosaur knowledge by asking the other group questions. The same group keeps asking questions until the responding group gets a question wrong. Each question is worth five points. The group with the most points wins.

LANGUAGE ARTS CONNECTION

SESSION FOCUS: RECONSTRUCT A DINOSAUR

ACTIVITY: My Dinosaur

Hand a sheet of paper to each student. Direct students to create an imaginary dinosaur and name it, design its habitat and decide its size, scale, and eating habits in a descriptive paragraph.

MOVIE WATCH

Jurassic Park

VIDEO HUB

How Are Fossils Made? https://in.pinterest.com/pin/220535712972536277/

Last Day of the Dinosaurs (Documentary) https://www.youtube.com/watch?v=vuet3t9geXo

Jurassic Adventure Dinosaur Theme Park https://www.youtube.com/watch?v=VfnN7Y8ZUXc

Name _____ Date _____

Comprehension Check

Draw each of the items below.

A fossil

A dinosaur

A desert

A forest

Write: How do the drawings help me understand each of the items?

MEET THE MOLA MOLA

LIFE SCIENCE OUTCOME

Students will understand that humans need to respect animal life, natural resources and habitats. They will be able to inform about the mola, its size, food, appearance and interactions.

LANGUAGE ARTS OUTCOME:

Students write several sentences to form a paragraph that synthesizes information they read.

CURRICULUM CONNECTION

LIFE SCIENCE

This article connects to the life science curriculum. You teach that there are many kinds of plants and animals in an area and they exist on land and in water. In this article, students meet the mola, a unique kind of fish. They also learn how people are harming the mola's habitat and what they can do to help the ocean. Finally, they learn about what a marine biologist does.

BEFORE READING

BUILD BACKGROUND

Begin the session by playing a game of A-Z of ocean animals.

Seat students in a circle. Start the game by naming an ocean animal that begins with the letter 'a', for example an angel fish. Student 1 adds a name starting with the letter 'b', for example, blue whale. Student 2 adds a name with letter 'c', for example, crab. The game continues till you cover all the letters of the alphabet. List the names on the board as students speak or you could pass around paper for students to write the names as they say them.

Read out the list and praise students for their efforts. Let them know that the list that they have generated is just a fraction of the thousands of animals that live in the ocean. Marine biologists are constantly discovering more and more animals to study.

Inform them that they will learn about an ocean animal that a marine biologist is studying.

READY TO READ

- Hand out copies of **engage** magazine and have students turn to page 10.
- Read the story 'Meet the Mola Mola'.
- Ask students questions about Tierney Thys and what she likes to do.
- Read and discuss the information about the mola mola from the story, like its appearance, the food it likes to eat, the way it helps other animals and the threat to the animal.
- Discuss how Tierney tracks the mola through a radio transmitter.
- Explain that a scientist might place the transmitter around an animal's ankle, neck, wing or fin. The transmitter sends out a signal in the form of radio waves, just as a radio station does. To keep track of the signal, the scientist follows the animal using the receiver.
- Show students a variety of ocean animals on page 18 and 19 like the yeti crab, anglerfish, fingehead and barreleye. Discuss other unusual fish that students may be aware of.
- Have children study the mural on page 15 and point out the animals they can see.
- Briefly discuss threats to ocean animals and ways to protect them.

AFTER READING: EXTENSION ACTIVITIES

SCIENCE CONNECTION

SESSION FOCUS: ABOUT THE MOLA MOLA

• Discuss the following facts about the mola mola. The word "mola" is Latin for millstone, which is a large, heavy round stone used to grind grain. Ask students to explain why this is an appropriate name for this fish. (*It sort of looks like a millstone.*) The mola is also known as the ocean sunfish as it enjoys sunning itself at the surface of the ocean. It is the world's largest and heaviest bony fish.

• Students might suggest the blue whale is the largest ocean animal. Point out that a whale is a mammal and is different from a fish in many ways. Also point out that some fish are larger, but those fish do not have bones. They have cartilage instead of bones. Cartilage is the same stuff that makes up your nose.

• Whales are warm-blooded, breathe air, give birth to live young and produce milk to feed their newborns. Whereas fish (including sharks) are cold-blooded, extract oxygen from water through their gills and lay eggs.

