GRADE 5 GEOGRAPHY

TOPIC 1 UNIT 1 – MAP SKILLS

1. **Mapping**

a. has been part of people's lives for thousands of years. The first maps were painted on the walls of caves 17000 years ago.

b. History of mapping:

Native Chinese geography begins in the Warring States period (5th century BC). It expands its scope beyond the Chinese homeland with the growth of the Chinese Empire under the Han Dynasty. It enters its golden age with the invention of the **compass** in the 11th century (Song Dynasty) and peaks with 15th century (Ming Dynasty) Chinese exploration of the Pacific under admiral Zheng He.

There is a classical Chinese legend called "He Bo Xian Tu" about the ancient map. It is said that in the time of "Dayu's Taming of the Floods" (roughly during the Xia Dynasty), a river god gave Dayu a stone with a flood map etched upon its surface. Dayu used this map to hold back the flooding that threatened to devastate the rural agriculture. Another account attributes Dayu's deeds as a marvelous feat of engineering.

In general, the development of early Chinese cartography experienced three phrases: primitive map, classical map, and survey map. The primitive maps were simple maps, still steeped in myth and legend. It wasn't until the Han Dynasty that classical maps began to emerge.

The earliest reference of a map in China history can be found in Shiji, Volume 86, "Jingke Biography". This was the event of 227 BC where Crown Prince Dan of Yan had his assassin Jing Ke visit the court of the ruler of the State of Qin, who would become Qin Shi Huang (r. 221–210 BC). Jing Ke was to present the ruler of Qin with a district map painted on a silk scroll, rolled up and held in a case where he hid his assassin's dagger. Handing to him the map of the designated territory was the first diplomatic act of submitting that district to Qin rule. Instead he attempted to kill Qin, an assassination plot that failed. From then on maps are frequently mentioned in Chinese sources

In 1986, seven maps were found in Tomb 1, dating to the Qin State of the Warring States period, at Fangmatan in Gansu province. The maps are drawn in black ink on four rectangular pieces of pine wood. In addition to the seven maps on wooden blocks found at Tomb 1 of Fangmatan, a fragment of a paper map (5.6 × 2.6 cm) was found on the chest of the occupant of Tomb 5 of Fangmatan in 1986. This tomb is dated to the early Western Han, so the map dates to the early 2nd century BCE. The map shows topographic features such as mountains, waterways and roads, and is thought to cover the area of the preceding Qin Kingdom.

The oldest map of the African continent

The Chinese map was produced in silk and covers more than 17 square metres, and is on display in Cape Town. The Da Ming Hun Yi Tu, or Amalgamated Map of the Great Ming Empire, is a unique snapshot of history

Created in China in 1389, and clearly showing the shape of Africa, more than 100 years before Western explorers and map-makers reached the continent.

The map clearly shows South Africa's Drakensberg mountain range and what may be an attempt to depict Lake Victoria and the River Nile.

c. Discuss: Why are maps necessary?

d. **Discuss:** First sailing ships
    i. See SHIPS – a timeline
    ii. Search for ships used in *The Usborne internet-linked Ancient World* and draw them in the space and label them.

e. **Read about Explorers**
    i. Introduction & A little history *Explorers who got lost* p1-8
    ii. Bartholomeau Dias and Vasco da Gama *Explorers who got lost* p9-18

f. **Discuss:** Name other forms of transport

g. **Notebook entry:** Color the silly map of Africa

h. **Discuss:** How do you think the San people found their way in search of food - they didn't have any maps? *They used their expertise at tracking (making use of the wind, animal spoor and even their knowledge of the type of grass that certain animals grazed on).*
** For pictures on the San, see *All about South Africa p14-15.*

i. **Discuss:** Today, maps of our planet have been photographed from the skies, high above the earth. We can look at a map that is transmitted from hundreds of kilometers above the earth – we can even zoom into maps of our own streets.

j. **Read** Geography Encyclopedia p248-251 (What is a map?)

k. **Read** Kids World Atlas p14-15 & Student Atlas of the World p10-11 (Kinds of maps)

l. **Read** Kids World Atlas p12-13 & Student Atlas of the World p8-9 (How to read a map)

m. **Notebooking entry:** Draw pictures in the blocks (use the whole block, and use lots of colours)

2. **Read & discuss** p3 LB

3. **Compass & compass directions**
    a. What is a compass, and what is it used for? *A compass has a dial showing the four main compass points (north, east, south, west), and a freely swinging needle.*

    b. Expand on the intermediate points of the compass, and their abbreviations. *(e.g. if you want to go in the direction between north and east, you would be traveling north-east).*

4. **Read**
The compass is a simple device for orientation identification. It consists of a rotational magnetic needle loaded on a shaft and a directional plate. It is one of the four great inventions of ancient China that has exerted profound influence on the development of human civilization.

Which means pointing to south, was recorded in the great literature Han Feizi during the Warring States Period (206BC-23AD) for identifying directions. It is the original basis for the invention of compass, and the oldest south-pointing device in human history. It is chiseled out of magnetic lodestone in the shape of a ladle or spoon. Its handle will point south when put on the smooth Earth Plate used for divination, which contains 24 directions based on the magnetic meridian direction.

In the Chinese history, numerous skillful craftsmen created interesting and delicate directional devices, such as the Compass Chariot made by Ma Jun during the Three Kingdoms period, the Compass Fish in the Northern Song Dynasty and the Compass Tortoise designed by Chen Yuanliang in the Southern Song Dynasty. The "Zhang Xianren Porcelain Figurine" unearthed in 1988 is a strong evidence to the fact that the basic form of modern compass was first invented by ancient Chinese.

The compass in real sense was created by a Chinese geomantic omen master in late Tang Dynasty, who originally used it for divination. The major material of the compass is magnetized steel needle, making up for the flaw that magnetism is easily lost in lodestones, of which Si'nan was made.

The compass body was first made simple, then complicated and finally simple enough for application in navigation. With the help of it, human beings finally made their first stride in conquering the sea, while the compass itself was brought to all over the world along with the sea waves, significantly driving the development of navigation in both China and the world.

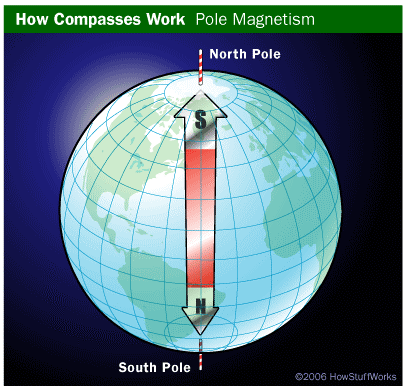
No matter where you stand on Earth, you can hold a compass in your hand and it will point toward the North Pole. What an unbelievably neat and amazing thing! Imagine that you are in the middle of the ocean, and you are looking all around you in every direction and all you can see is water, and it is overcast so you cannot see the sun... How in the world would you know which way to go unless you had a compass to tell you which way is "up"? Long before GPS satellites and other high-tech navigational aids, the compass gave humans an easy and inexpensive way to orient themselves.

But what makes a compass work the way it does? And why is it useful for detecting small magnetic?

A compass is an extremely simple device. A **magnetic compass** (as opposed to a gyroscopic compass) consists of a small, lightweight magnet balanced on a nearly frictionless pivot point. The magnet is generally called a **needle**. One end of the needle is often marked "N," for north, or colored in some way to indicate that it points toward north. On the surface, that's all there is to a compass.

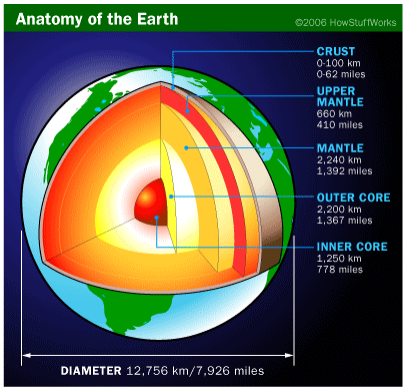
Earth's Magnetic Field

The reason *why* a compass works is more interesting. It turns out that you can think of the Earth as having a gigantic bar magnet buried inside. In order for the north end of the compass to point toward the **North Pole**, you have to assume that the buried bar magnet has its south end at the North Pole, as shown in the diagram at the right. If you think of the world this way, then you can see that the normal "opposites attract" rule of magnets would cause the north end of the compass needle to point toward the south end of the buried bar magnet. So the compass points toward the North Pole.



To be completely accurate, the bar magnet does not run exactly along the Earth's rotational axis. It is skewed slightly off center. This skew is called the **declination**, and most good maps indicate what the declination is in different areas (since it changes a little depending on where you are on the planet).

The magnetic field of the Earth is fairly weak on the surface. After all, the planet Earth is almost 8,000 miles in diameter, so the magnetic field has to travel a long way to affect your compass. That is why a compass needs to have a **lightweight magnet** and a **frictionless bearing**. Otherwise, there just isn't enough strength in the Earth's magnetic field to turn the needle.



The "big bar magnet buried in the core" analogy works to explain why the Earth has a magnetic field, but obviously that is not what is really happening. So what *is* really happening?

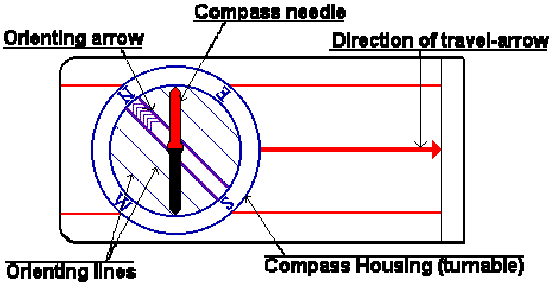
No one knows for sure, but there is a working theory currently making the rounds. As seen on the above, the Earth's core is thought to consist largely of molten iron (red). But at the very core, the pressure is so great that this superhot iron crystallizes into a solid. Convection caused by heat radiating from the core, along with the rotation of the Earth, causes the **liquid iron** to move in a **rotational pattern**. It is believed that these rotational forces in the liquid iron layer lead to weak magnetic forces around the axis of spin.

It turns out that because the Earth's magnetic field is so weak, a compass is nothing but a detector for very slight magnetic fields created by anything. That is why we can use a compass to detect the small magnetic field produced by a wire carrying a current.

How to use a compass - Using the compass alone
The first thing you need to learn, are the directions. **N**orth, **S**outh, **E**ast and **W**est. Look at the figure and learn how they are. North is the most important.

There are several kinds of compasses, one kind to attach to the map, one kind to attach to your thumb. The thumb-compass is used mostly by orienteers who just want to run fast, and this is the kind of compass I normally use.

But not in this tutorial. I would recommend the third kind of compass. Let's take a look at it:

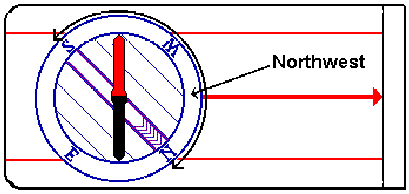


You see this red and black arrow? We call it the *compass needle*. Well, on some compasses it might be red and white for instance, but the point is, **the red part of it is always pointing towards the earth's magnetic north pole.** Got that? That's basically what you need to know. It's as simple as that.

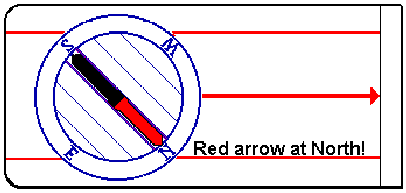
But if you don't want to go north, but a different direction? Hang on and I'll tell you.

