



Republic of Zambia

Ministry of Education

Directorate of Curriculum Development

GEOGRAPHY
TEACHING MODULE
FORM 1-TERM1



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DRAFT GEOGRAPHY MODULE FORM1-TERM1

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DRAFT GEOGRAPHY MODULE FORM I-TERM I

Preface

The introduction of the competence-based curriculum (CBC) marks a transformative step in improving education quality and relevance. This Form 1 Geography Teaching Module has been meticulously designed to support teachers to effectively deliver Geography lessons under the new curriculum. The module aims to bridge the gap created by the absence of approved textbooks and to equip educators with practical tools, activities, and assessments tailored to the learners' level and needs. As a Ministry, we understand the challenges that come with transitioning to a new curriculum framework. This module reflects our commitment to making this journey as smooth as possible for teachers, by providing structured guidance, suggested activities, and formative assessments that align with the CBC's objectives. However, we also encourage educators to supplement this module with their own research and innovations to address any gaps that may arise during implementation. The suggested activities and assessments provided in this module are designed to foster practical and critical thinking skills in learners while ensuring relevance and adaptability to different school contexts. Teachers are encouraged to tailor these suggestions to their unique classroom dynamics and to explore alternative, acceptable approaches when necessary. This flexibility is key to ensuring that all learners, regardless of their environment, benefit from meaningful and impactful Geography education. We hope this module will serve as a valuable resource for teachers as they navigate the new competence-based curriculum, enhancing their ability to inspire and equip learners with essential Geography knowledge and skills.

Faculty of Social Sciences

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Topic 1: Geography

1.1.Introduction

Geography is an important subject for secondary school learners, providing them with essential knowledge and skills that are applicable in real-life situations. It fosters critical thinking, global awareness and environmental stewardship, preparing learners to navigate and contribute positively to an interconnected World. By understanding geographical principles, learners are better equipped to face the challenges of the future, making Geography not just an academic subject, but a vital component of informed citizenship and personal development. The focus of this topic is to discuss Geography as a study discipline, identifying its branches and analysing the importance of studying the subject. This topic has one sub-topic; namely, introduction to Geography

1.2. General Competences

- The general competences in this topic include; analytical thinking, collaboration, creativity and innovation, and digital skills.

Hook:

- *“Imagine a world where the physical environment we know today no longer exist, how would geography shape the relationships, cultures, and economies of the people living in those regions?”*
- *“A teacher to take learners on field trip to the local environment highlighting unique geographical features, cultures and the environments.”*



1.3.List of Key Terms

- Geography
- Environment
- Physical Geography
- Human Geography

Sub-Topic1: Introduction to Geography


1.4.1. Introduction

Geography deals with inter-relationships that exist between human and the environment. It explores physical and human processes that shape the status of the environment. It further fosters critical thinking, global awareness and environmental stewardship in order to contribute positively to an interconnected World.

a. Specific Competence(s): -Learners to:

- Demonstrate understanding of Geography

b.  **Learning Activities**

 **Activity 1: Discussing Geography** (*Major concepts in Geography*)

c. **Learning Environment**

The environment set up for this activity will mainly be indoors:

Indoor set up:

- Cluster the learners in small groups to discuss the concepts of Geography
- Display World map or globe/pictures or videos of geographical features
- Learners to identify geographical features
- Each group to share key ideas to the class
- Key responses to be written down by grouping similar ideas
- Learner responses should be connected to cement the concept Geography

d.  **Content Tips**

- Geography is the study of the Earth's surface, environment and how humans interact with their surroundings
- Geography influences human life; where people live, what they eat and how they build communities
- Geography uses tools such as Maps, GIS, GPS, and Remote sensing systems as essential tools to help people navigate and understand the world
- Every place on Earth is unique shaped by its physical and human characteristics
- Geography helps solve real - world problems such as climate change, deforestation and disaster management.

e. **Teaching and Learning Materials**

- Wall maps and Atlases to indicate the physical and cultural features
- Globe to show that Geography is the study of the Earth's physical features and human aspects
- Tools such as GPS, Google maps showing physical and cultural features
- Projector to display physical and culture features

f.  **Assessment**

- Observe learners' participation in small groups as they interact with the globe and maps to identify physical and culture features.
- Observe learners' manipulation of tools such as Maps, GPS and Google maps to identify physical and cultural features.
- Quick quiz question - One thing I learnt about Geography today is.....



Activity 2: Identifying various branches of Geography (*Physical and Human*)

a. Learning Environment

The environment set up for this activity can be both indoor and outdoor:

Indoor set up:

- Arrange desks in pairs or small groups for learners to collaborate and display World map or globe showing features of physical and Human Geography.

Outdoor set up:

- Allow learners to observe the local environment and categorise physical and human features (such as mountains, rivers, farms, towns and waterfalls).



b. Content Tips

Geography is divided into two main branches:

- These are Physical and Human Geography
- Physical Geography studies natural features and processes. The following are some of the sub-branches of physical Geography, climatology, hydrology, geomorphology...
- Human Geography studies human activities and their impacts on the environment. The following are some of the sub-branches of Human geography, cultural geography, political geography, urban geography, population geography...
- Physical and human Geography are interconnected in that natural features affect human life and human activities impact the environment

c. Teaching and Learning Materials

- Chart of the World map or globe/pictures of different physical and human geography



d. Assessment

Observe learners as they:

- Identify and classify physical and cultural features



Activity 3: Analysing the importance of studying Geography (*Conservation of the environment, spatial and navigational skill...*)

a. Learning Environment

The environment set up for this activity can be both indoor and outdoor:

Indoor set up:

- Arrange desks in clusters, circles or u-shaped for learners to discuss and collaborate on the importance of studying Geography.

Outdoor set up:

- Use school surroundings such as school gardens, nearby natural parks for field observations on the importance of conservation of the environment

b. Content Tips:

- Helps learners understand current events such as climate change, migration or natural disasters
- Enables learners to use maps, globes or images to illustrate geographical concepts
- Fosters cultural awareness and global citizenships such as exploring diverse cultures and societies
- Develops critical thinking and problem-solving skills
- Enhances environmental awareness and sustainability
- Connect geographical concepts to learners' daily lives such as weather, food sources and local environments

c. Teaching and Learning Materials

- Wall maps and Atlases to show different continents and geographical features
- Posters and infographics to display key points why Geography is important



d. Assessment

- Observe learners how well learners contribute and apply geographical concepts
- Ask open ended questions such as; why geography is important

e. **Expected Standard-** Understanding of Geography demonstrated clearly



f. Summary

- Geography is the study of Earth's landscapes, environments, and the relationships between people and their environment.
- Physical geography focuses on natural features and processes such as landforms, climate, vegetation, and ecosystems.
- Human geography examines human activities, cultures, economies and their impacts on the environment.
- Geography helps learners understand global issues such as climate change, urbanization, resource management...
- Geographical skills include; map reading and interpretation, analysing spatial data and patterns, conducting field studies and research.