• Point at the mola on page 12 and discuss its rounded appearance and its unusual look. Inform students that while most fish have long fins, the mola's fin does not grow along with the rest of its body after it hatches and remains short and rounded. The short fin is called a clavus. Molas use the clavus to steer as they swim.

— *Colour*: An ocean sunfish's colour can vary from brown to grey or silvery, or even almost white. They may also have spots.
— *Food*: Ocean sunfish eat jellyfish. They also eat salps, small fish, plankton, algae, mollusks and brittle stars.
— *Parasites*: Many organisms like flat worms grow on mola mola. (*Parasites are organisms that live on other animal/species known as a host and obtain nutrition from them.*)

• When parasites infest a mola it swims to areas where smaller fish pick the parasites off its skin. A mola is also known to leap out of water and hit hard as they land to shake the parasites off their skin.

• Scientists also think that a mola spends time sunning itself to allow gulls to land on it and pick off the parasites. The fish float on one side as the birds peck them clean. Then the fish flip onto the other side so that can be cleaned, too!

Follow-up Activity:
Students solve the BLM:
Meet The Mola Mola Comprehension Check

MATHEMATICS CONNECTION

SESSION FOCUS: COMPARING THE HEIGHT AND WEIGHT OF THE MOLA MOLA

• Share with students that the size of the mola is 4 metres measured from face to tail and 3 metres measured from back to stomach.

• Let students compare their size to that of the mola.

• Mark 4 metres on the wall and have volunteers measure themselves against it.

• Ask students to compare their size to the mola's.

• *State*: A full-sized mola can weigh as much as 2,268 kilograms.

• Ask the weight of a child in the class and compare it with the mola. For example, if a child weighs 20 kgs, the mola will weigh as much as 114 such children put together.

ART & CRAFT CONNECTION

SESSION FOCUS: MOLA ORIGAMI

You need:
• 16.7 cm origami paper (silver or grey)
• a black marker
• silver glitter

To do:
1. Take a 16.7 cm origami paper. Fold it vertically at the centre and open it to get a vertical crease.

2. Fold both the sides so that they meet the centre crease (*figure 1*).

3. Now fold the paper horizontally to make a crease and then unfold it (*figure 2*).

4. Once again fold both the sides horizontally and then unfold to get three crease lines as shown in *figure 3*.

5. Make slant lines on the third box as shown in *figure 4*.

6. Fold at the slant lines, opening the bottom half so that the figure resembles a roof (*figure 4*).

7. Fold the top portion as shown in the figure 5 and then flip over (*figure 6*).

8. Finish off by making silver markings on the body and the eye.


figure 1


figure 2


figure 3


figure 4

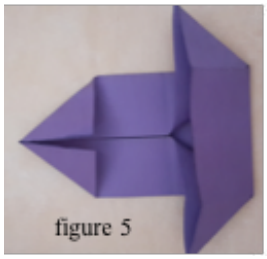


figure 5

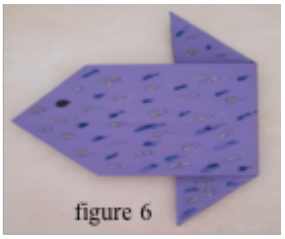


figure 6

STEM CONNECTION

SESSION FOCUS: HOW DO FISH RISE AND SINK IN WATER?

You need:
- a clear plastic bottle
- a sachet of tomato ketchup
- water
- a marker
- cello tape

To do:
Watch this video to see the experiment work.
https://www.youtube.com/watch?v=VbMi_DNTkUc

- Transform the ketchup sachet into a fish! Turn two corners of the sachet inward as if you were making a paper airplane. Keep the folds small. Tape the tabs in place.

- Gently squeeze the center of the packet and tape down the outer edges of the packet in the very centre. This will make the sachet look like it has a body and a tail like a fish.

- Color your fish with markers. Draw eyes, gills and fins to complete your fish.

- Gently push the ketchup sachets into the bottle. Fill it with water all the way to the top. If the sachets sink, then you will need to remove them and redistribute the air inside it.

- Screw the lid on the bottle and squeeze the sides firmly. The fish will dive to the bottom of your bottle ocean floor. Release the pressure and the fish will float to the top. It's science!