You've got this turnable thing on your compass. We call it the *Compass housing*. On the edge of the compass housing, you will probably have a scale. From 0 to 360 or from 0 to 400. Those are the degrees or the *azimuth* (or you may also call it the bearing in some contexts). And you should have the letters N, S, W and E for North, South, West and East. If you want to go in a direction between two of these, you would combine them. If you would like to go in a direction just between North and West, you simply say: *"I would like to go Northwest "*.

Let's use that as an example: You want to go northwest. What you do, is that you find out where on the compass housing northwest is. Then you turn the compass housing so that northwest on the housing comes exactly there where the large *direction of travel-arrow* meets the housing.



Hold the compass in your hand. And you'll have to hold it quite flat, so that the compass needle can turn. Then turn yourself, your hand, the entire compass, just make sure the compass housing doesn't turn, and turn it until the compass needle is aligned with the lines inside the compass housing.



Now, time to **be careful!**. It is *extremely* important that the red, north part of the compass needle points at north in the compass housing. If south points at north, you would walk off in the exact opposite direction of what you want! And it's a very common mistake among beginners. So always take a second look to make sure you did it right!

A second problem might be local magnetic attractions. If you are carrying something of iron or something like that, it might disturb the arrow. Even a staple in your map might be a problem. Make sure

there is nothing of the sort around. There is a possibility for magnetic attractions in the soil as well, "*magnetic deviation*", but they are rarely seen. Might occur if you're in a mining district.

When you are sure you've got it right, walk off in the direction the direction of travel-arrow is pointing. To avoid getting off the course, make sure to look at the compass quite frequently, say every hundred meters at least.

But you shouldn't stare down on the compass. Once you have the direction, aim on some point in the distance, and go there. But this gets more important when you use a map.

There is something you should look for to avoid going in the opposite direction: The Sun. At noon, the sun is roughly in South (or in the north on the southern hemisphere), so if you are heading north and have the sun in your face, it should ring a bell.

When do you need this technique?
If you are out there without a map, and you don't know where you are, but you know that there is a road, trail, stream, river or something long and big you can't miss if you go in the right direction. And you know in what direction you must go to get there, at least approximately what direction.

Then all you need to do, is to turn the compass housing, so that the direction you want to go in, is where the direction of travel-arrow meets the housing. And follow the above steps.

But why isn't this sufficient? It is not very accurate. You are going in the right direction, and you won't go around in circles, but you're very lucky if you hit a small spot this way. And that's why I'm not talking about *declination* here. And because that is something connected with the use of maps. But if you have a mental image of the map and know what it is, do think about it. But I think you won't be able to be so accurate so the declination won't make a difference.

If you are taking a long hike in unfamiliar terrain, you should always carry a good map that covers the terrain. Especially if you are leaving the trail. It is in this interaction between the map and a compass, that the compass becomes really valuable

5. **Notebook entry**
    a. Use letter stickers to complete the compass points on the diagram
    b. Paste the labels for the compass

6. **Crafty task:** Make a cardboard compass (p20 TG Ext. 1)

7. **Read & Discuss** p4 LB & Activity 2 p5 LB

8. **Discuss: Look** at the map on p320-321 (Geography Encyclopedia)
    a. If we travel South from Botswana, which country will we reach?
    b. If we want to go to Egypt from South Africa, in which direction will we have to go?
    c. And if we want to go to Mozambique from Namibia?

9. **Play a compass game**
    a. **Compass basketball**
    Draw the 8 compass points in the sand, and clearly mark the 4 main points. Call out a direction, he must run to the correct compass point and catch the ball there.

    b. **Find your place**
    Draw the 8 compass points in the sand. Mark only north. Stand on one of the points. Decide which compass point he will be. Call out, *this is … (e.g. north)*, he scurries quickly to his correct position relative to you.

    c. **Compass Scavenger Hunt**
    Prepare a simple orienteering course outdoors. Peg small cards to the ground. Each card should have on it a bearing and the distance to the next card. The card also contains a jumbled

up word for the team to unscramble. The words in the sequence produce a message. The first team to finish the orienteering trail and decode its message, wins.

Consider letting him find different letters at different compass points, which in the end spells out a message.

d. **Remedial** quick direction game p20 TG

10. **Discuss** Continents
    a. How many continents are there? *7*
    b. What is a continent? *LB p5 information block (He reads the answer)*
    c. Can you name the 7 continents?

11. **Read & Discuss** p5-6 LB

TOPIC 1 UNIT 2 – AFRICA OUR CONTINENT

1. **Introduction**
    a. Which ocean is the second largest in the world? *Atlantic*? And the largest? *Pacific.*
    b. Which *continent* do you think is the 2nd largest? *Africa*. And the largest? *Asia*

2. **Read & discuss** p7-8 LB

3. **Explain** what a port is.
    a. Get him to suggest the nearest port for landlocked countries. Point out how rivers, mountains, forests and a lack of proper roads can affect that choice.
    b. What does it mean to a country to be landlocked? (pro's & con's)

4. **Scan** atlases to learn new things about African countries.
    a. Kids World Atlas p136-147
    b. Geography Encyclopedia p232-245

5. **Notebooking entry:**
    a. Decide on a country to research
    b. Complete Cool Report.pdf (Also see Geography Companion Book Part 6 – Africa under Geography on pc)

6. **Discuss** Capital cities of countries

7. **Discuss** Activity 4 p9 LB

TOPIC 1 UNIT 3 – PHYSICAL MAP OF AFRICA

1. **Read & discuss** p10 LB

2. **Look at** the photographs of Africa's ten most famous natural features on pages 10-11 LB.
    a. Which photos show rivers? Waterfalls? Lakes? Mountains? Deserts?

3. **Notebooking page:**
    a. **Africa's natural features** (Cut & paste)
    b. **Research -** Look up facts (at least 5) about some of Africa's natural features

4. **Read & discuss** p13&14 LB

5. **Read & discuss** Activity 6 p14

6. **Notebooking page**

a. **Complete** an outline map of Africa and its physical features, step by step (p4 of Africa's natural features).
b. Use the physical map of Africa just created. Paste number stickers on the pics & descriptions of Africa's natural features and put the same number on a map of Africa on the coordinating spot.

7. **Read & discuss** Rivers, lakes and borders between countries p15-17 LB

8. **Notebooking entry** – Vocabulary mix & match - match the word with its meaning
Physical features – things in the natural environment, such as rivers and mountains
Plateau – high, flat inland parts of a country
Coast – where the land and the sea meat
Coastal plain –low-lying land that is near to the sea
Escarpment – a steep slope between a plateau and a lower area
Bay – a dent or curve in the coastline
Cape – a piece of high land that goes into the sea
Mountain peak – the highest point at the top of a mountain

TOPIC 1 UNIT 4 – IMAGES OF AFRICA

1. **Read & Discuss** the introduction p18 LB

2. **Look** at the photographs on p19LB
   a. The more carefully you look, the more you will see
   b. Make up as many questions as you can for each photograph – use where, when, who, why, what, will, if, is, can…

3. **Read and discuss** p20-21 LB

4. **Crafty project:**
   a. **Discuss** the vegetation, the animals, the choice of colour, as well as other materials that will be needed to produce a painting or drawing.
   b. **Paint** a picture about one of the places in Africa (choose one from p20 LB)

5. **Read some history** about Africa
   a. Ancient Africa p68-69 *Usborne internet linked Ancient World*
   b. African countries p62-63, 64-65, 74-75, 90-91 *Usborne internet linked Medieval world*
   c. The Scramble for Africa p346-347 *Encyclopedia of History*

6. **Draw up a timeline** for the history of Africa (use the pictures provided, write the dates)
   A. **Draw** a curved line over the double page spread (notebooking page)
   B. Watch a video clip about Saladin (http://www.history.com/topics/middle-ages/videos#saladin)
   C. Watch a video clip about Timbuktu (http://www.teachersdomain.org/resource/islam08.socst.world.glob.timbuk/)

**** TERM ASSESSMENT EXEMPLAR LBp22-23**

**** TERM ASSESSMENT p88-89 TG**

TOPIC 2 UNIT 1 - SOUTH AFRICA FROM ABOVE

1. **Draw** a simple cross-section of the build of South Africa on the board. Describe the build of the land using the terms 'high', 'low', 'flat' or 'sloping'.
    a. **Illustrate this** by using an upturned side plate.
        i. Place the inverted plate on a table. Explain that the short, steep part is the coastal plain, the plate's ridge is the escarpment (mountain ridges), and the larger inner surface is the central plateau. Point out the size of the plateau and the height of this area.
        ii. Tell him that the surface on which the plate rests is the sea; the part of the plate that touches the 'sea' is like the flat land near the sea. The rim before the center of the plate represents the part of the build where the land becomes higher. The flat central part of the plate is higher than the part near the 'sea' but not as high as the rim.
        iii. Transfer the above ideas to the cross-sectional drawing. Make sure he understands that this is a drawing from coast to coast, across South Africa. Let him find the same areas of land as he saw with the inverted plate.
    b. **Introduce** terms such as *coastal plain, plateau, escarpment*.
    c. **Point out** the location of Namaqualand, the Kalahari, and Karoo.

2. **Read & discuss** p25 LB

3. **Read & discuss** p26-27 LB

4. **Crafty task**
    a. Salt dough map of South Africa (see Social Sciences directory for instructions)
    b. Go through the vocabulary terms on the salt dough map

TOPIC 2 UNIT 2 – PHYSICAL FEATURES

1. **Discuss** well-known physical features in your own local area.

2. **Read and discuss** p28-29 LB

3. **Look at** photos (in books) of South Africa's landscapes. Identify the natural features and locate the area where each photograph may be taken. (Notebook page – paste number stickers on the photos, and on the corresponding spot on the map of South Africa)

4. **Activity 5 p30 LB** (Cut & paste a table)

5. **Read & discuss** Activity 6 p30 LB (Physical features of your province)
    a. **Research:** Write a paragraph about the *physical features* of Limpopo Province (What the land looks like – Plants and trees relate to vegetation and not directly to physical features. And similarly, climatic characteristics are not included here. I.e. identify smaller features such as cliffs, rocks or interesting shapes, sandy areas, waterfalls, fast or slow flowing sections of river.)
        i. Use 4 or more sentences
        ii. Use the words you have learned in this topic

6. **Read & discuss** p31-32 LB

TOPIC 2 UNIT 3 – RIVERS

1. **Draw** a sketch of a river on the board

2. **Discuss** rivers
    a. **Point out** the river source, delta and mouth, and how we are able to identify the direction in which a river flows (from higher to lower ground) when looking at a picture or map.
    b. **Explain** that rivers follow a path as it flows downhill, away from the source.

3. **Read & discuss** rivers p33-34 LB
    a. **Discuss** the terms *tributaries, stream, river system, catchment area* while referring to the diagram on page 34 LB

4. **Practical activity**
    a. Make a mound of sand or soil. Pour a jug of water slowly over this mound. Ask him to closely observe the path the water takes. Relate this back to the words they have learnt.
    b. Use salt dough map. Identify the terminology.
    c. Talk about river safety
        i. dangers of jumping or diving into a river which may be shallow or have rocks just below the surface
        ii. dangers of crossing rivers that are in flood or flowing quickly
        iii. rivers flow fastest in the middle. Most people assume that because the current on the edges of the river is not very strong the whole river flows like that.

