Name:…………………………………..

‘Fragments of hope’ learning programme

Researcher

Workbook

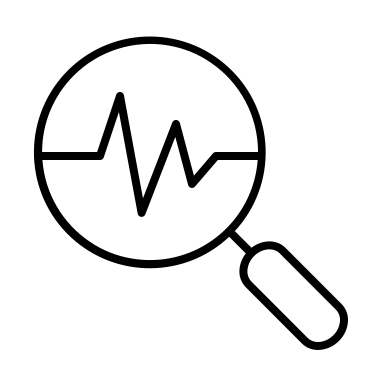
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**B1/2. What threatens the health of the Belize Coral Reef System?**

 What threatens the health of Belize coral reefs? Ask yourself two questions:

1. What do corals need to thrive? (Clue: look back at A10. in your Explorer Workbook!)
2. Do the Belize coral reefs always have what they need to keep healthy?

*Task:* Complete the paragraph using these words:

|  |
| --- |
| oxygen algae corals zooxanthellae sunlight |

Corals NEED the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that grow inside of them for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and other things. Zooxanthellae are \_\_\_\_\_\_\_\_\_\_\_ which are plants, and we know that plants NEED \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to survive. That means that \_\_\_\_\_\_\_\_\_\_\_ also NEED sunlight.

Corals can be found throughout the world's oceans, in both shallow and deep water. However, the reef-building corals like the ones found on the Belize coastline, that depend upon algae, need shallow water where the sunlight can reach them. These corals rarely thrive in water deeper than 50 metres. The water also needs to be clear enough to let the sunlight through. Sea levels are rising due to global warming which means that sunlight is further from the corals.

*You need to be a research team of 3 – 5 young people.*

*Task:* You are going to show that a plant needs sunlight to thrive.

You will need: some cress seeds, damp paper towels, 2 shallow dishes.

1. Place the damp paper towels in a shallow dish and sprinkle some cress seeds on top.
2. Place one dish on a window sill.
3. Place the other dish in a dark cupboard.
4. Check on the cress each day. Ensure the paper towels stay damp.
5. Note your findings here:

|  |  |  |
| --- | --- | --- |
|  | Cress in sunlight | Cress without sunlight |
| Day 1 |  |  |
| Day 2 |  |  |
| Day 3 |  |  |
| Day 4 |  |  |
| Day 5 |  |  |

Corals are sensitive to pollution and sediments. Sedimentation comes from soil erosion or from the decomposition of plants and animals. Sediment can cause the water to become cloudy, blocking out the sun. Waste water discharged into the ocean near the reef can contain too many nutrients that cause seaweeds to overgrow the reef.

### Corals need saltwater to survive and require a certain balance in the ratio of salt to water. Saltwater is more dense than freshwater. As weather patterns change due to global warming, freshwater added at the surface dilutes the seawater so reduces the salinity, and so makes the water less dense.

### *Task:* Still in your teams, you are going to show that saltwater is more dense than freshwater.

### You will need: table salt, 2 clear glasses, a tablespoon, tap water, 2 raw eggs.

1. Fill the 2 glasses with tap water.
2. Add about 6 tablespoons of salt in one glass and stir it well with a tablespoon until the salt has completely dissolved in the water.
3. Place one egg in each of the glasses and observe which one of the eggs floats in the container and which one sinks.

The egg that is placed in tap water sinks to the bottom of the glass. This is because a raw egg has a greater density than tap water. When you add salt to the water, you increase the density. That is to say, the salt packs into the same volume of water. With enough salt added to the water, the density of the water is greater than the egg, allowing the egg to float.

Corals generally live in water temperatures of 20–32° C. They have tolerance to a very narrow temperature range. Oceans absorb more than 90% of the excess heat caused by global warming so sea temperatures are rising.

Record ocean temperatures cause stronger storms, kill fish, threaten coral reefs, boost the growth of harmful algae and in the long-term, they cause sea levels to rise. Rising sea levels mean that sunlight might not reach the corals.

*Task:* List what threatens the Belize Coral Reef System. Use the information you have learned from this workbook and add any other ideas you might have.

|  |  |
| --- | --- |
|  | What threatens the Belize Coral Reef System? |
| 1  2  3  4  5  6 |  |

**B3. What is the impact of these threats?**

There are three main ways that climate change and rising sea temperatures cause damage to coral reef environments.

1. Increased acidification of the ocean affects the ability of ocean species to make tough protective shells.
2. Increased temperatures cause coral bleaching.

*Task:* Watch the ‘ocean acidification’ and ‘coral bleaching’ videos. Look at the sheet which identifies if coral bleaching has taken place.

1. The increased number of hurricanes and powerful storms physically breaks the coral.

*Task:* Explore The Earth Museum’s Belize Coral Reefs map and look for the film at Carrie Bow to see the effects of Hurricane Nana.