The ketchup sachet floats because it has air trapped inside it and air is lighter than water. When the bottle is squeezed, the air bubble is compressed into a smaller space because air compresses more easily than water. This increases the density of the ketchup sachet and makes it sink to the bottom of the bottle. When the pressure is released, the air inside expands, allowing the sachet to rise again.

Fish rise and sink using a similar principle. Most fish have an air bladder inside their stomachs that they fill with air to control their upward and downward movement. Just like the ketchup sachet, when the fish wants to rise it increases the air in the bladder, and when it wants to sink, it releases the air, so that it becomes denser and sinks.

CITIZENSHIP CONNECTION

SESSION FOCUS: PLASTIC POLLUTION AWARENESS

- Briefly discuss the threats to animals and their habitat in the oceans. Over fishing, oil spills, global warming, plastic dumping and garbage dispersal etc. have resulted in loss of habitat of animals. Many animals are also endangered due to these reasons.

- Discuss how a mola may mistake a plastic bag for a jelly fish. They eat the plastic bag by mistake and might choke and die. Many other animals also snack on the plastic and sometimes get entangled in them. So, one must pick up garbage and litter near beaches and volunteer for ocean clean up camps.

- Show students the video on this link: http://www.plasticpollutioncoalition.org/

- Ask students to research and find out actions they can take to downsize the use of plastic for example, using a cloth bag at the grocery store

instead of plastic bags, not purchasing items sold in disposable containers and carrying your own water bottle instead of purchasing a disposable water bottle.

- Create a bulletin board in school educating the school community about the problem and display all the possible solutions and/or alternatives.

- The board can also outline ways the school could help and/or how students/faculty could help at home.

- Students can also work in smaller groups and present lessons in the other classes on how plastics impact wildlife, and what we can do to become agents of change by downsizing the use of plastic.

LIFE SCIENCE AND LANGUAGE CONNECTION

SESSION FOCUS: CAREERS – MARINE BIOLOGIST

- Recall the name of the scientist from the story and ask students the name of her profession (*Marine biologist*).

- Ask children about the skills they might need to become marine biologists. (*Deep sea diving, studying hard to graduate in marine biology, being adventurous and fearless.*)

- Share the following information about marine biologists:
  A marine biologist studies marine organisms, their behaviour, what they look like, how they live, their enemies and threats, etc. They study subjects like biology, physics, chemistry and mathematics apart from being adventurous and passionate about marine life. They collect and analyze data, study different plant and animal species and the effects of the environment on them, among other things. They could research how ocean acidification is affecting marine organisms.

  Marine biologists are somewhat similar to zoologists and wildlife biologists. The only difference is that they work in the ocean. Molecular biology, applied research and biochemistry are key skills. They help the seafood industry by providing consumers with sustainable food choices. They work underwater as much as they work in laboratories, where they can study the animals more closely. Much of their work focuses on research.

- After sharing the above information, ask students about their interests and what they would like to become when they grow up. Discuss the hard work, dedication and passion that one needs to achieve something of significance in one's life.

- Encourage them to research the subjects they need to study to pursue a particular career.

Follow-up Activity
Students solve the **BLM**: **When I Grow Up...**

VIDEO HUB

Giant Alien like Fish https://www.youtube.com/watch?v=nrAhcHWKX4Q

Seagulls Help Sunfish https://www.youtube.com/watch?v=U60obmWODLQ

Divers Encounter Giant Fish https://www.youtube.com/watch?v=QV3m-5rCLtc

Facts – The Ocean Sunfish https://www.youtube.com/watch?v=SHzBoG8IIOw

Swim with the Giant Sunfish – Tierney Thys Ted Talk https://www.ted.com/talks/tierney_thys_swims_with_the_giant_sunfish