5. **Read & discuss** p35-36 LB

6. **Read** I wonder why the wind blows p16-17

7. **Read** Stages of a river *The Usborne Science encyclopedia p190*

8. **Paste** the correct descriptions on the diagram of a river

9. **Read** Erosion & Transportation *The Usborne Science encyclopedia p191*

10. **Read** Rivers at work *Geography Encyclopedia p60*

11. **Notebook entry**
    a. How an oxbow lake forms (cut & paste)
    b. Which 3 rivers are the longest in the world *The Usborne Science encyclopedia p410*
    c. Rivers vocabulary (paste)
    Source – the start of a river or stream
    Mouth – where a river flows into the sea
    Tributary – a stream or river that flows into a bigger river
    Catchment area – the area drained by a river and its tributaries
    River system – all the rivers and streams in a catchment area
    Groundwater – the water that had been soaked into the ground and absorbed into a lyer of permeable rock
    Permeable – water can soak through

12. **Experiment** how water deposits materials in layers *The Usborne Science encyclopedia p191*

13. **Read** Deltas *The Usborne Science encyclopedia p191*

14. **Draw** a delta (and explain what it is orally)

15. **Read** Using rivers *The Usborne Science encyclopedia p62-63*

16. **Read** *An introduction to rivers (printed book)*
    a. **Discuss** what rivers provide people with, and paste the *Rivers* minit-book

17. **Crafty activity**
    a. **Draw** an island (Activity 10 p36 LB), and give it a name

18. **Outdoor experiment:** Everything Kids Science Experiments p94-96

TOPIC 2 UNIT 4 – PHYSICAL FEATURES AND HUMAN ACTIVITIES

1. **Read & discuss** p37-39 LB

2. **Discuss** how people can change a physical landscape
    a. **Show Pictures** of how people and their activities have changed the landscape.
        i. **e.g.** a human settlement such as a town changes the landscape: trees, bushes and natural vegetation are cleared in order for construction to take place (use local examples – changes that took place in order for the town to develop).
        ii. **e.g.** sometimes the slope of the land is changed by the removal of soil so that roads can be built. Bridges are built to allow people and motor vehicles access to areas in order for development to take place and for people to access these areas later on.

3. **Read & discuss** p40-41 LB

**** TERM ASSESSMENT EXEMPLAR LBp42-43**

**** TERM ASSESSMENT p90 TG**

TOPIC 3 UNIT 1 – WEATHER, CLIMATE AND VEGETATION OF SOUTH AFRICA

Weather

1. **Discuss** the following terms:
    a. **Weather**
        i. Daily environmental elements, such as temperature, wind speed and wind direction, cloud cover, rainfall and other forms of precipitation (such as snow, hail and frost).
        ii. The type of weather at a place affects people, such as their clothing, food, transport and outdoor activities.

    b. **Temperature**
        i. We measure temperature in degrees Celsius (°C).
        ii. We use a thermometer to measure temperature.
        iii. Read *Geography Encyclopedia p86-87* (World temperatures)
        iv. How to convert Fahrenheit to Celsius = (5/9)*(deg F-32); Celsius to Fahrenheit = (1.8*deg C)+32.

    c. **Precipitation**
        i. Refers to all water that falls from a cloud.
        ii. There are various forms of precipitation.

2. **Read & Discuss** p45-47 LB

3. **How's the weather?**
    a. **Discuss** today's (also yesterday and the day before's) weather:
        i. How hot/cold is it?
        ii. Absence/presence of wind
        iii. Rainfall
        iv. Cloud cover
    b. **The elements** of weather are described and measured in standard ways.
        i. **Read & discuss** p48 LB

4. **Notebook Entry**
    a. Define Anemometer, Barometer, Hydrometer

5. **Read** Geography Encyclopedia p76-77 (Weather)

6. **Narration:** (GE p77)
    a. Tell what you know about how winds are caused by the sun.
        i. **Illustrate:** How winds are caused by the son
    b. Tell how clouds are formed?
    c. How did people predict the weather without computers?

7. **Read** e.explore Weather p8-9

8. **Complete** the mind map – write the four elements of weather (p46 LB)

9. **Read** All about South Africa p114

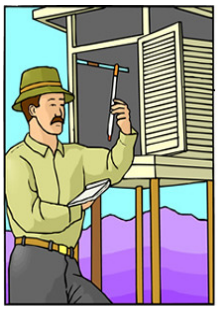
10. **Read** about the origin of the word *weather*

    This word traces its origin to *we,* which means "blow," and formed part of what is known as the Indo-European family group of languages. Two nouns were created from *we: wedhrom,* which the Russian language adapted to *vedro,* meaning "good weather"; and *wetrom,* from which the Lithuanian word *vetra,* meaning "storm," derives. One of these words then became the base for the early German word *wethram,* which, in time, became the German word *wetter* and the English word "weather." From *we,* we also get the English words "ventilate"and "wind."

11. **Explain** the expression “Feeling under the weather”
    If you feel “under the weather,” chances are that you are sick or unwell. The phrase has nautical origins. On board a ship, if a sailor felt sick, he was sent below deck to recover, away from (or under) the weather. Originally, this expression meant to be feeling the effects of seasickness or bad weather. Gradually, however, it came to refer to any kind of illness. An expanded version of the phrase is “under the weather bow,” referring to the side of the ship facing the bad weather.

12. **Explain “Red sky at night”**
    Ever hear the rhyme “red sky at night/sailor’s delight/ red sky at morning/sailors take warning”? It dates to medieval England. At the time, there was no accurate way to predict the weather, and people used their observations of the world around them and their experiences to create probable weather situations. The rhyme is quite accurate, since a red sky in the morning indicates that the rising sun is reflecting the dust particles of a system that has just passed from the west—a sign that a storm system may be moving to the east. A morning sky that is a deep, fiery red tells of a high water content in the atmosphere, which most likely means rain. A red sky at night means that the setting sun is sending its light through a high concentration of dust particles. Usually, this situation indicates high pressure and stable air coming in from the west—the variables needed for good weather.

13. **Read**
    Weather Stations



A study of local weather usually requires observations of some of the following: temperature, humidity, rainfall, wind, present weather, clouds, visibility and pressure. Most of these observations are made at Weather Stations.

Weather stations use sophisticated equipment and trained staff to make observations. Weather stations also can tell us how fast the wind is moving and how much rain falls during a storm.

Observations need to be taken regularly, often for many months, if the results are to be of any use. This requires dedication by those involved as they will be required to take careful, regular readings.

Weather Stations can be set up almost anywhere on land, but can often be found at local airports, due to constant staffing and the fact that pilots are dependent on data provided by these stations to guarantee a safe flight.

Weather Balloons

Almost everyone likes balloons, including scientists! Weather balloons are used as a scientific instrument and are released to float high up into the atmosphere. They carry special instruments that send all kinds of information about weather back to people on the ground.

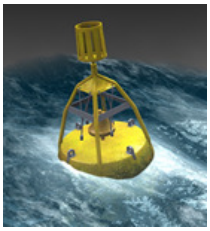
Twice a day, every day of the year, weather balloons are released simultaneously from almost 900 locations worldwide.

The balloon flights last for around 2 hours, can drift as far as 200km away, and rise up to over 32km in the atmosphere.

Weather stations keep wide records of their weather balloon information, permitting scientists to study weather patterns over many decades.

Weather balloons are the primary source of data above the ground. They provide valuable input for computer forecast models, local data for meteorologists to make forecasts and predict storms. Computer forecast models which use weather balloon data are used by all forecasters worldwide, from National Weather Service meteorologists to your local TV weatherman. Without this information, accurate forecasts beyond a few hours would be almost impossible.

Ocean Buoys



A buoy is an object that floats on water, and is often used to warn boats away from dangerous places in the ocean or on a river. But some buoys have special instruments on them. These buoys can tell us about the conditions of both the ocean and the atmosphere, they are the weather stations of the sea.

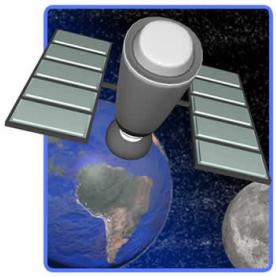
They are deployed to measure and transmit barometric pressure, wind direction, speed, air and sea temperature, wave energy and height. Even the direction of wave is measured on many Ocean Buoys.

Weather Satellites

Humans send satellites into space to circle the Earth and send back information to scientists on the ground. Some of the information they send back helps with navigation, measures changes in vegetation, movements in the earth's surface and observations of the atmosphere and weather.

Satellites have been successful in the creation of an imaging network on a truly global scale. Information is now available for inhospitable land areas and the oceans, where weather data were previously largely unavailable.

Those that observe the atmosphere are known as weather satellites and the information they provide is used by weather forecasters, as well as others with an interest in the weather.



The advent of weather satellites has also provided a continuous, automatic feed of data, with a coverage and resolution not possible by any other means. Therefore, we can now look down and record what is happening, and the information from satellites helps in the prediction of changes in the weather.

There are two types of satellite providing weather data; Geostationary & Polar-Orbiting

Geostationary - these are positioned at a height of 22,230 miles above the equator, and hang over the same spot on the Earth's surface all the time. These satellites provide pictures every 15 minutes.

Polar-Orbiting - these pass over the Earth from pole to pole. The NOAA satellites, operated by the USA, orbit at a height of 515 miles and take 1 hour and 42 minutes to complete each orbit. During this time, the Earth has turned by about 25 degrees, so the satellite views a different part of the surface each time it passes. The images provided by these satellites give more detailed information about the cloud structure in the atmosphere due to the fact that the orbit is much lower than that of the geostationary satellites.

Ice Cores

To find out more about climate change, Climatologist turn to ice for clues. Not just any ice, they look to the ice from glaciers that have been around for a very long time.

Obtaining ice cores from different parts of the world helps explain the diverse parts of the Earth's complex climate system. Ice cores are an excellent archive and have proved to be invaluable records of climate, volcanism and human influences on the atmosphere.

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Scientist examine pieces of ice core samples looking for air bubbles that were trapped in the ice hundreds or even thousands of years ago. The air bubbles help them discover what the climate used to be like on Earth. The evidence they uncover is creating a historical record of regional temperatures and greenhouse gas concentrations dating back 160,000 years.

Once or twice a year Keith Mountain, Xpedition Team Member and chair of the Department of Geography and Geosciences at the University of Louisville, travels to a high glacier in mountainous

areas of Bolivia, Peru, China, Antarctica or Tanzania where he will spend months hunting for a disappearing treasure: ice.

Tree Rings
Year to year changes in the weather create the patterns of different ring size. Trees respond to temperature, rainfall and other environmental conditions by altering growth.

Some trees might respond to changes in overall rainfall, others to the amount of rain during the late summer, and others to the seasonal temperatures that limit the length of the growing season. Human activities such as the burning of fossil fuels etch their signatures in wood as well.

The advantage of using trees to study climate is that they are living records of past climate and weather. Those records are available in parts of the world where there are few weather stations and where consistent and accurate records of weather rarely go back more than 100 years.

