Questions and comments for teachers on ELASMO 2- AN ADVENTURE IN TIME

This topic is so huge it lends itself to many off-shoots. It will be possible to take themes and develop them into maths lessons; biology lessons and many other fun things. For that reason, I have developed a selection of comments and questions for teachers to think about when using this e-book.

I have included notes about creatures you may not have heard of – or ideas for activities

eg making volcanos

"To make volcano for kids, firstly take a **soda bottle and mix water, dish soap, food coloring and white vinegar**. Then, make baking soda slurry and add slowly to this solution. Let the children watch the volcano erupt and understand the concept of eruption properly."

This is just to stimulate your imagination – it is just a sample of my ideas!

Page 2

This question is the reason for going back into time. This book charts the evolution especially of sharks and the megaladon. We want to dispel the myth that THE MEG lives on, encouraged by YOUTUBE and films such as THE MEG.

Page 3

This states that the yellow submarine is able to travel in time/space wherever it wants - when travel starts it would be good to talk about NUMBERS what is a million? Suggest counting to a million, one number a second. Count for 10 seconds - then try and guess how long it would take to get to a million (it's just over 11.5 days - with no eating, sleeping and especially no going to the toilet!). For Maltese children, get them to imagine the time between them and the Romans - then think about the Romans, they thought of the pyramid building Egyptians as the same amount of time before them. Then think of the pyramid builders - they thought of the temple builders in Malta as the same amount of time in the past. That is just (roughly) 6,000 years in total so going back 600 million would be 100,000 times further. Then, of course you have the age of the universe, Earth etc - the numbers are really too big. With imagination it could be a great mathematics lesson!

Page 4

300 and then 400 million years ago. This shows Elasmo going back in time through 300 and then 400 million years. Get the children to understand that the bigger the number the further back in time we are going.

Page 5

600 million years ago. Chance to talk about THE BIG BANG theory or other geological facts - how the earth was formed
Elasmo is going back in time.

Single celled life (perhaps bacteria, these are believed to have been the first life on earth) but still a lot of volcanic activity. Not a good place for Elasmo

Page 6

575 million years ago. Elasmo travelling forwards in time through to 575 million years in the past. Strange life forms known as the Ediacarans appear around this time and persist for about 33 million years. They may be a cross between plants and animals - no known descendants today.

Page 7

550 million years ago. Simple one celled creatures appear in the sea - such as Bacteria which are thought to have been the very first life on earth. Followed by more complex creatures like jellyfish. Indications are that some organisms become self powered rather than immobile.

Trilobites appear at the end of this period. (notes on trilobites on Snakes and Ladders game notes) Trilobites were abundant and have left many fossil remains.

Page 8

500 million years ago. Elasmo travelling forwards in time to 500 million years in the past. He misses seeing the first land animals appearing and early squid-like creatures

Page 9

450 million years ago. Coral fossils have been found at this period of time - also the first fish and very early shark-like creatures (bony fish and cartilaginous fish respectively).

Page 10

445 million years ago. THIS VIDEO CONTAINS FLASHING LIGHTS DO NOT PLAY IF THERE ARE EPILEPTICS IN YOUR CLASSROOM - the video should be safe for all children but the flashing images MAY cause a problem - use your discretion.

Page 11

445 million years ago. The first of the 5 major extinctions occurred it is called the **ORDOVICIAN** and 85% of life on earth perished. The black and white starburst on page 10 indicates a mass extinction event happening. Chance to talk about what might have caused the rapid global cooling and falling sea levels. Could it have been due to volcanic activity? Chance to make a science experiment volcano - perhaps talk about NUCLEAR WINTER such as happened after Mount St. Helens, NW USA, in 1980 - clouds of smoke and ash or 2010 the Iceland volcano and its disruption to the whole world!.

Page 12

400 million years ago. Elasmo travelling forwards in time to 400 million years in the past. He misses the first insects and the first plants with woody stems

Page 13

350 million years ago. Trees with leaves, stems, roots, seeds arrive, and Fish started to breath air (like modern day lungfish) - walk on land (Malta National Aquarium has an EPAULETTE SHARK which is capable of using its pectoral fins to walk from rock pool to rock pool in its native Australia) beginning of reptiles. Insects were very large and grew in number of species. Dragonflies the biggest insects ever "It was one of the largest known insects that ever lived, with a reconstructed wing length of 330 millimetres (13 in), an estimated wingspan of up to 710 millimetres (28 in), and a body length from head to tail of almost 430 millimetres (17 in). " Opportunity for making kites of dragonflies out of thin tissue and card.

