KS2 (years 3,4,5 and 6)

Key Stage 2 carries on the learning from KS1. It is sometimes broken into lower key stage 2 (years 3 and 4) and upper key stage 2 (years 5 and 6) This is because there is such a big difference between learning in year 3 and year 6. The ideas we have used for KS1 and EYFS will support the learning in KS2 and by taking part in the activities and completing their task sheets, a broader learning experience can be achieved.

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant
- Investigate the way in which water is transported within plants
- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat
- Recognise that living things can be grouped in a variety of ways
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- Recognise that environments can change and that this can sometimes pose dangers to living things
- construct and interpret a variety of food chains, identifying producers, predators and prey
- compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
- Describe in simple terms how fossils are formed when things that have lived are trapped within rock

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird
- Describe the life process of reproduction in some plants and animals
- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals
- describe the ways in which nutrients and water are transported within animals, including humans.
- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago

- ❖ Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- ❖ Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

As part of their study of evolution children may learn about famous scientists who explored evolution concepts and ideas (Charles Darwin, Thomas Huxley, Alfred Russel Wallace and Mary Anning). They might also discuss how scientists learn about adaptation and evolution through studying fossils to find out what things were like millions of years ago.

Idea 1 - Year 6 (Evolution)

- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

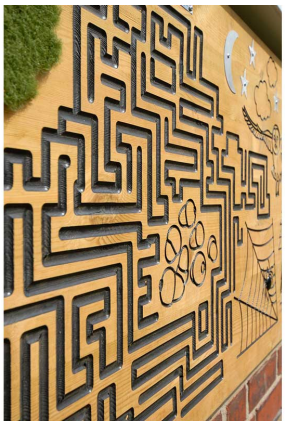
Finger maze

- The blind cave fish have adapted to their environment and have evolved over hundreds of years to live in the dark successfully, they don't need their sight, they rely on their other senses. They are very sensitive to noise, vibration and movement.

Read the story of the blind cave fish.

As one of the tasks, have a simple maze to move your finger through (or some kind of mechanism) ..The maze could have a picture of a cave on and you have to navigate out of the cave, back into the river. Can you do it when you are blindfolded, using your other senses to get out of the cave? We/you could add textures for them to feel and use their sense of touch, have an instrument for them to hear which way to navigate. When one of your senses is taken away, you rely on your others more.

- *If you don't need a tail to swing through the trees then chances are you won't have one..*



Worksheet based questions:

- If you could have one amazing sense, which one would it be?
- Can you draw a blind cave fish with your eyes closed? Is it difficult for you not being able to see?
- Can you think of any other animals who have adapted to their environments?
- Write a different ending to the story of the blind cave fish.

Idea 2: - Exciting Predators

- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.
  ENGLISH TARGETS ALSO APPLY

Arguments for and against:

Clacton Pier once held 3 killer whales. They were captured in Iceland and brought to Clacton in 1968. Their names were: Nemo, Neptune and an unnamed male. The male died within 2 weeks of being captured. Neptune lived for 2 years and Nemo lived in captivity for 19 years. Watch the you tube videos for more information.

News report:

https://www.youtube.com/watch?v=5ZO6gmP1ex4

These videos can bring about lots of questions for children to consider about captive animals and generate lots of written work in the form of letters of complaint or biased arguments.

Big questions to think about:

1. Why did Greenpeace become involved with the killer whales on Clacton Pier?
2. Should large animals be kept in captivity?
3. What do you think should have happened to the killer whales at Clacton?

Predator Quiz questions:

1. What is the most deadliest predator in the ocean?
2. Can you name any other predators that live in the ocean?
3. What are the 5 senses and what extra sense does a shark have? Why?
4. Why are senses so important to a predator?
5. Senses are important to all animals. Can you name some animals with any extra special senses? (dogs – smell, cats/owls – sight, bats – hearing and moths have just been named as the animal with the best hearing!)

Idea 3: Exciting Predators

- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Trackers:

We use trackers to learn more about sharks and whales and other sea creatures that dive below the water. Here, the tracker sends a signal to a satellite whenever the shark surfaces. The data is logged and recorded and the scientists can track the animals movements.

Looking at the movements of exciting predators within the water.