Topic 2: The Solar System

2.1.Introduction

The solar system is made up of the sun and its eight planets and everything that orbits around it, such as moons, asteroids, comets and various other celestial bodies. In this topic you should guide learners to the position of the Earth in the solar system, its shape, size and the movements it makes. You should also let learners explore the Earth's graticule and atmosphere

The study of the Solar system is important for understanding of various aspects of our lives and the future of our planet. By exploring the solar system, scientists gain insights into Earth's

forces such as gravity and atmosphere in order to better comprehend our planet's complex system. This enhances people's knowledge of the cosmos and sheds light on the origins of our own planet (Earth) and the fundamental processes that govern celestial phenomena. Additionally, the exploration of the space will inspire scientific pursuits, drive technological innovations and a deeper appreciation of the Earth in the universe. The study will further help in continuous exploration of planets and other astronomical bodies beyond planetary boundaries so as to unlock mysteries that could provide fundamental answers to human survival, life existence and the dynamics of the universe thereby shaping the trajectory of human progress. The following Sub-topics would be covered under this topic:

- The Earth in the Solar System
- Shape and Size of the Earth
- Movements of the Earth
- Earth's Graticule (Latitude and Longitude)
- The Earth's Atmosphere

2.2. General Competences to be acquired

The general competences that the learners are expected to acquire include; analytical thinking, creativity and innovation, collaboration and digital skills.

Hook

Imagine discovering a planet within our own solar system that, despite having extreme conditions, harbors a form of life completely unlike that of the Earth. How would such a discovery reshape our understanding of life's potential adaptability and boundaries of life sustaining environments?



2.3. Key terms

- Solar system
- Planet
- Earth
- Orbit
- Celestial

Sub Topic 1: The Earth in the Solar System

2.3.1. Introduction


The Earth is the third planet from the Sun in the Solar system and is the only known planet to support life. It is a terrestrial planet, consisting of iron, oxygen, silicon, magnesium, and nickel, with a solid and active surface. The Earth's atmosphere is composed of 78% nitrogen, 21% oxygen, and 1% other gases, which provides the perfect conditions for life to thrive. The Earth's distance from the Sun allows it to maintain liquid water, which is essential for life. The planet's rotation and orbit around the Sun also create day and night cycles, as well as seasons, which have a significant impact on the Earth's climate and weather patterns.

The solar system is a vast and diverse place, comprising various celestial objects that can be broadly categorized into several elements such as planets, moons, asteroids, comets...

a. Specific Competence-Learners to;

- Demonstrate understanding of the position of the Earth in the solar system

b.   Learning Activities

-  **Activity 1.** Identify various elements found in the Solar system (Sun, Planets, meteors...)

c. Learning Environment

The environment set up for this activity can be both indoor and outdoor:

Indoor set up:

- Classroom set up in small groups for the learners to discuss and collaborate as they identify elements of the solar system.
- Learners will work in small groups to observe a poster, chart or diagram of the solar system and discuss the position of the Earth and share their thoughts with the whole class
- Learners will work in small groups to examine the 2 dimension or 3-dimension diagrams of the solar system to identify the planets in their order from the sun and determine Earth's position (3rd from the Sun).
- Learners will work in small groups and use planet cut-outs and glue or cardboard and paint or balls or clay to create a model of the solar system.
- Each group should explain their model focusing on the Earth's position and its importance.

Outdoor set up:

- Learners observe the sky during the day, evening and night for characteristics such as the sun, moon, stars and planets

d.  Content Tips

- The Solar system consists of the sun, planets and their moons and smaller objects like asteroids and comets.
- The Sun is at the centre of the solar system and the Earth is the third planet from it.
- The Earth is the only planet known to support life due to its right balance of sunlight, temperature, water and atmosphere.
- All planets including the Earth revolve around the Sun in elliptical orbits.
- The force of gravity keeps the planets, including the Earth in their orbits around the sun.


e. Learning and Teaching Materials

- Solar system posters/charts displaying the planets with their names, sizes and distances from the sun.
- Solar System models 2 dimension or 3-dimension diagrams to show the arrangement of planets around the sun.
- Digital tools such as Google Sky or videos from different Websites with solar system simulations
- Materials such as planet cut-outs and glue, balls or clay, cardboard and paint for creating solar system model
- Printed materials such as modules, worksheets...

f.  Assessment

- i. Observe learners' discussions by noting their explanations, participation teamwork and understanding

- ii. Ask questions to check understanding of:
 - The position of the Earth if it was further away from the sun.
 - The position of the Earth in the Solar system and its significance for human habitation.
- iii. Ask learners to write one thing they learned concerning the Earth in the Solar system.

 **Activity 2:** Engaging in observing celestial activities as a hobby or for educational purposes

a. Learning Environment

The environment set up for this activity can be both indoor and outdoor:

Indoor set up:

- Set up an astronomy corner in the classroom with charts, books, models, pictures and arrange them for group discussion.
- Discuss what they already know about celestial bodies (sun, moon, stars, planets) and share personal experiences such as seeing a shooting star or an eclipse
- Discuss concepts such as phases of the moon, constellations and planetary movements
- Share observations and compare notes to see if others noticed the same celestial objects

Outdoor set up:

- Create observation areas or points in school fields or playground away from artificial lights or dark sky areas with minimal light obstruction.
- Observe night sky or day sky in order to identify the phases of the moon, planets, meteor showers and constellations
- Record date, time and weather conditions, sketch objects they observe (eg shape of the moon, position of stars) and identify interesting patterns or changes such as brightness of planets
- Learners to provide weekly observations of celestial activities and how they differ from each other.
- Use Binoculars and telescopes if available and ensure safety of learners.

b. Content Tips

- Celestial objects are natural entities that exist in the universe such as stars, planets, moons, asteroids, comets, galaxies.
- These objects are also referred to as heavenly, astronomical, space, cosmic or stellar objects.
- The celestial bodies appear to move from east to west due to the Earth's rotation
- There are eight planets and these are; Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune
- Venus, Mars and Jupiter are the only planets visible to the naked eyes.
- The brightness of the star in the night sky often depends on its distance from Earth and its size
- The moon goes through a repeating cycle of phases every month and they occur because of the changing positions of the Earth and the Sun.
- The solar eclipse happens when the moon passes between the Earth and the Sun, blocking the Sun's light from reaching the Earth.

c. Teaching and Learning Materials

- Charts, posters and diagrams showing celestial bodies.
- Observations tools such as Binoculars, Star Charts, Mobile, Astronomy Apps, notebooks for observing celestial bodies.

d. Expected standard

- Understanding of the position of the earth in the solar system demonstrated correctly



e. Assessment

- Ask questions to check understanding of:
 - The three planets that are visible without a telescope
 - Constellations and their examples
 - Stars that appear to move across the skies in the night
- Observation logbook /Journal questions
 - What was the date, time and weather during your observation?
 - What celestial objects did you observe?
 - Sketch what you observed?