Ghostly Yeti Crab Swarms https://www.youtube.com/watch?v=r17cPDVzTls

Fish With Transparent Head https://www.youtube.com/watch?v=Zoygy-8PTtU

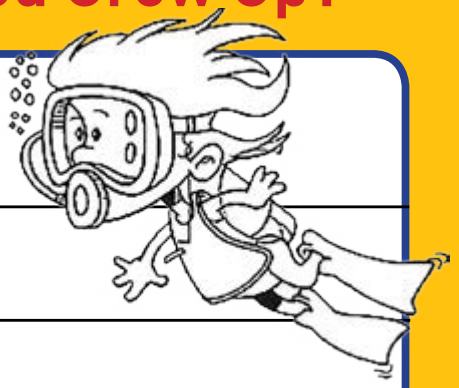
Invisible Fish: The Mystery Solved https://www.youtube.com/watch?v=kWtgzKDXHFA

Weird Killer of the Deep (Angler Fish) https://www.youtube.com/watch?v=XUVerZsbYiw

Reaper Vampire Creature - The Sarcastic Fringehead https://www.youtube.com/watch?v=I6S6vJHy6fA

Tierney Thys studies life in an ocean.
She is a marine biologist.

What Would You Like To Be When You Grow Up?

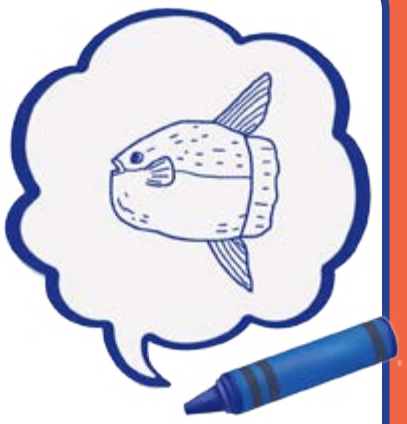


Write It!

Draw It!

MEET THE MOLA MOLA: Comprehension Check

Use the information in the story to answer the questions.



1. Which ocean animal does Tierney Thys study?

_____

_____

2. What material is the mola made up of?

_____

_____

3. What does the mola eat?

_____

_____

4. How does the mola help other animals?

_____

_____

5. What is the biggest threat to the mola?

_____

_____

SKY LIGHTS

PHYSICAL SCIENCE STANDARDS
Students will understand that white light is made of seven different colours.

LANGUAGE STANDARDS
Students read for meaning, demonstrating both understanding and personal response to what is read. They use reasoning strategies and background knowledge to solve complex problems related to the text.

CURRICULUM CONNECTION

PHYSICAL SCIENCE

This article connects to the physical science curriculum. You teach that some materials allow light to pass through them. You also teach that some materials reflect, or bounce, light. This article expands on these ideas by teaching that visible light is made of seven colours. These colours can be seen in the sky as a rainbow. Students also learn that the sun is the primary source of energy in the solar system.

BEFORE READING

BUILD BACKGROUND

Write the word 'sky' on the board and ask students to say the first thing that comes to their minds when they think of the word 'sky'. (*Possible answers: stars, sun, moon, clouds, rainbow, blue, dark, etc.*) Write their responses on the board as they say them out loud.

Then discuss how the sky changes from day to night. Focus on the colours one can observe in the day sky and the night sky.

Let the students know that they will be reading about colours in the sky and how they change in the story 'Sky Lights'.

READY TO READ

Hand out copies of **engage** and have students turn to page 25.

Read the story from page 24-31.

After reading the story, build a Word Wall with the words students find interesting in the story. Ask each student to write a word they have found interesting on the Word Wall.

AFTER READING: EXTENSION ACTIVITIES

SCIENCE CONNECTION

SESSION FOCUS: ABOUT AURORAS

- *Share the following information about auroras*:
  The aurora borealis is also known as the northern lights. It comes from two ancient names. Aurora is the Roman god of the dawn; borealis is the Greek name for the north wind. The northern lights are most visible to people living in the far north. They are green, purple, red or blue in colour. Near the South Pole, people may see the southern lights or the *aurora australis*.

- Show students these videos:
  The Science and Beauty of Auroras https://www.youtube.com/watch?v=ZVTbolyobcE
  Fantastic Aurora https://wwwyoutube.com/watch?v=N5utQxtma2U

- After watching the videos ask students to explain in their own words how auroras are formed. The students can work together in groups to explain the formation.

- Summarise with the following information:
  The sun causes an aurora. The sun is a star that is a huge ball of gas. Explosions on the sun produce

large amounts of energy. This energy is released as light and heat. When this interacts with the gases in the atmosphere it creates an aurora.