Sediment Analysis
Sediment is the earth and rock that has built up in layers over time. Scientists are learning a great deal about past climate from studying these layers. Sediment layering provides information about where glaciers have been in the past. Ocean sediments provide a map of how ocean currents have flowed in the past. And fossilized pollen found in sediment layers tells us about where different plants have grown in the past.

Probing the sediments from many lakes and ponds uncovers clues to past changes of climate. By studying the kinds of pollen and other materials in the layers of sediment, scientists can determine how plant communities shifted in response to climate changes and how lakes levels rose and fell with time.

14. **Notebook Entries**
    a. Call the Cape Doctor (Explain what it is – All about SA p114)
    b. Feeling under the weather (Explain what it is)
    c. How do we study the weather? (Cut & paste)
        i. Narrate each of these

15. **Oral Narration**
    a. Complete and explain: Red sky at night…

16. **VIDS:** Weather
    a. Predicting weather

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Wind

1. **Read** The Usborne Science encyclopedia (wind) p192
    a. Draw the diagram on p192 to show how warm air rises and cold air replaces it (how wind is formed) inside the booklet MSB-TwisterTrouble.pdf p6, What part of a tornado has the fastest wind?p18

2. **Read & discuss** p50-51 LB Wind direction

3. **Read:** Measuring wind speed

Weather vane
A weather vane is also called a wind vane. It is one of the oldest tools for measuring wind direction. The weather vane works by pointing in the direction that the wind is blowing. If the head of the arrow is pointing to the west, then the wind is coming from the west.

They can only measure wind a few meters from the ground and are commonly seen on top of buildings such as churches and houses.

Wind Sock
A windsock, also called a wind cone, shows both the direction and speed of the wind. The direction of the wind is shown when the wind blows into the larger open end and the sock points the way the wind is blowing. If the sock is pointing to the west, then the wind is coming from the east.

The windsock can also give an indication of the wind speed. If the sock is flapping about gently then the wind is only light, whereas if it sticks out in a straight line then the wind is much stronger.

Wind socks are commonly found at airports and seaports, but can also be found next to very windy roads.

Anemometer
An anemometer is the main instrument used to measure wind speed. It has three to four cups which rotate as the wind blows. The speed of the wind is determined by how many times the cups spin round in a given time. In a strong wind they will spin round very fast.

4. **Notebook entry**
    a. Draw instruments to measure wind speed with

5. **Read:** The Beaufort Scale (windenergy.pdf p5)

6. **Discuss:** What types of windstorms can you name?

7. **Windstorms**

7.1 DUST STORM
Also known as a **sandstorm,** is a common phenomenon in dry regions. It is characterized by high winds that carry great clouds of dust, usually in an area that has undergone a long period of drought. Dust storms cause soil loss from the dry lands and they can remove organic matter and the nutrient-rich lightest particles, thereby affecting the agricultural productivity in that region.

Dust Storm on the Loose
Dust storms don't just happen in the middle of the desert. They happen in any dry area where loose dirt can easily be picked up. Grains of sand tossed into the air by the wind usually fall back down to the ground after a few hours. Smaller bits of particles stay in the air for a week or longer and can be blown thousands of miles away. Dust from the Sahara desert is always blown across the Atlantic causing bright red sunrises and sunsets in Miami. The dust doesn't stop there. It keeps traveling as far as the Caribbean and the Amazon basin.

The scary thing about a dust storm is that they can spread over hundreds of miles and rise over 10,000 feet. They also have wind speeds of at least 25 miles per hour. Not strong enough to blow the feathers off a chicken but still something worth avoiding.

Dust storms usually arrive without warning and advance in the form of a big wall of dust and debris. The dust is blinding, making driving impossible. Often they only last for a few minutes but storms usually leave serious car accidents behind.

http://www.kidzworld.com/article/707-dust-storm-on-the-loose#ixzz2iWI85rfL

a. **Notebook entry:**
    i. Why can dust storms be bad for the environment and for people? *(causing sicknesses such as asthma because of dust etc.)*

7.2 SQUALL - is a sudden, sharp increase in wind speed (18mph - 25mph) that is usually associated with brief (at least 1 minute) and heavy precipitation. This usually occurs in a squall line.\

a. **Notebook entry:**
    i. What is a squall?

7.3 HURRICANES

a. **Read** Geography Encyclopedia p82 (Hurricanes)

b. **Read and discuss** the story weather_hurricane_upperelem.pdf
    i. What causes hurricanes to form? Name 3 causes.
    ii. What causes a hurricane to weaken?
    iii. What are some of the steps that Terrance and his family take to prepare for the hurricane?

c. **How do hurricanes form?**
Hurricanes only form over really warm ocean water of 80°F or warmer. The atmosphere (the air) must cool off very quickly the higher you go. Also, the wind must be blowing in the same direction and at the same speed to force air upward from the ocean surface. Winds flow outward above the storm allowing the air below to rise. Hurricanes typically form between 5 to 15 degrees latitude north and south of the equator. The Coriolis Force is needed to create the spin in the hurricane and it becomes too weak near the equator, so hurricanes can never form there.

Warm water heats the air causing it to rise really quickly, then it gets pushed aside as it cools. This pushing causes the clouds to spin.

When does it become a hurricane?
Hurricanes are tropical storms where the winds get faster than 118 km/h (73 mph).
The storms have a central area of calm known as the "eye", which is the funnel through which the warm air rises.
Overland, the storms no longer have warm water to power them and die out within a few days, but not before winds do a lot of damage.

d. **Who names hurricanes?**
From 1950 to 1952, tropical cyclones of the North Atlantic Ocean were identified by the phonetic alphabet (Able-Baker-Charlie-etc.), but in 1953 the US Weather Bureau switched to women's names. The rest of the world eventually caught on, and naming rights now go by the World Meteorological Organization, which uses different sets of names depending on the part of the world the storm is in. Around the U.S., only women's names were used until 1979, when it was decided that they should alternate a list that included men's names too. There's 6 different name lists that alternate each year. If a hurricane does significant damage, its name is retired and replaced with another.

e. **Discuss:** Where does the word *hurricane* come from?
The word *hurricane* is from the Spanish word *huracan* meaning a big wind. Hurricanes are the most dangerous storms on earth. Even though the winds are only about half as fast as a tornado, a hurricane can be 2,000 times as wide as a tornado! Most hurricanes last less than an hour, but others go on and on for days!

When Christopher Columbus and his men landed in Hispaniola, they met the Taino people. Columbus' crew soon adopted and adapted some words from Arawak, the language of the

Taino. One word was *hurican,* which the Taino are believed to have borrowed from the neighboring Carib tribes. Interestingly, *Hurican* was the Carib god of Evil and derived from a Mayan god named Hurakan.

Hurakan was a creator god, who was said to have blown his breath across the ocean waters to create land. Later, he sent a great storm and flood that destroyed humans after they angered the gods. As a result, when the Spanish arrived in the area, they called huge tropical storms accompanied by rain and heavy winds *hurícans,* which came into English as "hurricane."

f. **Discuss:** What is the difference between a hurricane, a typhoon, and a cyclone?
Nothing except geography. Tropical storms occur in several of the world's oceans, and except for their names, they are essentially the same type of storm. In the Atlantic Ocean, Gulf of Mexico, and the Eastern Pacific Ocean, they are called hurricanes. In the Western Pacific Ocean, they are called typhoons. In the Indian Ocean, the Bay of Bengal, and Australia, these types of storms are called cyclones.

g. **Read** I Wonder why volcanoes blow their top p10-11

h. **Online game:** Create a hurricane (http://www.nhc.noaa.gov/HAW2/pdf/canelab.htm)

i. **Experiment:** Show how pressure is created in our atmosphere by sucking an egg in a bottle

SUCK AN EGG INTO A BOTTLE

MATERIALS:

- glass bottle with a long, narrow neck (an apple cider jug works well)
- boiled egg
- matches

PROCESS:
Put the empty bottle on a table.
Peel the boiled egg.
Light a match and drop it into the bottle. Repeat about three or four times.
Quickly put the egg over the mouth of the bottle.

EXPLANATION:
What happens? The lit match heats the air inside the bottle. When air is heated it expands and takes up more room. As the heated air expands, some of it escapes out of the bottle. When the matches go out, the air inside the bottle cools and contracts, which takes up less room. This creates a lower pressure inside the bottle than outside the bottle. The greater pressure outside the bottle forces the egg to get sucked into the bottle.

*To get the egg back out of the bottle, tilt the bottle and blow air into it. Make sure you get out of the way, because the egg will shoot out.

7.4 TYPHOON - is a tropical cyclone that is similar to a hurricane, except that it occurs over the western Pacific Ocean and its shores.

Japan's annual typhoon season begins in late summer and continues through the fall. Like the hurricanes that strike the east coast of the United States, these violent rain and windstorms are extremely destructive. The word "typhoon" describes its strength, as it derives from the Chinese words for "great wind."

In the last part of the 13th century, typhoons contributed to the outcome of two major events in Japanese history. The Mongol hordes had earlier thundered across Central Asia to take China. Now, Kublai Khan, the grandson of the great Mongol conqueror Genghis Khan, sat on the Chinese throne as

the founder and first emperor of the Yuan Dynasty (1279–1368). After destroying the last resistance from the preceding Song Dynasty, he had invaded and subdued Korea. The first non-Chinese to conquer all China, he ruled a territory stretching from the Pacific Ocean to the Ural Mountains and from Siberia to Afghanistan.

But he hungered for more land and saw Japan as his next conquest. Kublai sent emissaries to conduct negotiations and then fumed when he was informed that the Japanese had rejected his demands to submit to Chinese rule and had even dared to behead his envoys.

And the Invasion Begins

Still, the Japanese greatly feared invasion by the Mongol emperor's mighty military forces. The panicked members of the Japanese court in Kyoto, which, at the time, was the country's capital, began praying to their gods for deliverance.

Meanwhile, the samurai, or military lords, made defensive preparations. Kublai Khan's plan was to invade by sea. His commanders chose the shortest crossing point between Korea and Japan, a distance of about 100 miles over treacherously rough waters. The first expedition arrived from Korea in mid-November 1274. Composed mainly of Korean ships manned by Korean sailors, the invaders staged a violent takeover of two small islands. They then advanced to the port of Hakata on the large island of Kyushu, where fierce fighting began. Japan's fall to the Mongol invaders seemed imminent.

This painting of Kublai Khan was done in 1294, shortly after his death that same year.

Imminent, that is, until a warning came that a typhoon was about to strike the area. The weather-wise Korean sailors persuaded the commanders to send their men back to the ships before the storm struck land. For some, however, the advice came too late as tempestuous gales drove their vessels out to sea, destroying many of them. An estimated 13,500 men perished before the remaining ships made it back to Korea. Just seven years later, in 1281, Kublai Khan tried again. That diplomatic effort also failed and, as in the past, his emissaries were beheaded. This time Mongols, Koreans, and Chinese sailors made up the attack force. But the Japanese were better prepared this time. With their difficult-to-scale stone defensive walls and improved strategy, they offered enormous resistance. And, helping them once again was a massive typhoon.

Thus, it seemed fitting to the Japanese to name these winds *kamikaze,* or "divine winds," for who but the gods would send such help to their earthly followers. The ferocious, gale-force southwest winds of mid-August blew continuously for more than two days, mercilessly pounding the shores, uprooting huge trees, and wreaking havoc on manmade structures.

For the Mongols, the result was a catastrophe. They lost at least half their fleet and had to retreat.