Sub-Topic 2: The Size and the Shape of the Earth


2.5.1. Introduction

The Earth our home planet is a vast and complex system that has fascinated humans for centuries. Understanding the size and shape of our planet is essential for grasping various geographical concepts, from navigating and mapping to climate and global connections. The Earth is not a perfect sphere, instead, it has an oblate spheroid shape, meaning it is slightly flattened at the poles and bulging at the equator. This shape is due to the planet's rotation. By exploring these concepts, we gain insight into how our planet functions and its place in the universe.

a. Specific Competence-Learners to;

- Use model of the earth to show the Earth's shape and size

b.  Learning Activities

-  **Activity 1:** Describing the shape and the size of the Earth

c. Learning Environment

This learning activity would involve both Indoor and Outdoor setup.

Indoor set up

- Learners will work in clusters and use the globe, maps and models to illustrate the Earth's shape
- Learners to use online maps like Google maps to explore the Earth's shape distances.
- Observe images or Google Earth for real-world visual evidence of the Earth's
- Use a ball and flashlight in a dark room show the Earth's shape. Place the ball in front of the flashlight and rotate it slowly. observe curved shadow, the lit side and the dark side.
- Let learners observe and explain what they see

Outdoor set up

Let learners walk the scaled model of the Earth's circumference such as (1 meter represents 1000 km). Have learners walk the measured distance to understand how vast Earth's circumference is



d. Content Tips

- The Earth is not a perfect sphere but an oblate spheroid (spherical), meaning it is slightly flattened at the poles and bulging at the equator.
- The term “geoid” refers to the Earth's shape as defined by mean sea level and the gravitational field.
- The Earth's circumference is about 40,075 kilometers around the equator.
- The average diameter of the Earth is about 12,742 kilometers.
- The equatorial diameter is about 12,756 kilometers, while the polar diameter is about 12,714 kilometers.
- The total surface area of the Earth is about 510 million square kilometers and its volume is approximately 1 trillion cubic kilometers.
- The Earth's radius is approximately 6,371 kilometers.

e. Teaching and learning materials

- Globe, maps and models to illustrate the Earth's shape
- Ball and flash light
- Videos showing the shape and size of the Earth.
- Aerial photographs to show Size and Shape of the Earth



f. Assessment

- Quizzes to determine learners' understanding of the key concepts such as the Earth's shape, size and circumference.
- Observe learners' participation in groups as they discuss the Earth's shape and size.
- Ask learners to create concept maps or diagrams to illustrate their understanding of the Earth's shape and size.
- Learners to use clay, play dough, or papier Mache or any materials found locally to create the Earth object, illustrating its shape and features as homework task.



Activity 2: Analysing evidence of the Earth's shape.

a. Learning Environment

The activity would be both Indoor and Outdoor setup

Indoor set up

Lunar eclipse

- Watch a video or images of the lunar eclipse
- Identify the and sketch the round shadow cast by Earth on the moon
- Discuss why the angle appears round from any angle

Satellite Images and Google Earth

- Use google Earth or satellite images to observe Earth from space
- Confirm Earths shape

Travel and Circumnavigation

- Research how airplanes and ships travel in curved paths
- Discuss why no one has come across the edge of the Earth
- Present findings

Outdoor set up;

In School playing grounds;

- In an open area learners observe a distant object (airplane or tall building), Record how it disappears from the bottom up as it moves further away and discuss what this tells us about the Earth's shape
- Place a stick upright in the ground at noon and measure its shadow
- Compare results with learners from another distant location and analyse the difference in shadows



b. Content Tips

- The Earth's shape is an oblate spheroid, meaning it is approximately spherical in shape but slightly flattened at the poles and bulging at the equator.
- Evidence of the Earth's Sphericity includes; Ship's visibility over the horizon, the moon's eclipse/lunar eclipse, Aerial Photography, Circumnavigation of the Earth...
- Analysis of the evidence of the shape of the Earth is important for various reasons, among them include; understanding our planet, confirming scientific theories, for navigation and transportation, for GIS purposes, for climate modelling and weather forecasting ...
- The Earth's spherical shape influences climate and weather patterns, which affect agriculture, water resource and daily life.


c. Teaching and Learning Materials

- Educational videos or clips from reputable sources like NASA and National Geographic.
- Satellite images, pictures of the Earth from space or photographs of ship disappearing over the horizon
- Physical and digital globes and maps to illustrate the Earth's shape and geographical features.
- Real -time Satellite data, such as images or sensor readings that illustrate the Earth's shape and curvature.
- GIS software and other educational applications such as Earth viewer or Global explorer that enable learners to visualise geographical data.



d. Assessment

- Observe learners' participation in activities.
- Check if learners can explain their findings clearly
- Check if learners are able to collect and analyse data

 **Activity 3:** Relating the Earth's spherical shape and size to natural and human activities (*climatic patterns, ocean currents and weather phenomena, and Earth's curvature in satellite positioning and communication...*)

a. Learning Environment

The activity will be conducted indoors

Indoor set up

In small groups learners will:

- Use ball and flashlight to simulate Earth's rotation and how it causes day and night
- Discuss why the sun rises earlier in some places
- Use a world map to analyse climate differences
- Discuss how the Earth's shape affects seasons, sunlight and climate
- Use maps or Google Earth to trace airplane routes discuss why flights follow curved paths
- Research how time zones affect foreign business and communication
- Present their observations and findings



b. Content Tips

- The Earth is approximately spherical in shape, meaning it is roughly circular in shape when viewed from space.
- The Earth's spherical shape is characterised by its curved surface, with all points on the surface being approximately equal distance from the equator.
- The Earth's spherical shape plays a crucial role in many natural phenomena such as climate patterns, ocean currents and the behaviour of the atmosphere.
- The Earth's size affects many aspects of our lives including; climate, geography and the availability of natural resources.
- Natural activities refer to the processes and events that occur naturally on the Earth without human intervention. These include climate patterns, weather events, earthquakes, volcanic eruptions and the water cycle.
- Human activities refer to the actions and processes carried out by humans that impacts the Earth's environment, ecosystems, and natural resources.

c. Teaching and Learning Materials

- Physical or digital globes to illustrate the Earth's spherical shape.
- Physical or digital maps to show the relationships between Earth's shape, size and natural and human activities.
- Videos or documentaries that explore the relationships between the Earth's shape, size and natural and human activities.
- Case studies that demonstrate the relationships between the Earth's shape, size and natural and human activities.

d. Expected Standard

Model of the earth to show the Earth's shape and size used correctly

e. Assessment

- Quizzes to check learners' understanding of key concepts.
- Observe learners' participation in class discussions on the relationship of the Earth's spherical shape and size and the impact on natural and human activities.
- Check learners research reports on the Earth's spherical shape and size and the impact on natural and human activities.