Page 14

340 million years ago. An asteroid hits the earth (not a great deal of detail on this, but much more on the KT extinctior

Page 15

340 million years ago. The second of the 5 major extinctions occurred it is called the **DEVONIAN** and 70% of life on earth perished. The black and white starburst indicates a mass extinction event happening. Chance to talk about Asteroids (what they are and where they are from and especially what speed they travel at - compare to cars, current spaceships etc). What happens when one hits earth - meteors are smaller versions that burn up in the atmosphere (why/friction?) and meteorites that actually hit earth. Look at the moon - many craters - why doesn't Earth have craters like that (or does It and they are all hidden by sea and vegetation? Hint – big crater on East coast of USA now called the Chesapeake Bay)).
"Nuclear" winter caused by dust blocking out the sun, leading to rapid cooling globally - local destruction on earth from debris, death of many plants due to lack of sun, and ocean life affected by changing temperatures.
340 million years ago. Some aquatic animals develop and begin to colonise the land
300 million years ago. Early colonisers from the sea evolve into early Amphibians and Reptiles.

Give examples of Amphibians and Reptiles. What is the difference between an Amphibian and a Reptile.

Amphibians are a **class of cold-blooded vertebrates** made up of frogs, toads, salamanders, newts, and caecilians (wormlike animals with poorly developed eyes). MALTESE example Painted Frog.

Reptiles are **air-breathing vertebrates covered in special skin made up of scales, bony plates**, or a combination of both. They include crocodiles, snakes, lizards, turtles, and tortoises. ... Because of their slow metabolism and heat-seeking behaviour, reptiles are cold-blooded. MALTESE examples snakes, lizards and turtles.

275 million years ago. Therapsida evolve and remain for 175 million years. They gradually evolve into the first mammals (mammals are like us and most of the animals we know). What is special about mammals?
250 million years ago. The third of the 5 major extinctions occurred it is called the PERMIAN and 95% of life on earth p levels, de-oxygenation of oceans - desertification of land happening.
250 million years ago. Where are the dinosaurs?
250 million years ago. Clocks show the passage of time.

Page 19

243 million years ago. The age of the dinosaurs arrives. What does dinosaur mean - dino (terrible) and saur (lizard). Many different types - both plant and meat eating. Some found in the sea (Pleisosaur). Some get very, very big - Argentinosaurus huinculensis 35m (115 feet) and 69 tons - Brontosaurus only 20m (66 feet) and 35 tons. Amphibians and reptiles thrived - chance to talk about how fish adapted over 50 million years from being totally sea creatures to living on land. Talk about amphibians - cold blooded creatures - reptiles such as wall lizards needing to sun themselves

in the morning to get warm. The life cycle of amphibians such as frogs? How did dinosaurs live - were they coloured? did they have feathers? were they warm blooded? Chance for homework – research different dinosaurs? Draw a picture of what you think a dinosaur would look like.

Page 22
243 million years ago. This T Rex roars loudly - there are lots of buttons underneath which the children can press and make different roaring sounds which they can judge - loudness - likely to be what a dinosaur sounds like. Prepare for a noisy time whilst they play with the buttons. Action play they could be dinosaurs - they can talk about different types of dinosaurs. ESPECIALLY what they ate! Opportunity for research into the world of the dinosaur! How did dinosaurs scratch their bums with such tiny arms?

200 million years ago. Lots of trees. Some dinosaurs may be evolving into bird-like creatures.
Many mammals around beginning to develop warm-bloodedness.
200 million years ago. Dinosaurs and mammals share the plains. Most mammals are small and can hide easily.
200 million years ago. Climate change brings about significant temperature increase.
Some dinosaurs thrive on this, although many die out. Many of the forests die and become grassy plains - grazing dinosaurs and mammals evolve to make use of this space.
175 million years ago. Mammals split into egg-laying monotremes (Monotremes are a unique order of mammals that includes only three surviving species: **the duck-billed platypus (Ornithorynchus anitinus), the short-billed echidna (Tachyglossus aculeatus), and the western long-billed echidna (Zaglossus bruijni)),** and other more abundant mammals.