A God-Given Victory

In the years that followed, the Japanese victory over Kublai Khan greatly affected how the Japanese thought of themselves. They became convinced that their islands were divine and that the gods had sent divine winds to protect them from outsiders. It was not difficult for the Japanese to believe in the intervention of the gods because they traced their ancestry back to the mythical sun goddess Amaterasu. Many historians, however, think that the Japanese had more to thank than the storms for their victories. They see among the other contributing factors unseaworthy ships and the reluctance of the Chinese and the Koreans to fight.

Understandably, Kublai Khan found it difficult to gain support for a third invasion attempt. He died in 1294, never having accomplished his goal of taking control of Japan. The term *kamikaze* surfaced again in the 1940s, as World War II raged in the Pacific.

Some of the Allied forces began to use this Japanese word to describe suicide attacks on their shipping by Japanese airmen, soldiers, and boat crews. Not so with the Japanese, however, who continued to use the term to describe the violent typhoons of the 13th century.

Did you know?
There is a word in the English language that describes the ailment of a person with an extreme fear of wind and rain. It's anemophobia, a derivative of two Greek words: *anemos,* meaning "wind," and *phobos,* meaning "fear."

a. Notebook entry

i. What does the word Typhoon mean in Chinese?

c. Oral narration:

i. Describe how typhoons saved the Japanese from the Mongol invaders

7.5 TORNADOES

a. Read

i. I wonder why the wind blows p24
ii. I Wonder why volcanoes blow their top p14-15
iii. **Read** Geography Encyclopedia p83 (Tornadoes)

b. Read

What are some other factors for tornadoes to form?
Several conditions are required for the development of tornadoes and the thunderstorm clouds with which most tornadoes are associated. Abundant low level moisture is necessary to contribute to the development of a thunderstorm, and a "trigger" (perhaps a cold front or other low level zone of converging winds) is needed to lift the moist air aloft. Once the air begins to rise and becomes saturated, it will continue rising to great heights to produce a thunderstorm cloud, if the atmosphere is unstable. An unstable atmosphere is one where the temperature decreases rapidly with height. Atmospheric instability can also occur when dry air overlays moist air near the earth's surface. Finally, tornadoes usually form in areas where winds at all levels of the atmosphere are not only strong, but also turn with height in a clockwise or veering direction.

What do tornadoes look like?
Tornadoes can appear as a traditional funnel shape, or in a slender rope-like form. Some have a churning, smoky look to them, and other contain "multiple vortices", which are small, individual tornadoes rotating around a common center. Even others may be nearly invisible, with only swirling dust or debris at ground levels as the only indication of the tornado's presence.

What is a funnel cloud?
A funnel cloud is a rotating cone-shaped column of air extending downward from the base of a thunderstorm, but not touching the ground. When it reaches the ground it is called a tornado.

How do tornadoes stop?
It is not fully understood about how exactly tornadoes form, grow and die. Tornado researchers are still trying to solve the tornado puzzle, but for every piece that seems to fit they often uncover new pieces that need to be studied.

What is a gustnado?
A gustnado is a short-lived, relatively weak whirlwind that forms along a gust front. A gust front is the surge of very gusty winds at the leading edge of a thunderstorm's outflow of air. Gustnadoes are not tornadoes. They do not connect with any cloud-base rotation. But because gustnadoes often have a spinning dust cloud at ground level, they are sometimes wrongly reported as tornadoes. Gustnadoes can do minor damage.

What is a landspout?
A landspout is a very weak tornado that is not associated with a wall cloud or a mesocyclone. It is the land equivalent of a waterspout.

What is a dust devil?
A dust devil generally forms in the hot sun during the late morning or early afternoon hours. These are mostly harmless whirlwinds and are triggered by light desert breezes that create a swirling plume of dust with speeds rarely over 70 mph. These differ from tornadoes in that they are not associated with a thunderstorm (or any cloud) and are usually very weak.

Tornadoes differ from hurricanes and typhoons in two significant ways: firstly, they occur over land and not over water; secondly they occur when airstreams collide rather than when there is a difference in temperatures between the air and the surface. However, despite the differences, tornadoes can be just as destructive. Where the funnel (the centre of the storm) touches the ground heavy objects like animals, cars and even houses can be sucked up and flung around. And, surprisingly, the most likely place to see a tornado is the UK with around 33 every year!

c. Extra reading (news article)

i. COB1203_Perfect Storm.pdf p16,17

d. Notebook entries:

i. Hurricane vs Tornado

Hurricane	Tornado
• Warm ocean water making humid air & clouds • Winds coming together to force air upward • Humid air to form storm clouds • Light winds outside to steer it and let it grow	• Abundant low-level moisture to help develop a thunderstorm • Trigger (cold front or converging winds) to lift moist air • Unstable atmosphere (temperature decreases rapidly with height, or when air overlays moist air near Earth's surface) • Strong atmospheric level winds, turning with height in a clockwise or veering direction

e. Experiment:

TORNADO IN A BOTTLE

MATERIALS:

- 2 2-liter clear plastic pop bottles (empty and clean)
- water
- duct tape or you can purchase a Tornado Tube at the Weather Wiz Kids® Store that will connect the 2 2-liter bottles together

PROCESS:
Fill one of the bottles two-thirds full of water.

Take the Tornado Tube and twist it on the first bottle. Then, grab the second bottle and attach it to the Tornado Tube.

Or use duct tape to fasten the two containers. Make sure to tape tightly to make sure that no water will leak out when you turn the bottle over.

Turn the tornado maker, so that the bottle with the water is on top. Swirl the bottle in a circular motion. Most tornadoes form counter-clockwise in the Northern Hemisphere. A tornado will form in the top bottle as the water rushes into the bottom bottle.

*If you want to get creative, you can also use food coloring to make the tornado have a color and glitter to represent debris.

EXPLANATION:
The swirling motion you give the bottle forms a vortex and is a easy way to create your own tornado.

TORNADO IN A JAR

MATERIALS:

- mayonnaise jar or a canning jar
- clear liquid soap
- vinegar
- water

PROCESS:
Fill the jar about three-quarters full of water.

Put a teaspoon of the liquid soap into the jar.

Also, add a teaspoon of vinegar into the jar.

Tighten the lid and shake the jar to mix up the ingredients.

Now, swirl the jar in a circular motion.

The liquid will form a small tornado.

*If you want to get creative, you can also use food coloring to make the tornado have a color and glitter to represent debris

EXPLANATION:
The swirling motion you give the bottle forms a vortex and is a easy way to create your own tornado.

7.6 CYCLONE

By definition, the word “cyclone “ refers to a storm that consists of a swirl of counterclockwise winds circulating around a low-pressure center. The word was coined in 1848 by British meteorologist Henry Piddington, who had studied storms in the Indian Ocean. To name such weather, he suggested using a variation of the Greek work *kyklon,* which means revolving.” But Piddington apparently confused *kyklon* with another Greek word—*kykloma,* which means “a wheel” or “movement in a circle resembling the coil of a snake.” By 1856, the term was also being used to describe tornadoes in the United States, such as the cyclone in the story *The Wizard of Oz.* Today, the word “cyclone” once again is used to refer to tropical storms in the southwestern Pacific and Indian oceans.

8. VIDS Storms

9. Notebook entry

a. What is the difference between hurricane, typhoon, cyclone?
b. windy_word_find.pdf minitbook
c. Strong South African winds (Let him write the names on the flaps)
    i. Berg winds
    Unpleasantly hot, dry wind in some coastal areas
    ii. The Buster
    Strong south-westerly wind in KwaZulu-Natal

d. Measuring wind speed
    i. 1 knot = 1.852 kilometres per hour
e. What information is collected by weather balloons?

10. **Discuss** the pros and cons of wind
    a. We learned about the damage wind can cause when it becomes a storm. Do you think wind can be used for good?

11. **Read** about the uses of wind
    a. Did you know wind can be used as a source of energy for electricity? Energy, generated at power stations, is used everyday to give us electricity and heat.
    b. Wind has been the world's fastest growing renewable energy source for the last seven years, and is expected to continue with falling costs of wind energy and the urgent international need to tackle CO2 emissions to prevent climate change.
    c. Windenergy.pdf p9-11

12. **Notebook Entry**
    a. Despite the benefits of wind power, not everyone thinks it is such a good idea. Take a look at the statements (what do you think about wind energy and wind turbines) - which statements do you think are in favour of wind energy, and which are against it. Put a smiley face next to the statement that like wind energy, and a sad face next to those that don't.

13. **Practical (design)**
    a. workingwithwind.pdf p3 (info p4-10)

14. **Barometers – Read** e.explore Weather p32 (barometers)

15. **Experiment**

MAKE YOUR OWN BAROMETER

MATERIALS:

- small coffee can
- plastic wrap
- scissors
- straw
- index card
- rubber band

PROCESS:

Tightly cover the top of the coffee can with plastic wrap, using a rubber band to hold the plastic wrap in place.
The cover should be tight making the can airtight.
Place the straw horizontally or sideways on the plastic wrap so that two-thirds of the straw is on the can.
Tape the straw to the middle of the plastic wrap so that it will not fall off.
Tape an index card to the can behind the straw. The straw will act as a pointer on the card.
Carefully record the location of the straw on the index card with a pencil. If desired, marks can be drawn on the index card to make observing the changes easier.
After 15 minutes, record the new location of the straw on the index card. Continue checking and recording the straw location as often as you want.

EXPLANATION:

High pressure will make the plastic cave in and the straw go up. Low pressure will make the plastic puff up and the straw go down. If possible, check your measurements with a real barometer.

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17. **Explain** Weather maps
    Weather maps give information about daily temperatures, precipitation and wind in different parts of a country.

18. **Read & discuss** p51-52 LB Weather maps

19. **Read & discuss** p53 LB How weather affects our daily lives
    a. **Complete** table (draw pictures)

20. **Computer Assignment**
    Weather report (step 3 p54) – also include a bar graph for these two weeks (Formal Assessment)

21. **Read** about Weathering **–** Geography Encyclopedia p32-33

22. **Notebook entry**
    a. Weather vocabulary mix & match

TOPIC 3 UNIT 2 – RAINFALL

1. **Read** about water and clouds **–** Geography Encyclopedia p78-79 & The Usborne Science encyclopedia p193 (you can also explore e.explore Weather, p 50, 78-79
    a. Name the 3 states of water
    b. Complete the water cycle diagram
       Be sure to label all of the following:
        i. Ocean
        ii. Soil
        iii. Lake
        iv. Surface runoff
        v. Evaporation
        vi. Condensation
        vii. Precipitation
    c. Explain the water cycle
        i. **Read** Usborne Internet-Linked First Encyclopedia of Science p14-15
    d. Explain how clouds form
    e. **Draw** different ways of precipitation (rain, snow, hail, or sleet)
    f. How evaporation takes place

2. **VIDS** Clouds - Cloudspotting guide

3. **Read & Discuss** rainfall p56-58 LB
    a. We measure the amount of rainfall in millimeters (mm).
    b. We use a rain gauge to measure the amount of rainfall.
    c. We use **maps** and **graphs** to determine rainfall patterns over a long period.
    d. The eastern half of South Africa gets more rain than the western half.
    e. The south-western parts of the country receive most of its rain in winter. The south-east coast receives rain throughout the year. Most of the country receives rain during the summer.
    f. **Read** All about South Africa p115 (Rainfall)

4. **Notebook Entry**
    a. Vocabulary booklets (Let him decorate the cover background with the meaning of the word)
        i. Annual rainfall – the amount of rain a certain place gets in one year
        ii. Evaporation – when water is heated up and changes from a liquid into an invisible gas

5. **Read** about floods
    a. Geography Encyclopedia p84-85
    b. Printed book *Floods*
    c. You can also explore

i. e.explore Weather p70-71
ii. floods-around-the-world-2010.pdf (Geography directory)

6. **Notebook Entry**
   a. What causes floods minit.doc (Rivers directory)

7. **Discuss**
   a. What are the effects when there is too little rain in an area?
   b. What are the effects when there is too much rain in an area?
   c. What is a flash flood?
   d. Why doesn't the water flow away?
   e. Why do the same places flood?
   f. Why was the Thames Barrier built?
   g. How can floods cause water shortage?
   h. How do droughts happen?