2.6 Sub-Topic 3: Movements of the Earth

2.6.1 Introduction

The Earth's primary movements are Rotation (spinning on its axis) from West to East once in every 24 hours causing day and night and Revolution (orbiting around the Sun) once in 365¼ days causing seasons. These movements significantly impact life on Earth by causing day and night cycles, seasons, and variations in the amount of sunlight different regions receive, influencing climate and weather patterns.

a. Specific Competence(s):

Learners to: Apply knowledge of earth movements in different situations.

b. Learning Activities

 **Activity 1:** Examining the movements of the Earth and their effects.

c. Learning Environment

The learning environment set up for this activity will integrate indoor setup

Indoor setup

- Display maps and diagrams showing the movement of the earth
- Learners to study the video showing movement of the earth
- Learners work in pairs to mimic rotation and revolution of the Earth
- One learner stands still (representing the sun) and the other one (representing the Earth) spins and to show rotation and moves round to show revolution
- Discuss what happens when the earth:
 - ✓ Rotates
 - ✓ Revolves

Outdoor setup

Rotation

- Prepare learners for a rotation relay
- Select 5-6 learners to represent major locations (Zambia, Kenya, USA, India and Japan)
- Each learner stands at a different point in a large circle around the sun (a learner at the centre holding a flashlight)
- The stations represent different longitudes (time zones)

Revolution

- Create four groups each representing a season (summer, Autumn, winter, spring)
- As one learner orbits the sun holding the Earth model each group:
 - ✓ Explains what happens what happens in their season (temperature, daylight, weather)

d. Content Tips

- The Earth moves in space in two distinct ways namely Rotation and Revolution
- Rotation is the spinning of the Earth on its tilted axis.
- The Earth rotates from West to East once in every 24 hours.
- The effects of rotation of the Earth results in day and night, difference in time at different lines of longitude, deflection of winds and ocean currents, revolution of the moon around the earth and tidal changes.

- Revolution refers to Earth's orbital motion around the Sun every 365¼ days.
- The effects of revolution of the Earth includes; changes in the length of day and night from day to day, changes in the altitude of the midday sun and changes in seasons.
- The combined effect of Earth's revolution, rotation, and axial tilt produce seasonal variations in the North and South Hemispheres.
- In general, they influence the global climate, wind and ocean current patterns, and the Sun's heat distribution.


e. Teaching and Learning Materials

- Videos showing movements of the Earth
- Pictures, Diagrams and Maps depicting the Earth movements
- Models showing Earth movements and its impact



e. Assessment:

- Ask questions to assess understanding of:
 - Rotation and Revolution of the earth
 - Effects of the Rotation and Revolution of the earth
- Learners to make a model of the Earth depicting its movement

 **Activity 2:** Using knowledge of Earth movements to plan for specific events (*calendar system and time, predict weather patterns, check the impact of human activities on the planets ecosystems...*)

a. Learning Environment

The learning environment for this activity would be indoor and outdoor

Indoor set up: Event Planning

- Learners in groups choose an event (planting season, religious festival, international business meeting, sports activity)
- Using charts and weather charts or calendars learners:
 - ✓ Identify best time of the year the event taking into account seasons, daylight hours and weather
 - ✓ Consider time zones if it is an international event
 - ✓ Discuss how Earth's movements affect the event's success
- Groups to present their plans to the class



b. Content Tips

Earth's rotations affect time and daily activities.

- It causes day and night, influencing work schedules, travel and business hours
- It creates time zones affecting global communication and event planning

Earths revolution determines seasons

- Affects farming
- Influences tourism and outdoor events

c. Learning and Teaching Materials

- Weather instruments such as thermometers and wind vanes
- Model of the Earth to demonstrate planetary movements in the Solar system.
- Weather maps, diagrams depicting the Earth's surface
- Calendars to plan and track events

- Video showing rotation and revolution of the Earth

d. Expected Standard

Knowledge of earth movements in different situations applied accordingly

e. Assessment

- Observe in discussions if the learners can explain their observations
- Monitor learners' engagement and participation in the activities

Sub-Topic 4: Earth's Graticule


2.7.1 Introduction

The Globe comprises of a number of imaginary lines that crisscross it. These lines constitute of what is called the Earth's graticule. It is composed of two main sets of lines namely latitudes and longitudes. These lines are used to precisely measure and locate positions on the Earth's surface.

a. Specific Competence(s) – Learners to:

- Use latitudes and longitudes to locate places on the globe
- Apply calculations of time and longitude in different situations
- Use latitude to calculate distance
- Apply calculations of the midday sun in real- life

b.   Learning Activities

 **Activity 1:** Describing latitude and longitude

c. Learning Environment

The environment set up for this activity would include both indoor and outdoor:

Indoor set up:

- Display globe or world map or short video to arouse curiosity
- Learners in groups use rubber bands or strings and markers to conduct a globe or ball activity
- One learner holds a globe or ball while another wraps a string or rubber band around it horizontally (latitudes)
- Another wraps a string or rubber band around it vertically (longitude)
- Learners describe latitudes and longitudes

Outdoor set up:

- Learners in groups to make model of the globe showing latitudes and longitudes using locally available materials.
- Each group presents their model to others



d. Content Tips

- The Earth's graticule is the network of lines and coordinates that crisscross the globe, providing a framework for mapping, navigation and geographic reference.
- Latitude is the angular distance of a point on the earth's surface, measured in degrees from the centre of the earth.

- Lines of latitudes are imaginary lines that run east-west around the Earth, parallel to the equator, hence also called parallel of latitudes.
- Important latitudes; the Arctic Circle ($66\frac{1}{2}^{\circ}$), the tropic of Cancer ($23\frac{1}{2}^{\circ}$ N), the Equator (0°), the Tropic of Capricorn ($23\frac{1}{2}^{\circ}$) and the Antarctic Circle ($66\frac{1}{2}^{\circ}$).
- On the globe they appear as circles becoming smaller pole wards, making the equator the longest parallel and are drawn at 1° interval.
- Longitude is the angular distance measured in degrees along the equator east or west of the Greenwich Meridian (0°).
- They are lines that run from North Pole to the South Pole, measuring distance east or west of the Prime Meridian (which passes through Greenwich, England).
- Longitudes are also known as Meridians. The Greenwich Meridian/Prime Meridian (0°) passes near London and all Meridians radiates from it, East wards or West wards up to 180° .
- Longitudes are used in determining local time in relation to the Greenwich Meridian Time (GMT).

e. Teaching and Learning Materials

- Globe to show lines of latitudes and longitudes.
- Maps to show the inter-connections of latitudes and longitudes.
- Model to show positions of latitudes and longitudes.
- Charts and diagrams showing grid system.
- On-line mapping tools such as GPS, Google map, Google Earth.

f. Assessment

- Observe participation of learners in small groups as they identify and describe latitudes and longitudes on the globe and maps.
- Quick question - I learnt that Latitudes and Longitudes are used for...