We/you could make our own… It would be good for the children to log the data or even plot a course onto a sheet from a map on a screen.

This one is currently up and running:

https://www.smithsonianmag.com/smart-news/track-a-great-white-shark-from-your-computer-50263488/

Idea 4: Exciting Predators

- construct and interpret a variety of food chains, identifying producers, predators and prey

Can you generate electricity?

To help children understand about the sense of detecting electricity (that sharks and rays have) they could try and generate some themselves (to become the prey).

If they managed to generate some, it could light a bulb, a shark picture or the sharks eyes or a kind of game where you have to press a button or turn a wheel to create the electricity, causing the predator to eat the prey.

Question: *Why would being able to detect small electrical currents from fish help sharks and rays hunt?*

What kind of senses have humans adapted and enhanced and why?

- Night vision
- Radar (picks up electrical signals)
- Heat sensor

The word "radar" stands for **ra**dio **d**etection **a**nd **r**anging

- Imagine an airplane flying at night through thick fog. The pilots can't see where they're going, so they use the radar to help them. Fishermen use these to detect where big shoals of fish are. Heat sensors/Night vision detect heat. (Infrared)

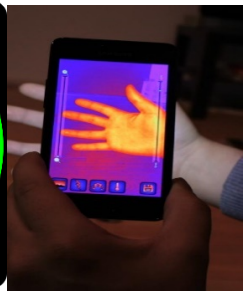
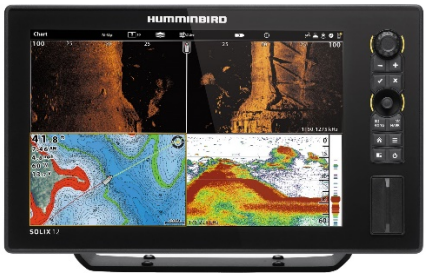
- We can use a simple camera to detect heat in the aquarium
- We can use some kind of radar (GPS) device to look for shoals of fish in the sea around Clacton?

Fish Radar App;

https://www.youtube.com/watch?v=7bbyPp_JMzk

Top 10 fish radar apps;

https://www.youtube.com/watch?v=-84jCVi-DH8

Big questions:

Do the senses help the animals to survive in their habitats?

Can you name any other animals who are at the top of their food chain?

What other features do predators have? Why?

Idea 5: Food Chains

- Construct and interpret a variety of food chains, identifying producers, predators and prey.

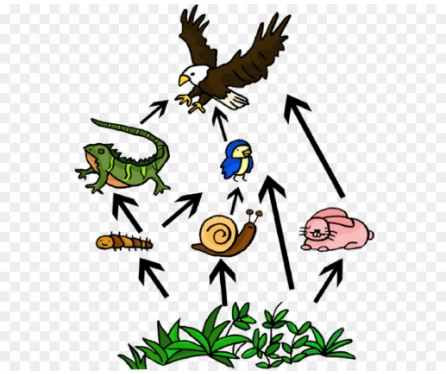
Magnetic board:

Having looked at the simpler food chains that are provided for KS1, KS2 could begin to consider their own food chains and begin to design their own using (wooden) magnetic pictures and a board that has spaces to put them in. Some of the food chains could be more complex and could be turned into food webs. They would then have to fill in their own food web on a task sheet.

Here, it would also be good to show how important the sun is in the food chain.

We want them to construct their own marine food chain.

On the board, there would be magnetic blocks with pictures of different animals that live in the sea, along with these there would be blocks with arrows, plankton, the sun and more. It would create a lot of discussion for all ages.



Idea 6: Building a Town – Habitats -LINK WITH GUNFLEET SANDS

- Recognise that environments can change and that this can sometimes pose dangers to living things.

More info:

- ✓ Biodiversity is the term that describes many different species living in one habitat. Usually, the more species, the healthier the environment
- ✓ An eco-system is a community of organisms and other living things.
- ✓ Habitat loss is probably the greatest threat to the variety of life on this planet today.

Questions: *How do habitats change?*

Answer: Sometimes the action of people can change habitats, coastal areas can be developed with sea-life being affected. Over-fishing and of course – plastic pollution or litter in rivers and seas is also another human impact. Changes in weather can also affect some habitats. (we would need to mention invasive species)

Question: *What happens when habitats are altered?*

Here, we want the children to see how habitats might be altered by humans. To build or design a town near the coast, allows them to think about the impacts of humans.