- Different gases in the atmosphere create different colours. Most of the atmosphere is made of oxygen and nitrogen. Oxygen gives off red or greenish light and nitrogen gives off red or violet light. We see northern lights only at the north and south poles because of our planet's strong magnetic field. It is like a bar magnet. When the solar wind collides with the gases in the Earth's atmosphere, the charged particles are largely deflected by the Earth's magnetic field. However this magnetic field is weaker at the north and south poles and therefore attracts the solar wind at the poles, creating these beautiful dancing lights.

ACTIVITY: Colouring an Aurora

You need:

- black chart paper
- oil paint

To do:

1. Give each student an A3 size black chart paper.
2. Using a pencil/white crayon ask them to draw a horizontal line across the paper, about an inch above the bottom, and an outline of hills.
3. The students can now use oil paints to draw an aurora.

IMAGE: http://kathy-angelnik.blogspot.in/2015/01/northern-lights-winter-landscape-art.html?spref=pi

LANGUAGE ARTS CONNECTION

Explain to students that a compound word is a word made of two shorter words. For example, the word 'rainbow' is made up of the two words 'rain' and 'bow'. Have them read the story and circle all the compound words. Then have them read the entire magazine and circle all the compound words they can find.

LANGUAGE ARTS & SCIENCE CONNECTION

SESSION FOCUS: THE COLOURS OF THE SKY

- Show students the video **Sky Color** (share with the students that this spelling of color is used in US English) by Peter H. Reynolds https://www.youtube.com/watch?v=noNTx4YdgMY

- After watching the video, summarise the story: Marisol notices how the sky changes colour as the sun sets, and how the sky isn't blue at all during the night or on a rainy day. Ask the students to share their observations about the colours of the sky and whether they know why we see the different colours in the sky at different times.

- ***Explain***: The light from the sun is actually white light. It is made up of all the colours of the rainbow – red, orange, yellow, green, blue, indigo, violet – mixed together. Light bends when it passes from one medium (e.g. air) into another medium of a different density (e.g. water). This bending of light is called refraction. Different colours are refracted by different angles because they have different wavelengths. As a result, when white light is refracted, it is separated into different colours.

- Show students the splitting of a white light by placing a glass prism under strong sunlight.

- ***Explain***: Earth's atmosphere is full of gases, like oxygen. When sunlight hits the Earth's atmosphere it is scattered by all the gases in the air. Blue light is scattered more easily than other colours because it has a shorter wavelength. This means that we see the blue light scattered over the sky, making the sky look blue.

- At sunset the sky looks orange and red. The sun is lower in the sky so the light has much further to travel to reach us. The blue light has scattered so much that it doesn't reach us. The red light, with a longer wavelength reaches us, so the sky looks red.

- Show students the video **NASA Science – Why is the Sky Blue?** https://www.youtube.com/watch?v=qP2Vp1zj8H0

ACTIVITY
Ask students to track the colours of the sky at different times of day and write down what they see. Also ask them to draw pictures of the different coloured sky at different times of day.

SCIENCE CONNECTION

SESSION FOCUS: PROPERTIES OF LIGHT

You need:
- torch
- mirror
- transparent plastic sheet
- bowl of water
- coin
- prism

To do:
1. Ask students to name a few natural and artificial sources of light.
   Natural sources – the sun is the main source of light. Other forms of natural light include the moon and the stars that reflect the light of the sun.
   Artificial sources – light bulb, candle and light from burning wood, to name a few.
2. Turn off the lights in the room and ask students if they can see and name any of the objects in the class. Discuss why we cannot see objects when the light is turned off.
3. Explain that in order to see an object, it must reflect light. Reflection is the phenomenon where light bounces off of an opaque object, which is an object that you can't see though, like chairs, tables, books, students etc. Light travels from the light bulb to the objects in your classroom and bounces off them so that they are visible to your eyes.

Effects of Light on Different Materials
- Light is made up of tiny particles that travel in waves. Light travels until it hits an object and is either absorbed or reflected by it. We can see because light is reflected from an object to our eyes.