 **Activity 2: Illustrating the International Date Line (IDL)**

a. Learning Environment

The environment set up for this activity would only involve indoor activities.

Indoor set up:

Role -play travel across the IDL

- Display maps/globe showing International Date Line
- Learners in groups to identify the international date line and countries or towns near it
- Learners to be placed in small groups to act out travelers flying between:
 - ✓ Fiji to Hawaii (gaining a day)
 - ✓ New Zealand to the USA (losing a day)
 - ✓ They use flight tickets (made in class) showing departure and arrive dates
- Discuss
 - ✓ what happens to the date when you cross the IDL
 - ✓ Why some countries adjust their time zones
 - ✓ How it affects international trade and communication

b.  Content Tips

International Date Line involves the following:


- The International Date Line is an imaginary line on the Earth's surface that runs North to South through the middle of the Pacific Ocean following 180 degrees Meridian.
- It separates two consecutive calendar days with locations to the West of the line being one day ahead of the locations to the East.
- It is not a straight line but zigzagging and deviates from 180 degrees meridian in several places to avoid dividing some islands
- When crossing the date line from East to West one loses a day (because of the loss in time one has made) and by crossing the date line from West to East a day is gained (because of the gain encountered in time)
- It is a line of longitude where the date changes by exactly one day when it is crossed
- When travelling eastwards from Greenwich, time is gained by 24 hours until one reaches the Meridian 180° E and is ahead of GMT.
- Similarly, when going westwards from Greenwich, time is lost by 24 hours when one reaches 180°W and is behind GMT

c. Teaching and Learning Materials

- Globe to show lines of International Date line
- Maps to show International Date line
- Model to show positions and location of International Date line.
- Chart of the World map or globe international Date line

 **d. Assessment**

- Observe learners as they demonstrate the crossing of the International Date Line in a classroom or playing grounds.
- Verify if Learners understand what happens when the International Date Line is crossed

 **Activity 3: Locating places on the map using latitudes and longitudes**

a. Learning Environment

The environment set up for this activity would be indoor

Indoor set up:

- Cluster the learners in groups
- Provide the globe or grid and digital maps for learners to identify latitudes and longitudes
- Learners to use latitudes and longitudes in locating and pin pointing places on the maps.

 **b. Content Tips:**

- Places on the Earth's surface can be located using imaginary lines (Latitudes and longitudes)
- Latitudes runs from west to east, parallel to the equator
- Longitudes runs north and south passing through the poles
- The intersection of the two set of lines (latitudes and longitudes) pin-point and indicate precise location of a place on the Globe.


c. Teaching and Learning Materials

- Globe to show lines of latitude and longitude

- Maps to indicate intersection of latitudes and longitudes
- Chart showing latitudes and longitudes to indicate location of a place

 **d. Assessment**

- Observe learners create a coordinate grid on a piece of paper and ask them to plot points using latitudes and longitude coordinates
- Learners to generate maps of a given area using GPS

 **Activity 4: Locating places on the globe using Geographic Information System (GIS)**

a. Learning Environment

The environment set up for this activity would be indoor

Indoor set up:

- Setting up a computer laboratory (GIS)
- Pairing of learners to conduct the learning in the computer laboratory
- Learners to search and locate places on the globe using GIS

 **b. Content Tips:**


- GIS is a computer-based system that integrate geographic data with spatial analysis and visualization.
- It is used in locating places by pinpointing specific locations using geographic coordinates such as latitudes and longitude

c. Teaching and Learning Materials

- Computers to provide learners with GIS software
- Videos and interactive maps indicating use of GIS
- Smart phones location of places using GIS
- Google Earths and Maps to show various spatial data

 **d. Assessment**

- Observe learners using GIS to create a coordinate grid of latitudes and longitudes to locate places such as staff houses, poultry etc.

 **Activity 5: Using knowledge of location of places in various ways. (Route planning, reading maps and using GPS, time zone differences, daylight saving...)**

a. Learning Environment

The environment set up for this activity will involve both indoor and outdoor:

Indoor set up:

- Learners clustered to collaborate on the use of gained knowledge
- Display charts, maps, pictures showing spatial distribution and time zones
- Learners to identify areas or situations where to use gained knowledge and skills

Outdoor set up:

- Use GPS to ascertain coordinates of important local areas such as sporting fields, clinic...
- Learners to create plans using GIS knowledge

b. Content Tips:

- Latitudes and longitudes are used to locate places, calculation of time and distance.
- GPS can be used in planning for route use, search for location when in a new place
- Time zoning such as planning for different activities such as conferences, calls, meetings, travel
- Generate and read maps.
- GPS could be used in tracking of cars, animals in a national parks, theft cases.

c. Teaching and Learning Materials

- Globe to indicate latitudes and longitudes
- Maps and pictures to indicate time zones
- Charts indicating local time calculations
- Tools such as GPS, smart phones.

d. Expected Standard

Latitudes and longitudes to locate places on the globe used correctly





e. Assessment

- Observe learners demonstrate the use of GPS in identification of new locations.
- Observe learners plot coordinates using GPS
- Ask learners to calculate different local times using identified longitudes.

Specific Competence-Learners to:

- Apply calculations of time and longitude in different situations

a.  Learning Activities

 Activity 1: Calculating local and standard time using longitudes

b. Learning Environment

The learning environment for this activity will be indoor

Indoor set up:

- Learners would be put in small groups to discuss use of longitudes to calculate local and standard time.
- Display maps/charts or globe showing local and foreign cities and their longitudes
- Learners to make comparisons of time and standard time for each town
- Using longitude of each town, calculate the local time for some identified towns

c.  Content Tips

- Standard time is where each country adopts the local time of its Central Meridian e. g Zambia adopted the 30°E longitude as its Central Meridian.
- Time Zones are divisions into which the World is divided, that is, 24 belts, each 15° of longitude wide.
- Longitudes are used to calculate local time of places in relation to the Greenwich Mean Time (GMT) or World Time.
- If the GMT is known, local time can easily be found by either adding or subtracting the difference in the number of hours from the given longitudes.
- Therefore, to the East; Gain = Add (E.G.A) and to the West; Lose = Subtract (W.L.S).
- The Earth makes one complete rotation of 360° in one day or 24 hours; hence it passes through 15° in every 1 hour.

- Since the Earth passes through 15° in every 1 hour, this means it passes through 1° every 4 minutes.
- Time is gained (added) by 1 hour as one moves eastwards while westwards, time is lost (retarded) by 1 hour as one moves from the GMT respectively.

d. Learning and Teaching Materials

- Globe and time zone maps to display different longitudes
- Compass to show directions of towns
- Posters/charts displaying different standard time zones.



e. Assessment

i. Ask questions to check understanding of:

- Time calculation for local times such as Lusaka.
- GMT in relation to local time and its significance in calculation of local and standard times
- Observe learners calculate local times of different towns using longitudes.
- Ask learners to write on why different cities or towns have different times.