Have a model of a coastal area and building blocks and other small world toys to build a town nearby. What things do you need to think about? Here would include the Gunfleet sands project and give them a little info about where the power is coming from.

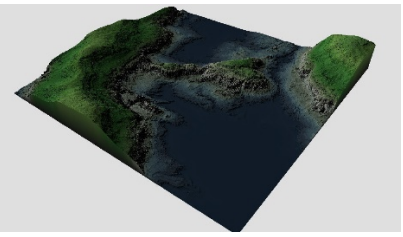
Video of the project

https://www.youtube.com/watch?v=hgbhKP1hb2w

They could draw their town – stickers?

Think about:

- Waste disposal
- Recycling centre
- Over fishing/sustainability
- Building too close to the sea
- Sea defences (We could link this to Clacton's sea defences)
- Wind farm for generation of power (Gunfleet Sands)



Could we look at Gunfleet Sands in more depth here? We could look at how a turbine works with smaller models. We could offer a set of instructions to build their own wind turbine. We could supply the technical information on how much electricity the turbines create in a day.

Why do we need to generate electricity?

Idea 7: Prehistoric cousins

Leaving imprints

- Describe in simple terms how fossils are formed when things that have lived are trapped within rock

https://www.bbc.com/bitesize/articles/z2ym2p3

Worksheet idea: Put pictures in order of fossilisation (sequencing)

This activity would help the children recognise that objects can leave impressions and when those objects have the right conditions- such as sedimentary rock -they will become fossilised, telling us a story from years ago.

We/you can make imprint trays and have rubber stamps of fossil for the children to impress into the sand. (like these made of rubber) or we could have objects to place in a steel pin imprint plate. (They would also be able to see the EYFS fossil rubbings and the fossil find from KS1)

Idea 5: Microscopic Life

- Recognise that living things can be grouped in a variety of ways
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals

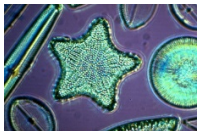
What kind of plankton are you?

This is a quiz which asks simple questions to determine what microbe you are teaching them that there are differences in micro biotic life and not all bacteria are harmful. It was designed by the Center for Microbial Oceanography: Research and Education, University of Hawaii, Honolulu.

https://www.asm.org/images/Education/K-12/hsia-what%20microbe%20are%20you_final.pdf

We/you could make our own – what kind of plankton are you?
The aim of this activity is to get the children to begin and explore categorising plants and animals. The task could be made easy or difficult but we would have to supply the information before the work could be completed.
We could make a simple yes, no question sheet, leading to what plankton you are. This would also link in to classifications of omnivores, carnivores and herbivores. If they designed their own they would need to categorise the plankton first. ***Key stage 2 could design their own or we could have some prepared:***
e.g:
Are you a vegetarian?
yes:
Do you enjoy being in the sun?
Yes
Do you prefer an ocean or a calm lake?

ocean
Do you prefer the colour red or yellow?
Yellow
Then you are a diatom phytoplankton, a plant based organism with a yellowish colour. You produce oxygen (with the help of the sun) and you drift in the ocean, near the surface.



Idea 8: Prehistoric Cousins

Megalodons were known to have lived because we found fossilised teeth. A few bones have been found too but never a whole creature. Most palaeontologists estimate the megalodons size by its teeth.

How big was a megalodon?