8. **Read** about Monsoons – Geography Encyclopedia p120-121
   a. Show on a map where monsoons are experienced
   b. Also explore e.explore Weather 66-67
   c. Visit http://news.bbc.co.uk/cbbcnews/hi/newsid_4720000/newsid_4722500/4722513.stm to view monsoon pictures in Mumbai, India

9. **Notebook Entry**
   a. Draw what happens during monsoon season, (Geography Encyclopedia p120), and explain the 3 seasons of monsoon regions
   b. What crops can grow in monsoon areas?
   c. Which diseases spread easily after the monsoon season?

10. **Experiment**

CREATE EVAPORATION

MATERIALS:
- hand sanitizer

PROCESS:
Pour some hand sanitizer on your hands and rub your hands together, as if you were washing your hands.

Your hands are now wet, so do your hands feel cooler? Answer: Yes!

After waiting a few seconds, are your hands now dry? Answer: Yes!

The hand sanitizer evaporated off your hands and your hands felt cool, therefore evaporation is a cooling process!

Repeat the steps above, but this time move your hands through the air. This simulates the wind. Do your hands feel even colder now? Answer: Yes!

EXPLANATION:
What happens? Again, evaporation is a cooling process and adding wind to the picture makes evaporation happen faster. This makes your hands feel even colder. This is why we have a "Wind Chill" factor. The wind causes moisture on your skin to evaporate at a faster rate, therefore making you feel colder.

TOPIC 3 UNIT 3 – CLIMATE

1. **Discuss:** Do you know the difference between climate and weather?
   Climate is the average pattern in weather conditions for an area over a long period.

2. **Read**
    a. Kids World Atlas p24-27
    b. Student Atlas of the World p20-23
        i. Name things that all play a role in determining the climate of an area (p22-23) (Cut & Paste & Discuss *Factors minitbook*)

3. **Read** Geography Encyclopedia p100-101 (Climate)
    a. **Discuss** different climate types (biomes)
        i. Geography Encyclopedia p116-132
        ii. The Usborne Science encyclopedia p194-195
        iii. WackyWeatherWords.pdf

4. **Notebook Entry**
    a. Paste the correct maps in the booklets and ** record at least one interesting fact about each biome

5. **Read** about changes in climate – Geography Encyclopedia p104-105

6. **Discuss:** Different places in South Africa experience different kinds of climate at the same time of year.
    a. **Read & Discuss** p59-62
        i. **Complete** the table (description of summers and winters in SA)
        ii. **Paste** the map of SA climates (first paste on different colored paper)
    b. **Read** All about South Africa p115 Climate & Climatic Regions
    c. **Notebook entry:**
        i. South Africa's two currents (draw the two currents and paste the name tags)
        ii. Climate Vocabulary

TOPIC 3 UNIT 4 – NATURAL VEGETATION

1. **Discuss:** What do you understand by 'natural vegetation'?
    b. **Natural vegetation** is the grass, plants and trees that grow naturally in an area without being planted there by people.
    The natural vegetation in an area is suited to the area's climate.

2. **Discuss:** How, do you think, does climate affect natural vegetation?

3. **Read & Compare** (world natural vegetation)
    a. Student Atlas of the World p24-25
    b. Kids World Atlas p28-29

4. **Read & discuss** p63-65 LB

5. **Notebook Entry:**
    a. **Draw** pictures in the blocks (SA's natural vegetation) and name examples

6. **Read & Discuss** Case study: Savannah Grasslands p66-67LB
    a. The savannah grassland is one type of natural vegetation found in South Africa. It is warm throughout the year and usually receives rainfall in summer.

7. **Explore** All about South Africa p110-111

8. **Read** about Weather Forecasting
    a. Geography Encyclopedia p90-91
    b. e.explore Weather p88-89
    c. All about South Africa p116-117

**** TERM ASSESSMENT EXEMPLAR LB p68-69**

**** FORMAL ASSESSMENT (GEOGRAPHY PROJECT p54-55 LB p38 TG)**

TOPIC 4 UNIT 1 – MINERALS & COAL RESOURCES

1. Introduction

1.1 Rocks

They're all around us and, at first glance, they may seem pretty boring. But take a closer look and you'll see that there's a lot more to rocks than you might have thought.

First of all, the planet we are living on is one giant rock. The Earth's outer solid layer, the lithosphere, is made of rock. The earth's molten inner layer is made of melted rock.

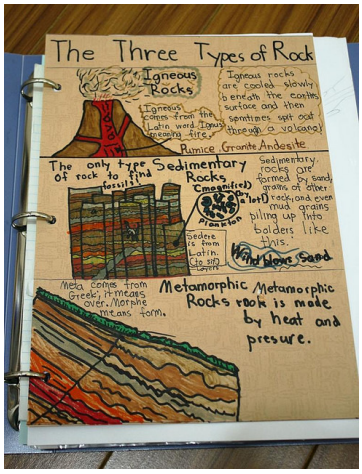
Almost everything we do involve rocks and minerals and the metals we extract from them.

a. Read Geography Encyclopedia p22-23 about Rocks, minerals and fossils

b. VIDS: Earth
- i. Layers of the Earth
- ii. What's the difference between rocks and minerals?
- iii. Mineral Identification

c. VIDS: Rocks
- i. Rock Types

d. Notebook entry:
- i. Label each of the three sections (a section for a rock)
- ii. Draw a picture of how the rock is formed
- iii. In one sentence write how the rock is formed
- iv. Write two examples of each rock



e. Read Geography Encyclopedia p24-25 about the Earth's resources

f. Discuss:
- i. Identify the metals on a periodic table.
- ii. Is gold a mineral, rock, or metal?
- iii. Where does a person find gold?

1.2 Gold

a. How does gold end up inside rock (How is it deposited)?

A deposit of gold is a concentration of gold in the same area or in the same rock formation.

Primary deposits are concentrations of gold inside rock. There are two main types of primary gold deposits. The first type is lode deposits. Lode deposits are formed by the same type of events that form mountains. Here is how it happens: When the earth's plates crash together they pile up on top of each other and form mountain ranges. Sometimes extremely hot water is forced up from deep inside the earth. The extremely hot water flows up through the cracks in the rocks. These cracks are called faults. The water contains lots of minerals and elements. As the water travels through the rock, it cools down. As the water cools it cannot hold onto the minerals. The minerals "fall out" of the water and are deposited along the cracks and fissures in the rock. Gold and quartz are often found together because they both get deposited in cracks in the rock though this process.

The second type of primary gold deposit is very similar to the first. The second type of primary gold deposit is called intrusion related. Here is how it works: Hot magma is sometimes forced up from deep inside the earth. As it rises from deep underground it forces its way up though the rock, sometimes following faults, sometimes just simply melting its way through. As the magma cools down it forms igneous rock. This type of rock formation is called an igneous intrusion. Sometimes as the magma forces it way to the surface it draws extremely hot water with it. Just like before, as the water cools, minerals fall out of the water and are deposited along they way. I can almost hear you ask, if the water is right next to magma why doesn't it just boil away? Magma is so much hotter than the boiling point of water. That's true, but the water is under so much pressure that it stays liquid long after it should have boiled away.

Secondary deposits are called secondary because erosion and water carry the gold from a primary deposit and deposit the gold in a different location. Secondary deposits are divided into two types: Placer and Laterite deposits.

Placer deposits are formed when water crumbles the rock and sweeps the gold downstream. Gold is very heavy for its size so the water has to be moving pretty fast in order to carry the gold downstream. When the water slows down enough, the gold settles to the bottom of the stream. The best place to find gold in the water is where the river slows down - like behind a big boulder, or as the river bends.

The most famous kind of gold mining is used to find placer gold. The method is called panning for gold. The idea behind panning for gold is pretty simple. You load up a high-sided metal or plastic pan with dirt you hope has gold in it. Fill the rest of the pan with water. You shake the pan in such a way that the heaviest stuff (gold) in your dirt falls to the bottom of the pan. As you continue to shake the pan you carefully dump the mud and water out of you pan until just the heaviest stuff remains at the bottom. You have to carefully pick out the rocks and make sure they are just rocks. Keep working until you have washed out all the dirt and are just left with gold. It sounds simple, but I have personally never tried it so I don't know how easy it really is. I think it takes a lot of practice; otherwise you might end up washing the gold out of the bottom of the pan along with everything else.

Today, more often than not, gold is extracted from ores. These ores often contain relatively little gold. Some of these processes cause environmental concern. Much gold is recovered from ores that are low in gold concentration using a cyanide extraction process.

b. Gold as a metal

Gold is a very interesting metal; it is one of the few metals yellow in color. Gold has physical properties that make it very desirable to people. First, it is pretty. People have liked the glimmer and shine of gold for longer than recorded history. Second, it is malleable. Malleable means that it is easy to shape. Third, it is ductile. Ductile means it can be stretched into a thin sheet or wire. Fourth, it conducts electricity.

c. Gold timeline

Gold has always fascinated people and gold is certainly one of the very first metals known. Nobody knows who picked up a gold nugget first but it would have been because it was shiny. Gold was highly valued from the earliest recorded times in history. It seems that the Egyptians developed gold smelting some 5600 years ago (about 3600 BC) using clay blowpipes to heat the smelter contents. Egyptian inscriptions dating back to 2600 BC describe gold. Gold workers from Mesopotamia (known now as Iraq) made one of the earliest known pieces of gold jewellery in about 2600 BC. Gold is mentioned several times in the Old Testament. Tutankhamun's funeral mask is one of the most iconic gold pieces known. It was made around 1223 BC and is a stunning piece of ancient gold craftsmanship.

People have been using gold to make jewelry since the Stone Age. You can find it just lying in little lumps in streams here and there. And gold is always pretty and yellow, even when it is just lying in the stream. But to get more gold you have to find gold mines underground. Because gold is both rare and pretty, it's valuable, and people have always been willing to work hard to get more gold.

Gold is easy to work, but it is not strong enough to make tools or weapons out of. For that you need bronze or iron.

One early source of gold was Ethiopia. The Egyptians got their gold by trading for it with the Nubians in Ethiopia, as well as from their own mines. Many places in Africa have gold mines where people mined gold for jewelry and decorations. In West Africa, people traded gold for salt from the Sahara desert to their north.