Activity 2: Calculating longitude using time given

a. Learning Environment

The environment set up for this activity would be indoor

Indoor set up:

- Learners to be placed in small groups and use a World Time Zone Map to locate their country and compare time differences with other locations
- Learners get real -world tasks, for example, If it's 2PM in Kenya and 11 AM in London, What is Kenya's longitude
- Learners can explain their thoughts to the class

Outdoor set up:

- Use the stick and sun method (shadow experiment) and let the learners place a stick in the ground observe local noon when the shadow is shortest-this when the sun is at its highest position in the sky
- Record exact time when the shadow is shortest; this becomes local noon time at their location; When it is before 12:00 PM GMT then it is **west** and when it is after 12:00 PM GMT then it is **East**
- Learners find out the current GMT which is always 12:00 PM GMT
- They calculate the time difference between their local noon and GMT
- They can use the formula **Longitude = Time Difference \times 15°**
- Learners discuss why the shadow changes throughout the day and compare results from different groups



b. Content Tips

- Calculating longitudes involve determining the difference between local time and Greenwich Mean Time (GMT).

- Determine the local time and GMT of a respective location
- Find the difference in time between local time and GMT
- Convert time difference to longitude by using the formula: **Longitude = Time Difference $\times 15^\circ$**

c. Teaching and Learning Materials

- Charts, posters and diagrams showing different local times
- Globe and World Time Zone maps to display different towns in relation to time and longitudes
- Straight stick (about 1 metre long), a watch, ruler and notebook for the shadow and sun experiment

d. Assessment

i. Ask questions to check understanding of:

- The relationship between GMT and local time
- Calculation of longitudes of different places using time



Activity 3: Using time zones in different situations.

a. Learning Environment

The environment set up for this activity would be indoor.

Indoor set up:

- Learners to be put in small groups to collaborate on use of time zones in different situations.
- Display Globe, Maps and Charts showing different town zones.

Suggested situations

- Learners simulate planning an international flight considering different time zones, for example, A flight from Nairobi departs at 10:00 AM local time. It takes 8 hours to reach London (GMT). What time does it arrive in London?
- Learners role play as international business people scheduling meetings across time zones, for example, A company in Kenya (GMT +3) wants to schedule a virtual meeting with a partner in New York (GMT -5). What time should they agree on
- Learners track international news or sports schedules for example, The FIFA World Cup final is happening in Qatar (GMT +3) at 8:00 PM. What time will it be in Zambia (GMT +2) and in New York (GMT -5)
- Learners can also be encouraged to use Digital tools such as World Clock Apps, Google Earth to compare real-time differences across cities

Discussion

- Learners to discuss how different time zones affect daily life and how such challenges can be resolved

b. Content Tips

- Time zones are regions on Earth that follow a uniform standard time at a specific meridian.
- Time zones facilitate efficient communication, transportation and economic transactions across the Globe.
- Time zones are integrated in the development of technological advancements especially modern technologies such as , GPS systems and computer networks which rely on precise time keeping and coordination.
- They are vital in Scientific Research, Navigation and mapping as they provide a common reference point for collecting and analysing data

c. **Teaching and Learning Materials**

- Charts and diagrams showing different time zones
- Globe and time zone maps to display time zones of different areas

d. **Expected Standard**

Calculations of time and longitude different situations applied accordingly



e. **Assessment**


i. Provide learners with a scenario and ask them to:

- Calculate departure and arrival times, taking into account the time difference between two towns.
- Ascertain the best time to undertake various activities such as meetings, travels, calls, taking into account the time zones of all the participants.

ii. Research on the importance of time zones in modern inter-regional trading

Specific Competence-Learners to: Use latitude to calculate distance

a.  **Learning Activities**

 **Activity 1:** Computing distance using latitudes

b. **Learning Environment;**

This Learning activity to be conducted both indoor and outdoor.

Indoor setup;

- Assign groups with cities with different known latitudes
- Distribute maps with lines of latitudes and let learners mark the different cities
- Provide learners with latitude calculation worksheets for different cities to calculate the distance between marked cities

Outdoor activities;

- Use GPS devices or smart phones to measure latitude and calculate distances between locations.

c. **Content Tips:**

- The Earth is a sphere with 360° of latitude of latitude 180° N/S from the Equator
- One degree of latitude = 111km (varies slightly due to the Earth's shape but is generally accurate for basic calculations)
- The formula for calculating: Distance = (Difference in Latitude) \times 111km
- Calculate the distance from Cairo (30° N) to the equator (0°).
 $30 \times 111 \text{ Km} = 3\,330 \text{ Km}$ from the equator.
- Latitudes are further used to calculate distances places on different hemispheres.

Places on different hemispheres

Calculate the distance between Zambia (30° S) and Morocco (20° N)

Solution

- First locate the places involved
- Latitude of Zambia = 30° S
- Latitude of Morocco = 20° N
- Latitude Difference; from South to North = Addition
- Thus latitude difference 20° S + 30° N = 50°
- Since $1^\circ = 111\text{km}$

- Hence, $50^{\circ} = (111 \times 50) \text{ km} = 5550\text{km}$; the distance between Zambia and Morocco
- Pilots, Sailors and hikers use latitudes to estimate distance and navigate.
- In Geography latitude is important in understanding geographic features such as climate zones and time zones.

Places on same hemispheres

Calculate the distance between Abuja 10°N and Tripoli 40°N

- Locate two places involved
- Latitude of Abuja = 10°N
- Latitude of Tripoli = 40°N
- From North to North = Subtraction
- Latitude difference = $40^{\circ}\text{N} - 10^{\circ}\text{N} = 30^{\circ}$
- Since $1^{\circ} = 111\text{km}$
- Then $30^{\circ} = (111 \times 30) \text{ km} = \mathbf{3330\text{km}}$
- Hence, the distance between Abuja and Tripoli is **3330km**

d. Teaching and Learning Materials

- Physical or digital maps with lines of latitude marked.
- Inflated or desktop globes to demonstrate the Earth's shape and latitude.
- GPS devices or smartphones with GPS capabilities.
- Online mapping tools such as Google Earth, Google maps or other online mapping platforms.



e. Assessment

Ask learners questions to assess if learners can:

- Show the relationship between latitude and distance.
- Calculate the distance between two points using latitude.



Activity 2: Guiding family and community members to use such calculations to arrive at distances, routes, directions and travel times to their destinations.

a. Learning Environment

The activity can be done both indoor and outdoor set up.

Indoor setup:

- Learners prepare guides, explaining how to use latitudes to calculate distances and routes to their family and communities.
- Practical exercises to help learners reinforce their understanding such as planning a trip or navigating a new city.