Are monotremes still alive today - what is unusual about them? All live in Australia – all are egg laying mammals.

The first feathered dinosaurs appear - they can't fly but they have simple feathers (examples - Epidexipteryx and later Archaeopteryx). Archaeopteryx is pictured in the e-book.
Turtles, snakes and other familiar reptiles appear.
100 million years ago. The first recognisable sharks, rays and skates evolve - Goblin sharks, frilled sharks and guitar fish abound. What do all these look like - what are their similarities and what are their differences.

65 million years ago. The K-T event which wipes out the dinosaurs. A 10km asteroid, travelling at over 65,00 kilometers an hour hits the earth in Mexico and makes a 200km wide crater.
How big is 10km, what would it weigh, how fast is it travelling - how far would it travel in a second?
If a crater is a hole in the ground - what happened to all the earth in it? Now look at dust in the atmosphere, how it cuts down the sunlight, what happens if you put a plant in a cupboard.
If the plants die what happens to the dinosaurs that eat plants. When it gets cold what happens to cold blooded dinosaurs (difference between cold and warm blooded animals - which one is best?)
Were all dinosaurs cold blooded - some evidence that T.Rex may have been slightly warm blooded. Are there any warm blooded sharks - white sharks keep their body temperature higher than the surroundings.

White sharks are "lamnid sharks" which have a unique system called a 'counter current heat exchange,' keeping their body warmer than the outside conditions by +/- 10-15 C°.
So if a white shark is in 9 C° water, its body temperature will be +/- 19-24 C° and so on. It appears that the heat retention system in lamnid sharks has allowed them to inhabit cold water and remain active predators of swift and agile prey.

How does this help them. Body works with chemical reactions - cooking is a chemical reaction - can you bake a cake in a cold oven? The hotter the oven the faster the cake rises - chemical reactions depend on heat to make them work faster. Too hot an oven and it all goes wrong – there are always limits to temperature and chemical reactions in living organisms.

65 million years ago. Why should deep water preserve the sharks? What survived the extinction? - the mammals go on to re-populate the earth but what else survived? There is a sixth mass extinction caused by global warming about 55 million years ago. The Palaeocene/Eocene extinction. A sudden rise in greenhouse gases sends temperatures soaring and transforms the planet, wiping out many species in the depths of the sea that can't adapt to the change in temperature (many sharks are able to adapt) – though species in shallow seas and on land develop strategies to cope with the heat. What could animals do to get away from the heat?

30 million years ago. Where is the Megalodon. It arrives as a fantastic predator relatively quickly.

30 million years ago. It's big, very big. Think a bus and a half and a mouth you could stand up in - probably not for long. Megalodon is an apex predator - this means that there is nothing that can hunt it and it can eat anything it likes.

30 million years ago. A trip round the jaw - this is an impression of what it might have looked like - the teeth were probably more like that of a great white shark but you get the idea of the size. Imagine something the size of one and a half buses coming towards you and looking peckish! Maybe you could get a long piece of rope and lay it out on the playground to get an idea of the size. Make Megalodon teeth out of papier mache and put them into a rope jaw. How many do you need (about 94 for a full) mouth. Remember sharks have multiple sets of replacement teeth hidden in their gums, so any finds of large numbers of fossil teeth probably include the "spares". The Meg is a terrible film but does give an idea of the real size of the Megalodon.

3 million years ago. The Megalodon becomes extinct (despite what the discovery Channel and Youtube would have you believe). The seas got colder and even though the Megalodon could survive the colder water (why?), it lived on large fish and mammals, especially blue whales and these didn't survive the temperature change very well and so their numbers were severely reduced. Thus, there were lots of Megalodon with no food and they gradually died out as the food supply dwindled.

2 million years ago. Humans (in a form that we would recognise) develop and begin to take charge of the planet.

Present day.

So Elasmo is descended from the surviving sharks and the Megalodon is not his direct ancestor.

He shares many of the characteristics of the Megalodon and other sharks but that is a story for another time.