Spain also had a lot of gold mines. The Phoenicians came to Spain about 700 BC and traded with the Iberians who lived there, trading glass beads and iron tools for the Spanish gold. Later on the Carthaginians also conquered Spain mainly for silver and gold, and then in 215 BC the Romans fought the Second Punic War to get control of those same mines. The gold and silver from Spain paid for the Romans to build the rest of their empire.

Gold coin of the Roman emperor Trajan (d. 117 AD)

When the gold in Spain began to run out, the Romans noticed that there were also gold mines in Dacia (modern Romania). The Dacians traded this gold to the Greeks for fancy pottery and to the Scythians for amber. About 100 AD the Roman Emperor Trajan conquered Dacia - mainly in order to get this gold. The Romans used the Dacian gold to pay their army. You can see a picture of a Roman soldier killing a man on the back of Trajan's coin. When the Dacian mines ran out of gold, about 275 AD, the Romans abandoned Dacia and went home again.

By 1433 AD, when Portuguese sailors figured out how to sail to West Africa and back, they were able to trade for gold with the West Africans without having to cross the Sahara desert anymore. By 1471, the Portuguese were calling West Africa the "Gold Coast".

When European people came to North America, soon after this, they thought they would find a lot of gold there, as they had in Africa. They did find some, though not as much as they had hoped. When men found gold in California in 1848 AD, thousands of men and women rushed out to California to pan for gold and try to make their fortunes. Most of them did not get rich, but a few did.

Gold has been the basis of many currencies over the centuries and so for economic reasons, among others, the possession of gold was or is restricted in some countries. Notably, private ownership of gold (apart from as jewellery and coins) was banned between 1933 and 1975. In 1422 the Venice Mint made ("struck") 1.2 million gold ducats using 4.26 metric tonnes of gold. These small coins (each about 3.5 g) were popular perhaps because they were easy to make and are highly transportable. In 1717 Great Britain moved to a pure gold standard. The British government linked the currency to gold at a fixed rate (77 shillings, ten and a half pennies per ounce of gold).

The Californian Gold Rush of 1848[+]1855 started on 24 January 1848 when gold was found by James W. Marshall at Sutter's Mill, in Coloma, California. Although attempts were made to keep the discovery quiet, news leaked out and the result was the migration of 300,000 people to California from the United States and beyond. The New York Herald was the first East Coast newspaper to report the discovery of gold and on 5 December 1848, President James Polk confirmed the discovery in an address to Congress. The gold-seekers were called the "Forty-niners" and often had a very hard time. Prospectors retrieved the gold from streams and riverbeds using low-technology methods such as panning. More sophisticated methods of gold recovery were eventually developed. Gold worth tens of billions of US dollars (2010 equivalent

price) was extracted. Some became wealthy but many finished with little profit and a lot of heartache.

Some years later in 1885 the South African Gold Rush began. An Australian miner, George Harrison, found gold on Langlaagte farm near Johannesburg while digging to build a house. The gold found at Langlaagte was different. The gold discovered there ran for miles and miles underground, 'an endless treasure of gold'.

i. **Notebook entry:** Complete the timeline of gold (Cut & paste)

d. How the discovery of gold changed South Africa

The discovery of gold on the Witwatersrand in 1886 was a turning point in South African history. Far more than diamonds, this changed South Africa from an agricultural society to become the largest gold-producer in the world.

Gold increased trade between South Africa and the rest of the world. For the main trading nations i.e. the Europe and the United States, gold was of value because their currencies were backed by gold. This was known as the gold standard. Under the gold standard, these countries had to keep gold in a bank vault to the value of the currency they issued. For example, if the government of a country wanted to print more money, it had to buy gold to back that money. If that country did not produce gold itself, it had to import gold from another country.

Under the gold standard the price of gold was fixed internationally. It was kept low as this benefited nations in Europe and the United States amongst others. These strong nations did not produce gold and had to buy it from elsewhere to back their own currency.

e. The Richest Gold-Mining Area in the World

Gold changed the face of the Transvaal. Before 1886 it was a poor, struggling Boer republic but ten years later, it was the richest gold mining area in the world. As news of the gold find spread throughout South Africa and the rest of the world, men made their way to the Transvaal.

They walked, rode on horseback, or came by ox-wagon. Ships no longer passed South Africa on their way to Australia and New Zealand. Instead, boatloads of men arrived at ports and hurried to catch the next coach to the Transvaal, hoping to find the riches of their dreams.

f. Mining Camps Become Towns

Wherever people found gold, another little mining camp grew. Langlaagte became part of a big mining camp called Johannesburg, where many other mining camps had been set up. Soon Johannesburg became the biggest town in the Transvaal, bigger even than Pretoria, the capital.

Other mining towns sprang up as well. These mining towns form a curve on the map. This curve is called the Witwatersrand, the Rand for short.

As time passed, the tents disappeared and people began to build houses, offices and shops. Builders were very busy. Ox-carts and horses filled the streets with traffic, dust and noise; yet the sound of the stamps crushing rocks in the mines around the town could be heard day and night.

g. People of the Mining Towns

Every week hundreds of people poured into the golden Rand all had come to seek their fortune. There were three main groups of people who hoped to make money from the mines.

The first to come to the mines were the prospectors. These were the men who came to look for gold in the soil. They came with great hopes of 'striking it rich'.

A growing group of people were labourers. Many of them were young African men who came to the mines in order to earn money to pay the traditional bride-price. Others hoped to find jobs so that they could pay their taxes, or buy guns or tools like hoes and ploughs for their land. For

many years most labourers did not come to stay. They went home as soon as they had earned enough money.

Other people did not get their money directly from the mines, they made money from the needs of the people who mined the gold. The sellers of land, lawyers, traders, shopkeepers, ox-wagon drivers, barbers, hawkers and many more made their money in this way.

Improved transport
More and more factory-made goods were being shipped from England to meet the demands of the mines and the communities that were developing around them. Goods had to be transported all the way from the coast to the Rand by ox-wagon - and ox-wagons were very slow. The equipment needed for the mines was taking too long to arrive.

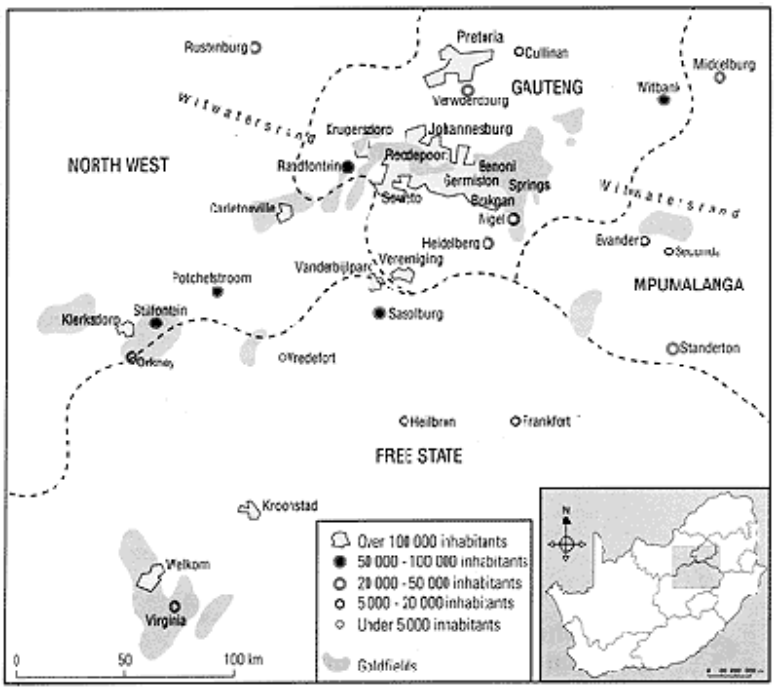
Something had to be done to improve the system of transport. First, the governments of the Transvaal, the Cape and Natal improved the roads so that wagons could travel faster. Then railways were built.

The first railways joined the ports to the mining Most of the main lines went to the Witwatersrand, to the gold mines. There was also main line to the diamond mines of Kimberley. The coming of Railways to South Africa made a great difference to people all over the country. People who wanted to work in the gold mines went by train. New towns grew up around the stations. People used the railways to travel from the countryside to the towns.

Farmers sent their produce by train to the larger towns.

An ever-increasing number of people were leaving their land and coming to the Witwatersrand to find work.

h. The importance of the gold-mining industry



The map shows that the gold-mining towns formed a curve starting from the East Rand in Heidelberg, extending westwards across to Krugersdorp and Randfontein. Later more gold mines were discovered further south and east. As a result of this 'endless treasure of gold', gold mining very quickly became the largest and most important part of the economy.

The discovery of gold in 1886 greatly changed the Witwatersrand area and led to its development into a huge industry. Small towns grew as more and more people moved to the towns in search of gold. But gold, as well as the discovery of a range of other minerals, changed not only the country, but also the lives of many thousands of people as well as the environment.

i. Explore All about South Africa – p82 The Story of Gold

j. **Read** All about South Africa – p98 Gold from the Witwatersrand (All about the first coins)

2. **Narration (oral)**
   a. How did the discovery of gold change South Africa? *(The poor, struggling republic became the richest gold mining area in the world; towns expanded drastically with people and buildings; industry expanded – people earning a living off of the needs of others; roads and railways were built; new towns sprang up around the railway stations; farmers started sending their produce to bigger towns by rail transport; the gold mines offered jobs for many people)*
   b. Some people didn't make their money from mining gold. How did they become rich?
   c. What was done to improve the transport problem? *(First roads were bettered, then railways were built)*
   d. How, would you say, the lives of people and the environment were changed by the discovery of gold and other minerals?

3. **Notebook Entry**
   a. How does gold end up inside rock?
   b. What are placer deposits? (He can draw where to find it)
   c. What is the Reserve Bank?
   d. How did the discovery of gold change South Africa?

4. **Read & Discuss** p71-72 LB

5. **Read** All about SA p45 (Mining)

6. **Discuss:**
   a. What does non-renewable mean? *Once a mineral is mined, it is gone forever. Another one will not grow in its place. This means that at some point all the minerals will be removed (or mined) from the earth.*

7. **Explain:**
   a. **Reserves** *are minerals that have not yet been mined. It is like having money saved for a rainy day.*
   b. * Visit the Chamber of Mines website to find out how much reserves South Africa has of minerals such as gold and coal.

8. **Read & Discuss** p73 LB
   a. **Notebook entry**
      i. Write the name of the main minerals mined in South Africa in each block, and draw one of the uses of the mineral (use the whole block size)

9. **Read & Discuss** p74-77 LB (how coal is formed)
   a. **Also read** *How coal is formed* in Our World printed book
   b. **Notebooking entry**
      i. How coal was formed (paste)
      ii. Uses of coal minit book (p75-76 LB)
   c. **Discuss:**
      i. Name the two types of mining. What is the difference between them?
      ii. Explain the processing of coal.
      iii. How does burning coal affect the environment?
      iv. What is the ash of burnt coal used for?
   d. **View** Mining pictures: http://www.bullion.org.za/content/?pid=85&pagename=Mining+Pictures

10. **Read** All about South Africa p84-85

11. **VIDS:** Mining

TOPIC 4 UNIT 2 – MINING & THE ENVIRONMENT

1. **Read & Discuss** Background of Diamonds
   In the 1800's a young boy named Erasmus Jacobs lived with his family on a farm near the Orange River in South Africa. Erasmus and his sister used to pick up pretty stones along the banks of the river and play with them. In 1866 they found a small white pebble which Erasmus showed to his father, and he in turn showed it to a neighbouring farmer named Schalk van Niekerk. Van Niekerk found the stone intriguing, and offered to buy it from the Jacobs' family, who simply gave it to him without payment. They never believed it was a diamond or that it was valuable.