Answer these questions:

1. What impact is climate change having on the Belize coral reefs?

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1. What do you think would happen if coral reefs were to die?

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If all coral reefs were to die, a quarter of marine life would lose their habitat. There are roughly around one million different species that depend upon coral reefs for food and shelter.

A world without corals means not only will we have a less diverse and less beautiful ocean, but it will also be an economic disaster for many people, especially those living in developing countries. Fisheries and tourism provide important livelihoods that directly depend on healthy coral reefs.

**B4. A study of a UK coral reef system.**

*Task:* Working on your own, you are going to create ‘A Guide to a UK coral reef’. Use the internet to help you!

|  |  |  |  |
| --- | --- | --- | --- |
| Research outline  A Guide to a UK coral reef   |  | | --- | | Where will you find a coral reef in the UK? |  |  | | --- | | Describe a UK coral reef. |  |  | | --- | | How are cold-water coral reefs different to warm-water coral reefs? | |

**B5. A study of one other coral reef system (of choice).**

*Task:* Working on your own, you are going to create a 2-page guide to one other coral reef system. Use the internet to help you!

|  |  |  |  |
| --- | --- | --- | --- |
| Research outline  A Guide to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   |  | | --- | | Where is this coral reef? |  |  | | --- | | How big is this coral reef? |  |  | | --- | | Describe this coral reef. | |

|  |  |  |
| --- | --- | --- |
| |  | | --- | | What threatens the health of this coral reef? |  |  | | --- | | Draw and colour what you see when you look at images of this coral reef. | |

**B6/7. What is affecting the world’s coral reefs?**

Over the last three decades, the world has lost half of its coral reefs. Destructive fishing practices, pollution, coastal development, climate change, and pests and diseases have led to mass coral death. In addition, our oceans absorb 30% of human-made carbon dioxide from the air (much like our forests do), and this is causing the ocean to become more acidic, which corrodes coral skeletons.

*You are now working again with your research team of 3 – 5 young people.*

*Task:* Each team will research how one of the following is affecting the world’s coral reefs:

1. Fishing
2. Pollution
3. Climate change
4. Tourism

There may be more than one team working on a title. If this is the case, share the research. For example, fishing can be overfishing or destructive fishing practices; pollution can be polluted water or plastic pollution.

Gather as much information as you can, using books and the internet, on the effects on the world’s coral reefs. Prepare a presentation of at least 6 slides to share with your class. Include data and say where you found these facts and figures. Add images.

*Task:* Share your presentation with the class. Ensure that everyone in your team speaks.

After listening to each research team’s presentation, create an infographic to show the facts:

|  |
| --- |
| What is affecting the world’s coral reefs? |

**B8/9/10. How is climate change, plastic waste etc affecting all of us?**

*Task:* Look out of your classroom window and answer this question:

1. What is the weather like today? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Weather is the condition of the atmosphere around us over a short period of time. It is about it being hot or cold, wet or dry, stormy or calm, sunny or cloudy.

Climate, on the other hand, is the average weather conditions over longer periods of time and over larger areas, like countries and continents.

The earth has a thick layer of air around it called the atmosphere. The atmosphere is made up of greenhouse gases. These gases act like a blanket around us keeping us warm and safe from space. Two of these gases are carbon dioxide and methane.

The sun shines on earth. The gases carbon dioxide and methane catch most of this heat and keep it on earth so that we stay warm. However, the more carbon dioxide and methane in the world, the hotter we get! This is known as ‘global warming’. Human activity has caused there to be too much greenhouse gases, like carbon dioxide and methane.

* When animals and people breathe, they produce carbon dioxide. When they fart, they produce methane!
* When we chop down trees, the trees release carbon dioxide. This is called deforestation. Deforestation also stops the trees from absorbing carbon dioxide as they grow.
* When we use cars, planes and other transport, carbon dioxide and methane are released as the transport burns petrol to move.
* When we burn oil, gas and coal (we call these fossil fuels) for electricity, carbon dioxide is released into the air.
* When volcanoes erupt, they release carbon dioxide and other greenhouse gases in their smoke.
* When we throw food in the bin it goes to landfill where it releases methane as it rots because it does not get enough oxygen.
* When we grow food, we use fertilisers to help the crops grow. These fertilisers have a greenhouse gas, called nitrous oxide, in them.

*Task:* Look at the activities on the next page. Colour in red the rectangles with the activities that you think will contribute to climate change.

|  |  |
| --- | --- |
| Having a shower | Planting a tree |
| Walking to school | Driving a car |
| Cutting down a tree | Turning the lights off when you leave a room |
| Flying to a holiday | Playing football with friends |
| Making a cake | Playing a video game |
| Putting logs on an open fire | Turning on an electric heater |
| Throwing your dinner in the bin. | Having a picnic |

*You are now working again with your research team of 3 – 5 young people.*

*Task:* Compare your table of activities with others in your research team. Explain why you have chosen to colour red the ones that you have. Discuss:

1. Which ones contribute to climate change?
2. Which ones might you need more information on to make your decision?
3. Are there any that might help slow down climate change?