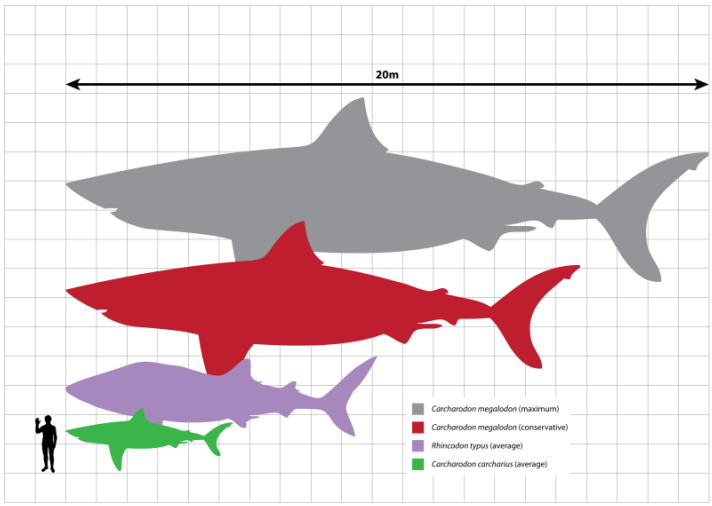
On a worksheet: have a part of a megalodon pictured (like its tooth) and the children have to draw the rest of its body, just like scientists would have to.

Try to estimate the size of the megalodon:

Children can work out how many of them (in height) equal one Megalodon (in body length). Could we supply a big calculator – children could measure themselves and calculate. We could also tell the children are how many pounds of food Megalodon may have consumed per day. They can then calculate how many pounds of food they are estimated to have consumed per week and per year. They could convert these estimates to numbers of six-ounce tuna cans

~6667 tuna cans per day,
~46,667 tuna cans per week,
~2,433,333 tuna cans per year.

Record this on their work sheet.



I like having a timeline of the earth shown somewhere???

A timeline of events:

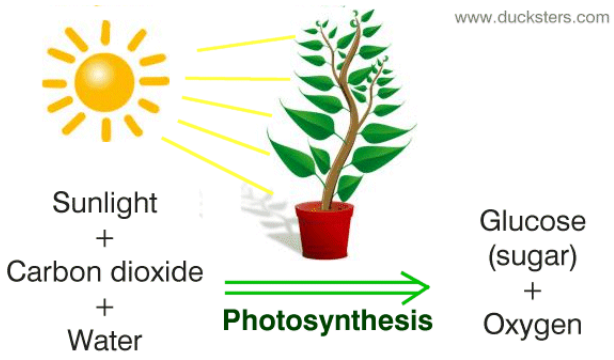
Age of the earth (4.6 billion years old)
First plants - algae (3.6 billion years ago)
First bacteria (3.2 billion years ago)
First eukaryotes (2.1 billion years ago)
First multi-cellular organisms (1.5 billion years ago)
First jellyfish (670 million years ago)
First fish (510 million years ago)
First sharks (435 million years ago)
First land plants (430 million years ago)
First insects (385 million years ago)
First amphibians (370 million years ago)
First reptiles (330 million years ago)
First mammals (240 million years ago)
First non-avian dinosaurs (225 million years ago)
First birds (220 million years ago)
First flowering plants (115 million years ago)
Extinction of non-avian dinosaurs (65 million years ago)
First evidence of Megalodon (17 million years ago)
Extinction of Megalodon (2 million years ago)
First modern humans – Homo sapiens (100,000 years ago)

Idea 9 – Microscopic Life, food chains and life cycles

- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant
- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat

Question: How does Plankton produce oxygen?

Answer: Plankton uses photosynthesis to convert carbon dioxide and sunlight into sugars that the plant can then use for energy. It releases oxygen into the atmosphere, providing us air to breathe. We breathe out carbon dioxide and breathe in oxygen.



Here, we want the children to understand photosynthesis and how the phytoplankton get their energy from the sun, water and carbon dioxide, converting it into its own energy (food) -making it a producer. Then releasing oxygen for us to breathe and supplying food for the food chain.

We/you could design a recipe for the plankton as plants like to make their own food. They could follow or write a list of instructions, step by step.

There could be a small station with examples of seaweed and other water plants. On the table there could be a bowl with a range of ingredients. The children could follow the steps to learn about photosynthesis.

Instructions for making your own energy:

Step 1: First, add a sprinkle of the sunshine and stir well.

Step 2: Next, add the carbon dioxide from your breath! We breathe out carbon dioxide so you should have plenty to put in there! Check it on our spinners. (have a garden windmill for them to breathe on to) Mix together well.

Finally, add a small amount of water…

Step 3: The chlorphyll is starting to work now, helping you to mix the sunlight, carbon dioxide and water.

Step 4: a little water. You are beginning to produce a little bit of oxygen. Keep mixing…

Step 5: Amazing you are now producing lots of oxygen and glucose. You are a producer.