Outdoor set up:

- Using Google Maps and GPS to teach family members to check coordinates
- Use familiar examples to compare distances of well-known trips
- Drawing maps to show routes visually for better understanding
- Help family members plan their journeys

b. Content Tips

- Latitude is used to measure the distance North or South of the equator ranging from 0° to 90°.
- Learners are encouraged to create a map of local area labelling important landmarks and their latitudes

c. Teaching and Learning materials

- Physical or digital maps with latitude lines marked.
- Inflated or desktop globes to demonstrate the Earth's grid system (latitude and longitude).
- Pictures, charts and diagrams to illustrate Earth's grid system, showing latitude and longitudes
- Pupils to act as tour guides

d. Expected Standard

Latitude used to calculate distance correctly


e. Assessments

Ask learners to:

- Give brief reports on how they were able to guide family members

Specific Competence; -Learners to: Apply calculations of the midday sun in real- life

a.  Learning Activities

 **Activity 1:** Calculating the position of the midday sun (Angle of Elevation) at a given latitude at different times of the year.

b. Learning Environment

The environment set for this activity can be indoor and outdoor

Indoor set up:

- Learners to be put in pairs.
- Display charts showing position of the sun in different places
- Provide the Globe to indicate Earth's inclination
- Display Maps indicating various location of towns

Outdoor set up:

- Learners to look up at any building or tall tree.
- Learners to estimate Angle of elevation between the ground and the line of sight (the eye and the top of the tree or building) of the top of the building or tree.


c.  Content Tips

- The angle of elevation is the angle between the horizontal plane and a line of sight to an object above the horizon.
- Angle of elevation is based on the position of the midday sun and position of the place.
- The angle of elevation can be calculated using the following procedure on the midday sun, when the overhead sun and the place are in the same hemisphere, subtract the overhead sun angle from the place and the difference subtract from 90° e. g Milan is 46°N, what is the angle of elevation of the midday sun on 21st June
 $90^\circ - (46^\circ - 23\frac{1}{2}^\circ) = 90^\circ - 22\frac{1}{2}^\circ = 67\frac{1}{2}^\circ$.

- When the sun is overhead at the equator use the formula $90^\circ - N$ where N is the latitude angle of the place for example what is the angle of elevation in Lusaka 25° on 21st March?
 $90^\circ - 25^\circ = 65^\circ$.
- When the overhead sun and place are in different Hemisphere add the overhead sun angle and the angle of the place then subtract from 90° . Cairo is 30°N , what is the angle of elevation of the midday sun on 22nd December
 $30^\circ + 23\frac{1}{2}^\circ = 53\frac{1}{2}^\circ$
 $90^\circ - 53\frac{1}{2}^\circ = 36\frac{1}{2}^\circ$

d. Teaching and Learning Materials

- Protractor and compass to measure the angle of elevation.
 - Globe/chart with time zones.
 - A video explaining on how to calculate the altitude angle of the midday sun
 - Projector for power point presentation.
 - Scientific Calculators and graph papers
- e. **Assessment**
- Observe the learner's participation in pairs as they estimate the angle of elevation between the ground and the line of sight.
 - Quick question: A city located at latitude of 40°N . Calculate the position of the midday sun on the following dates; September 22nd, march 21st.

 **Activity 2:** Calculating the latitude of a place using the position of the midday sun (Angle of Elevation).

a. Learning Environment

The learning environment set up for this activity will be indoor setup.

Indoor set up

- Learners to be put in small groups
- Display a map showing the relationship between latitude, longitude and the midday sun's position.
- Learners to calculate the latitude of a place using the position of the midday sun.

b. Content Tips

- Latitudes are calculated by using sun's elevation angle and the sun's declination
- Measure the elevation angle between the sun and the vertical (Line perpendicular to the horizon) at noon when the sun is highest in the sky.
- Determine the sun's Declination which is angular distance from the equator.
- Determine the hemisphere whether it is Northern or Southern
- Use the formula $90^\circ - (\text{Sun Elevation Angle} + \text{Sun's Declination})$ for Southern hemisphere OR $90^\circ - (\text{Sun Elevation Angle} - \text{Sun's Declination})$ for Northern hemisphere

Example

1. Suppose it is June 21st and John is standing at an unknown latitude. The measure of the Sun elevation angle is 74.5° while Sun elevation is approximately 23.4° . Calculate the latitude where John is standing.
 $90^\circ - (74.5^\circ - 23.4^\circ) = 38.9^\circ$ North. (21st June is in the Northern Hemisphere)


c. Teaching and Learning Materials

- Protractor and compass to measure the angle of elevation.
- Globe/chart with time zones.
- A video explaining on how to calculate the altitude angle of the midday sun
- Projector for power point presentation.
- Scientific Calculators and graph papers

d.  Assessment

Ask the learners to;

- a. On June 21st summer solstice the sun is directly overhead at the Tropic of cancer (23.5°N) Calculate the solar noon angle (altitude of the sun) for a location at 30°N latitude
- b. Explain how the latitude of a location affects the altitude of the midday sun throughout the year.

 Activity 3: Using calculations of midday sun in various ways. (*Estimate time, determine directions based on their hemisphere manage solar exposure for people and plants, solar panel placement, designing homes and buildings that are energy efficient....*)

a. Learning Environment

The environment set up for this activity would be indoor and outdoor.

Indoor set up:

- Learners put in small groups to discuss the use of the midday sun.
- Display Graphs, Globe, Maps and Charts showing different real-world applications.
- Learners to study the relationship between latitude, longitude and the midday sun position.

Outdoor setup

- Learners carry a case study of a real-life scenario such as solar Panel installation.

b.  Content Tips

- The angle of elevation helps determine the height of building, mountains or other structures.
- The angle of elevation is used in navigation systems such as GPS, to calculate positions.
- In engineering, angle of elevation is used to design and construct buildings, bridges and other infrastructure.

c. Teaching and Learning Materials

- Photographs or videos of real – life situations.
- Maps or globes that display latitude and longitude lines.
- Angle Measuring tools such as a protractor.

d. Expected standard

Calculations of the midday sun in real-life applied accordingly

e. Assessment

- Learners to apply the concepts of mid-day sun to real -world scenarios through projects.
- Peer Review to provide feedback on each other’s work.
- Quick questions on the real-world use of angle of elevation.


2.8. Sub-Topic 5: The Earth's Atmosphere

2.8.1. Introduction

The Earth's atmosphere is a mixture of gasses that surrounds the earth. It helps make life possible by providing air, shielding from harmful ultraviolet (UV) radiation coming from the sun, trapping heat to warm the planet and preventing extreme temperature differences between day and night. The Earth's atmosphere has five major and several secondary layers that comprise of the Troposphere, Stratosphere, Mesosphere, Thermosphere and Exosphere. The Atmosphere is a mixture of nitrogen (78%), Oxygen (21%) and other gasses (1%) that surrounds the Earth. These gases combine to absorb ultraviolet radiation from the sun and warm the planet's surface through the retention. Oxygen is the most important of all the gases in the atmosphere as it support human and animal life.