Things that we depend upon and value like water, energy, transportation, wildlife, agriculture, ecosystems, and human health are all experiencing the effects of a changing climate.

Global temperatures have risen 1.1°C since 1900, but climate change refers to more than an increase in temperature. It also includes sea level rise and changes in weather patterns, which have caused drought, wildfires and flooding. These effects are worldwide and you will certainly have experienced either a storm or flooding where you live within the past few years.

*Task:* Write a short newspaper article reporting on a storm or flooding that you have experienced or have seen on the news. Make sure you include the effects of the storm or flooding on the environment, people’s homes, wildlife and people’s wellbeing.

|  |
| --- |
| The Local Gazette  A screenshot of a notebook  Description automatically generated |

*Task:* Look around you for any items made of plastic. List some of them here:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Plastic is lightweight, hardwearing, easy to clean and has many uses. It is used for packaging food and medicines, in building homes, and in electronic and electrical items.

Since the 1950s, over 8 billion tonnes of plastic have been produced worldwide, of which only 9% has been recycled. A lot of plastic is not recyclable and most of it does not biodegrade. Unfortunately, plastic products often break down into very small fragments called microplastics that can pollute ecosystems and harm organisms. When microplastics are eaten by animals such as plankton, they enter the food chain and can even reach us. Plastic kills over 1.1 million seabirds and animals each year.

‘The Great Pacific Garbage Patch’ is a collection of marine debris in the North Pacific Ocean. Marine debris is litter that ends up in oceans, seas, and other large bodies of water. The microplastics of the Great Pacific Garbage Patch can simply make the water look cloudy, like a ‘plastic soup’. It is the size of 1.6 million square kilometres, which is about the size of Iran or twice the size of Turkey.

Rainwater and wind carry litter into streams and rivers, and down drains…drains lead to the ocean! Irresponsible dumping of waste also adds to the plastic in our seas. If you live near the coast, you will probably see plastic washed up on the beach.

*You are now working again with your research team of 3 – 5 young people.*

*Task:* Imagine you live in the beautiful seaside resort of Greenhill Bay. You have recently noticed that there is a lot of plastic waste in the sea and on the beaches. You write to your local Member of Parliament (MP) to express your concerns. Your local MP sets up a meeting.

You and your research team are going to role-play that meeting. Each of you chooses a card and plays the part of the person on that card. Read the card carefully and spend a few minutes thinking about what you are going to say.

Your meeting must involve:

The local MP

The local supermarket manager

A local resident.

Other people who might be interested and could be included are:

An environmentalist (someone who cares for the environment)

The manager of a local hotel.

|  |
| --- |
| The local MP  You are going to be chairing this meeting. You will invite people to present their views. It is your job to make sure that everyone has the chance to be heard. Ask them what can be done to solve the problem.  Plastic rubbish is a big problem in Greenhill Bay. You want to please local residents. After all, you need their votes at the next election! But that aside, you live in the Bay, and you would like to see cleaner beaches. You are either going to want cost-effective solutions or you are going to have to ask the government for support. |
| The local supermarket manager  **You want to keep your customers happy. You need to keep prices down or you will lose customers!**  You are the manager of the supermarket in Greenhill Bay. Your customers expect the best food at low prices. Plastic packaging keeps your food fresh and clean. It’s also strong, which means that less food is damaged when it is transported. This means that less food is wasted. |
| A resident of Greenhill Bay  **You organise regular beach cleans but that is not enough to solve the problem. You worry about the effect that litter is having on the environment. You know that it pollutes the seas and can kill wildlife.**  You moved to Greenhill Bay to be near the beach. The Bay attracts a lot of visitors who enjoy barbecues and picnics on the beach. However, they sometimes leave their litter behind. The rubbish bins are often full, and litter blows into the sea. |
| An environmentalist  **You think that there is too much plastic in the world and that a lot of the plastic rubbish that people throw away comes from supermarket packaging.**  You are worried because the plastic left on the beaches is polluting the seas and affecting wildlife. For you, the problem is not how to dispose of plastic waste, but how to make sure that there is less of it in the first place. |
| The manager of a local hotel  **You think that local government should do more to clean up the beaches. There should be more bins and better recycling services.**  Tourism brings money into Greenhill Bay. However, the beaches are full of litter and most of it comes from food packaging and plastic bags that people leave behind. You are worried that rubbish on the beach will turn tourists away. You and other local businesses will lose customers. |

*Task:* Write some suggestions to solve the problem here:

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Name:…………………………………..

‘Fragments of hope’ learning programme

Researcher

Certificate of Achievement

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