   Van Niekerk sent the stone via ordinary mail to Grahamstown where Dr. William Guybon Atherstone confirmed that it was in fact a diamond. The diamond found in Kimberly was indeed a 21.24 carat diamond and was named the Eureka.

   The Eureka diamond is the single most important diamond in the history of South Africa. After the discovery of the Eureka diamond, Kimberly was overwhelmed with people from all over the country and the world who wanted to make money mining diamonds in South Africa. The diamond rush that followed played an integral part in transforming South Africa into a leading industrial nation.

   More than 22 million tons of earth was removed from what is now known as "The Big Hole" in Kimberly, and roughly three tons of diamonds were removed. In 1888 the various mining groups decided to join forces and one of the world's leading diamond mining groups was formed known as De Beers Consolidated Mines. under the leadership of Cecil John Rhodes (South African statesman, proponent of British imperialism, and businessman after whom Rhodesia (Zimbabwe) was named). This was soon followed by the discovery of gold.

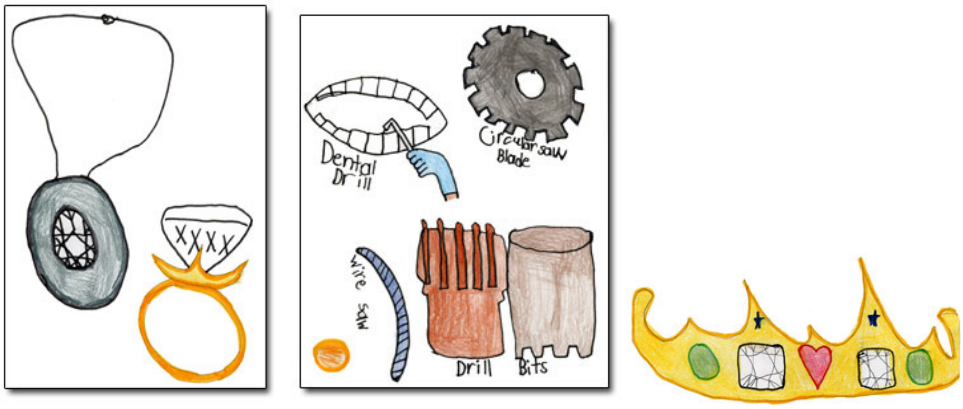
   The Eureka diamond exchanged many hands before it was finally purchased by De Beers who donated the Eureka to the people of South Africa. This magnificent diamond can now be found on display at the Kimberly Mine Museum in South Africa for all to enjoy its brilliance.

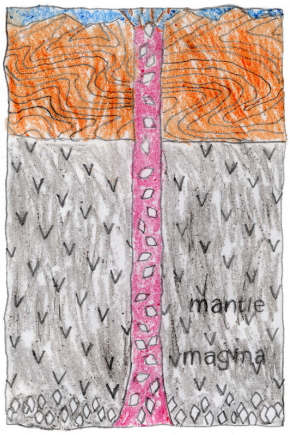
2. **Read** All about South Africa p86-87 Diamond Mining

3. **Discuss:** *What People Do With Diamonds*
   There are two kinds of diamonds, gem-grade and industrial-grade. Gem-grade diamonds are the ones that are used for jewelry. Their cost is determined by their cut, clarity and colour.

   Industrial-grade diamonds are valuable for their hardness and ability to conduct heat. They are used in drill and saw bits and other machines for cutting, drilling, grinding, and polishing (dental drill, circular saw, wire saw, drill bits).

   Synthetic or man-made diamonds are also used as gemstones (e.g. cubic zirconia) and in industry.





4. **Notebook Entry**
    a. Draw how diamonds are formed
    b. What people do with diamonds (divide the space into two – use one part for gem-grade products & the other space for industrial products)
    c. De Beers

5. **Read** about De Beer Mines & Mining methods

    a. Open Pit Mining
    Of all the methods we use to recover diamonds, open-pit mining is the most common. We use open-pit mining when diamond ore appears near the surface or is covered by a relatively thin layer of sand, cinder or gravel.

    b. Underground Mining
    Underground mining is probably the most technically complex of the methods we use to extract ore and recover diamonds at our land based operations. The choice of method used depends on the nature, shape and size of the kimberlite deposit and the characteristics of the surrounding rock.
    Diamonds are mined underground when:
    Open pit mining becomes uneconomic - As the open-pit excavation around a kimberlite pipe goes deeper, we balance the cost of waste removal with the rate of diamond recovery. At an appropriate point in the life of the mine, if the pipe continues to produce a high quality diamonds, and is of a suitable structure, we may decide to mine it underground. Debswana's Jwaneng Mine in Botswana and DBCM's Venetia Mine in South Africa are likely to "go underground" at some time in the future.

    The kimberlite deposit is not vertical - Kimberlite is usually found in cone shaped, vertical pipes, widening toward the surface, reflecting their volcanic origins. Occasionally, horizontal and sloping deposits are discovered, where weaknesses in the structure of the host rock has allowed the kimberlite to form branches and dykes. If these occur at sufficient depth, we mine them underground. De Beers Canada's Snap Lake Mine, in Canada's Northwest Territories, has this kind of deposit.

    c. Marine Mining
    The Orange River that carried diamonds from the centre of South Africa to the Atlantic Coast millions of years ago also deposited its precious cargo across the ocean floor.

    d. Alluvial Mining
    Alluvial diamonds reached their current resting place after being carried by wind and water down rivers over millions of years. Deposits of the resulting alluvial diamonds stretch north from the Orange River Delta along the west coast of Namibia.

6. **Notebook entry**
    a. Different methods of mining for diamonds (Paste)

7. **Discuss** The Value of Diamonds
    The value of diamonds is measured by four characteristics known as the 4C's.
    Cut
    Colour
    Clarity
    Carat weight

    The quality of a diamond is measured by its cut, colour and clarity. The carat weight measures the size of the diamond. Of all the 4C's, cut is directly influenced by humans. Colour, clarity and carat weight are all natural factors.

Cut
A diamond that is not cut yet is called a rough diamond. A cut diamond would be worth more money than an uncut one. It is important to distinguish between cut and shape. The most popular type of cut is the round brilliant. Some of the other popular shapes of diamonds include Oval, Marquise, Pear, Heart and Emerald

Colour
The colour of a diamond is one of the most important things in finding its value. The closer it is to being totally clear, the more valuable the diamond is.

There are also fancy coloured diamonds. Nitrogen is an element that absorbs blue light, making a diamond yellow. The element Boron absorbs red light and without the presence of nitrogen, the diamond with Boron makes it blue. An example of a diamond containing boron is the famous Blue Hope diamond. When you look at a diamond through a powerful microscope, it would look like a lattice, or an “x and o” pattern of atoms. When part of the pattern of atoms, or lattice, is missing, the diamond looks green. On the other hand, when there are discolorations in the lattice, a diamond may look brown, also known as champagne diamonds. Pink, the most rare, is a combination of dislocations and when part of the atom pattern is missing.

Clarity
Every diamond has unique characteristics. During the formation of a diamond, unpure or non-diamond crystals can get caught in the diamond. These tiny flaws are what makes each diamond unique. The clearer a diamond is the more valuable it is. The clarity gradings range from flawless to imperfect.

Carat Weight
Carat is a unit of weight for a diamond. The term "carat" is derived from the original method of using carob tree seeds to weigh diamonds. One seed from this tree was equivalent to one carat.

Diamonds are usually weighed before a jeweler put the diamond in the ring or necklace. Diamonds are priced per carat, according to their size and quality. Although the carat weight of a diamond determines its size, it does not necessarily determine a diamond's quality. Therefore, where two diamonds have the same carat weight, the one of better quality will be higher priced.

The actual weight of one carat is now considered to be 0.2 grams. To assist in accurately describing the weight of diamonds each carat is divided into 100 points. Diamonds of less than one carat in weight are known as "pointers". For example, a 0.15 carat diamond would be called a "15 pointer".

8. **Notebook Entries**
    a. The first diamond found in South Africa (Let him write Eureka (big in the middle); When: 1866; By: Erasmus Jacobs; Where: Kimberly on the inside; How big: 21.24kt)
    b. Kimberley’s big hole (cut & paste)
    c. Factors that determine the quality of a diamond
    d. Cecil Rhodes (paste)

9. **Read & Discuss** p78-79 LB

10. **Discuss:**
    a. How do you think mining could affect the environment? Think about the air, water, soil, plants, bushes, trees and other vegetation.

11. **Read & Discuss** p80 LB (Shaft and deep level mining)
    a. Notebook entry
        i. Drawing of a deep level mine

12. **Read & Discuss** p81 LB (Impact of mining on the environment)

13. **Notebook Entry**
    a. Draw and label how mining impacts the environment (p81 LB)

b. Newspaper articles (or internet sources – SA mining pollution) dealing with environmental pollution brought about by mining.

TOPIC 4 UNIT 3 – MINING & PEOPLE

1. **Introduction**
   It is not easy to be a miner. It's not easy to work up to 4km under the ground. Mines are one of South Africa's biggest employers, providing work for almost 500 000 people. But mining is also one of the most dangerous occupations. Every year, dozens of people die in mining accidents. And over the decades, hundreds if not thousands have been struck down by an eventually fatal lung disease called silicosis, contracted as a result of inhaling dust deep underground.

   But efforts are made to make mining safer. More solid shafts and tunnels are built, equipment is being improved, and rules are drawn up to protect the health and safety of miners.

2. **Use the internet**
   a. to gather material for your *Did you know* notebooking page. This could include information about the unbearably high temperatures miners have to put up with underground, about rocks that contain poisonous gases and about how cool air is pumped down a mine.

   b. Also gather life-of-the-times stories about miners and mining over the decades.
      i. What did miners eat and wear?
      ii. What were miners paid?
      iii. What were their daily struggles?

   c. Gather more information (even posters from pharmacies) on how silicosis destroys the lungs.

3. **Read** p83-85 LB
   a. Draw the miner's safety equipment, and label it

4. **Mining Vocabulary**
   Non-renewable – something that we can only use once
   Ore – a rock that contains large amounts of a certain mineral
   Fuel – something we burn to give us energy
   Industry – a very organized way of making things often in large factories
   Open pit mine – mines that remove large areas of soil and rock from the surface
   Shaft – hole that goes deep down into the ground
   Ventilation – a way to push cooled, fresh air into small spaces such as a mine
   Lift – a lifting machine that transports miners and rocks in a mine shaft
   Roof supports – lengths of wood or metal that stop the tunnel roofs falling down
   Impact – a powerful effect or damage
   Pollution – causing damage to air, water, soil with dirt and/or chemicals
   Mine dumps – large piles of waste rock
   Silicosis – a disease that attacks people's lungs which makes it difficult for them to breathe
   Tunnels - Horizontal passages that pass through rocks
   Ventilation pipes – pipes that take air around the mine tunnels and shafts
   Chemicals – strong substances that are used in mining, industry and farming

**** TERM ASSESSMENT EXEMPLAR LBp86-87**

**** TERM ASSESSMENT p92 TG**