Now let's try and think of someone who would also eat need this energy….

Now complete the recipe on the worksheet.

Video on photosynthesis:

https://www.youtube.com/watch?v=yHVhM-pLRXk

Idea 10: Environmental Issues

Sort, record and categorise the rubbish.

Question: *How can I help reduce the plastic in our ocean? How does it get into our oceans?*

The children could have clipboards and become eco warriors in this area. Within the recycling area, there could be an assortment of rubbish where the children can put the rubbish they have found into the correct bins, instead of it blowing into our oceans and streams.

For KS2: Record your findings and gather information.

- What kind of rubbish have they found?
- Where has it come from?
- Who do you think has dropped it?
- Where could we put it now?

Here, they could also create a tally chart and record all the rubbish they found in the area (or around the aquarium - maybe hidden in tanks or corners) and fill the chart in as they go.

Plastics	Card	Foil
Bottle Cap rope	Packaging cups	Wrappers

Worksheet based ideas:

What can we do to help reduce plastic?

Matching the items with the non-plastic alternative. This could be created on a board or be a paper-based activity. You would match the plastic forks for example, to the wooden forks. The plastic tray to the cardboard one and so on..

When do I use plastic and why?

What 3 items of plastic do you use each day? (This would get them thinking of the plastic they use in everyday life)

Can you draw the non-plastic alternatives? (This will make them think of what alternatives are out there)

What can you do with plastic apart from recycle? (Are there any ways we could upcycle the plastic?)

Where does plastic go when it is in the ocean?

For **KS2,** we could have information on the 5 gyres in the 5 oceans (we could bring geography into this and try to locate the 5 oceans and the continents) This clip is really useful and informative: (The biggest being the Great Pacific Garbage Patch.)

https://www.youtube.com/watch?v=YFZS3Vh4lfI

It would be great to have a large map that when you press a button in a specific location, information would be given. It could be about the 5 gyres, located in the 5 oceans – These being the rotating currents that gather massive plastic debris. (or the children could map out where the famous plastic ducks drifted when they were accidently dumped at sea)..

Current Issues noticeboard:

We/you would need to keep updating the latest information about the cleaning of our oceans, Including the plastic eating enzyme article, the boats (as of Sept 2018) that have set off from America, in an attempt to clear 'the great pacific garbage patch',.. Newspaper articles?

They have recently found a way to turn plastic waste into fuel….

Other ideas in the first stages of development:

A game to play at school (resource pack)

- Construct and interpret a variety of food chains, identifying producers, predators and prey.

All animals within an ecosystem are interconnected through food chains.

Action:

• Assign each student one of four roles: plant, insect, omnivore, and carnivore. Give each group a card that corresponds to their role. This is so that other students can identify them. There should be more plants than insects, more insects than omnivores, and more omnivores than carnivores.

• Each insect needs two plants to survive, each omnivore needs either two plants, two insects or one of each to survive, each carnivore needs two omnivores to survive.

• Play the game out like tag to see if everyone survives. After all the "food" available has been captured, assess if everyone had enough to survive. If there is someone that did not, they should sit out for the next round. Keep going until there are not many survivors left.

• Alter the number of each role to see how it affects the survival of all creatures. Water pollution or humans in and around their houses reduce the number of insects available. Farmers protecting their livestock reduce the number of carnivores. • Try adding a "safe base" that represents a specific habitat that animals would utilize to help protect them from predators. To keep the game moving, put a limit on the number of people that can be on

safe at any time or enforce a time limit. If they stay too long, they “starve to death” because they did not find enough food in time.

• After playing out numerous situations, return to the classroom to discuss what happened: What happened when there were not many plants? What happened when there were not many insects? What happened when there were not many carnivores? What happened when there was a safe base?

More ideas to link with creatures in the aquarium….

Habitats and adaption clown fish – learn how adaptable the clown fish is when it comes to their skin. (could we somehow make top trump cards for them to play in the aquarium…)

Archer fish – protects its habitat fiercely

Lion fish – poisonous – why is it poisonous? What does it do with its poison?

Turtles (fingerprints) Every turtle has a different shell, just like a fingerprint…