- Switch off the light and use a torch to direct a ray of light to a corner of the room. Ask students the reason the light does not move further. Wait for their responses and explain that light does not travel through opaque objects (the wall). Opaque objects block light and cast shadows. Demonstrate this by flashing a light on a student or a chair and showing the shadow cast against the wall.

- Once again flash a light onto a transparent object such as a plastic sheet and discuss that transparent surfaces allow light to pass through them.

Reflection:
- Flash a light on a mirror and let students observe what happens.
- Discuss how the shiny surface of a mirror reflects the beam of light.
- Show students their reflection in the mirror or on another polished surface like a metal spoon or plate, and then on a dirty surface. Discuss why they can see their reflection clearly on a polished/ smooth surface, but that it is distorted due to dirt or dust particles on the dirty plate.

Refraction:
- Place a spoon in a clear glass of water. What happens? The spoon looks broken.
- ***Explain***: When light travels through water or glass, it slows down and changes direction or 'bends'. This is due to refraction. When light passes through objects of different densities, it refracts, or changes direction.

Absorption:
- Sometimes, not all of the light is reflected by an object. Some of it is absorbed. Absorption is when the light waves are soaked up rather than reflected.
- The absorbed light cannot be seen by the human eye. This explains why some objects give off certain colours. Different waves of light appear as different colours, and the waves that are reflected are the ones that we can see. The waves that are absorbed are the ones we cannot see.

Follow–up Activity:
Have the students solve the BLMs:
'Colours in the Sky' and **'Is it a Light Source'**

SCIENCE CONNECTION

SESSION FOCUS: ABOUT RAINBOWS
- Ask students to state the colours of the rainbow. Ask them whether they have seen a rainbow?

- Show students this video of a book reading:
  A Rainbow of My Own by Don Freeman https://www.youtube.com/watch?v=QWn7HAxc9p8
  In the story, the boy believes the rainbow is his friend and that he can jump over it, play with it, and so on. Ask students if they can touch a rainbow. What made the rainbow in the boy's room? Ask students whether they have ever made a rainbow?

Divide the students into groups and give them prisms/old CDs (the silver side reflects light to show the rainbow colours) to make rainbows.

- Show students this video: **Why Do We Get Rainbows?** https://www.youtube.com/watch?v=i5i7XtxNz30

- Ask students to list the 3 conditions that are necessary for a rainbow to be seen.

ACTIVITY: Rainbow Art

You need:

- art sheet
- tissue paper or kite paper in all colours of the rainbow
- water
- spray bottles

To do:

1. Hand over art sheets and coloured tissue/kite paper to your students.
2. Instruct them to tear the coloured paper into small pieces and place them on the white art sheet covering it completely.
3. Give them spray bottles filled with water and let students spray water onto the coloured paper making sure that all the tissue pieces are wet.
4. Let it dry. As the tissue/kite paper dries the colour will bleed onto the paper it is placed on. (Wherever the tissues overlap they will see a blend of colours.)
5. Instruct students to remove the tissue pieces once dried.

VIDEO HUB

What is an Aurora? https://www.youtube.com/watch?v=czMh3BnHFHQ

Spectacular Norway Northern Lights https://www.youtube.com/watch?v=izYiDDt6d8s

Alaska's Epic Northern Lights https://www.youtube.com/watch?v=TLbIUQJ6bsY

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— https://educators.brainpop.com/lesson-plan/light-background-information-for-teachers-and-parents/
— https://spaceplace.nasa.gov/blue-sky/en/
— http://www.optics4kids.org/home/content/what-is-optics/scattering/why-is-the-sky-blue-why-are-sunsets-red/

STORY READ-ALOUDS

Water is Water Read Aloud https://www.youtube.com/watch?v=4b-ALD65trM

Water Dance by Thomas Locker https://www.youtube.com/watch?v=qHPqIQzkrHM

Name _____ Date _____

Colours in the Sky

Fill in the boxes with appropriate colours. Use the word bank to write the names of colours.

purple red green blue violet indigo yellow orange

The colour of the sky during the day

The colour of the sky at dawn and dusk

Colours in a rainbow

Colours of an aurora

Name _____ Date _____

Is it a Light Source?

Draw a circle around the objects that make light.