Specific Competence(s);-Protect Earth's atmosphere

a. Learning Activities

 **Activity 1:** Describe the Earth's Atmosphere (stating the major layers of the atmosphere)

b. Learning Environment

The learning activity would be outdoor and Indoor set up

Outdoor set up:

- Take the learners outside and let them observe the sky.
- Learners should describe their experience (clouds, wind, sunlight, temperature)
- Discuss in pairs what makes up the air and how the atmosphere helps us.
- Share their ideas with the class

Indoor set up:

Conduct research

- Learners in small groups, each group representing one layer of the atmosphere.
- They will use textbooks or internet to gather information
- Each group to present their findings.

c. Content Tips

- The first layer of the Earth's atmosphere is the Troposphere that extends from the surface to between 7km at the poles and 17 km at the equator.
- The Troposphere is the lowest layer with decreasing temperature with height. It is the layer we live in and where weather happens.
- The second layer is the Stratosphere found between 12km to 50km above. The temperature in this layer increases with height.
- The stratosphere houses the ozone layer which absorbs the ultraviolet (UV) rays from the sun. This stratospheric ozone provides an important service to life on Earth as it absorbs harmful ultraviolet radiation.

- Ultraviolet rays are harmful heat rays which when exposed to the body can cause skin disease and cancer.
- The Mesosphere is the third layer and is above the stratosphere lying between 50km and 80km.
- The Thermosphere is the next layer after the Mesosphere which lies 80km and above. The layer has increased temperature because it is directly heated by the sun.
- The Ionosphere is an electrically charged layer which is used for communication and navigation purposes making transmission of Radio short waves possible
- The Exosphere is the layer without gases and is mainly used in modern artificial satellite launch.

d. Teaching and Learning Materials

- A chart and diagrams showing the major layers of the Atmosphere.
- Videos showing different layers of the Atmosphere.



e. Assessment

1. Monitor learner's participation as they discuss the layers of the Atmosphere in small groups.
2. Ask the learners to
 - i. Research and write a report on the role of the atmosphere.
 - ii. Analyse the importance of the Troposphere.



Activity 2: Sharing with family and community members on the role of the atmosphere: (*air we breathe, protection from ultra violet rays, keeps the planet's heat, plays a role in water cycle...*)

a. Learning Environment

The environment set up for this activity would be both indoor and outdoor.

Indoor set up;

- Learners in small groups use the prior information to prepare the demonstration on the importance of the atmosphere.
- Each group to demonstrate to the whole class on how they will share the information with their family and community members on the protection of the atmosphere.

Outdoor set up;

- Learners will talk to family members about what they learned in class. They can ask questions such as
 - ✓ Do you know that the atmosphere protects us from harmful sun rays?
 - ✓ Can you imagine what would happen if there was no atmosphere?
- Learners can also organise a short talk with neighbors and about air pollution and its effects on the atmosphere
- They can also create short skits or stories and perform them on their families showing what life would be without the atmosphere



b. Content Tips

- The atmosphere provides essential elements that support life on Earth such as gases, water vapour...
- The atmosphere regulates temperature and protects people from harmful radiation.

- Climate regulate the influences of weather patterns, climate and global temperatures on the environment.
- Human activities such as pollution, cutting down of tree for fuel can affect atmospheric health.
- Conservation and protection of the environment requires collective action with the community to come up with conservation measures.


c. Learning and Teaching Materials

- Posters and charts



d. Assessment

- Observe learners as they give reports on how they shared information with family and community

 **Activity 3.** Engaging in measures that protect the Earth's atmosphere (*planting trees and supporting green spaces, using sustainable transportation, reducing energy use, reducing, reusing and recycling*)

a. Learning Environment

The environment set up for this will mainly be outdoor.

Indoor set up;

- The teacher in collaboration with the learners form the conservation club.
- Learners identify the area in the school surrounding where trees can be planted and maintained by the members of the club.
- Learners write posters on tree planting, reducing energy use, recycling, reuse... as a measures of conserving the Earth's atmosphere.

Outdoor set up;

Learners will

- Plant and care for trees
- ✓ Learners can organise a day to plant trees at school and home
- ✓ Each learner takes responsibility for caring for a tree, ensuring it gets enough water and protection
- Promote clean and safe transport
- ✓ Suggest that friends or families share rides
- ✓ Walk or use bicycles
- Reduce air pollution
- ✓ Sorting waste, disposal in waste receptacles and avoid burning waste
- ✓ Remind parents to use improved stoves
- ✓ Turn off lights and appliances when not needed
- Raising awareness in the community
- Organise and participate in clean up campaigns
- Work with teachers and local leaders to organise school or village clean up events
- Recycle and reuse materials

- Undertake a local tour of an area that is conserved such as reserved forests, protected parks, catchment areas....

b. Teaching and Learning Materials

- Charts, pictures, maps and diagrams of conserved areas.
- Videos on conservation of the environment.

c. Expected Standard

Earth's atmosphere protected appropriately



d. Assessment

- Observe learners' participation in class discussions
- Observe learners' participation in initiatives that help protect the atmosphere.



e. Summary

Earth's Position in the Solar System

- Earth is the third planet from the Sun in our solar system. It is situated between Venus and Mars.
- Seasons: Earth's tilt and orbit around the Sun cause the seasons. For example, when the Northern Hemisphere is tilted toward the Sun, it experiences summer, while the Southern Hemisphere has winter.
- Solar Energy: Solar panels capture energy from the Sun, which powers homes and devices. The Sun's position in the solar system makes it a crucial energy source for Earth.

Shape of the Earth

- Air Travel: The oblate spheroid shape affects flight paths. Pilots use the curvature of the Earth to plan the most efficient routes, known as great circle routes.
- Satellite Orbits: Satellites orbit around Earth, taking into account its shape to maintain accurate positioning for GPS, weather forecasting, and communication.

Size of the Earth

- Geography: Knowing Earth's size helps in mapping and navigation. For instance, understanding the Earth's circumference is essential for global shipping routes and air travel.
- Climate Zones: The size and shape of Earth create various climate zones, from tropical regions near the equator to polar regions at the poles.

Graticule of the Earth

- Navigation: Latitude and longitude are used in GPS systems to provide precise locations. For example, when you use a navigation app to find directions, it relies on the graticule.
- Time Zones: Longitude lines determine time zones. When you travel across different longitudes, you adjust your watch to match the local time.

Atmosphere of the Earth

- Weather: The layers of the atmosphere affect weather patterns. For instance, the troposphere is where most weather events occur, like rain, snow, and storms.
- Breathing Air: The atmosphere's composition is crucial for life. The oxygen we breathe is part of the atmosphere, and changes in its composition can impact health and the environment.

Topic 3: Weather and Climate

2.3. Introduction

Weather and climate play an important role in nearly all areas of life. It influences the clothes people wear, the food they eat, the way they design their homes and their recreational activities. Learning about weather and climate helps learners connect what they learn in classroom with the real -world experiences. This topic will focus on weather and climate, climate change and mitigation and adaptation to climate change. The following Sub-topics would be covered under this topic:

- Weather and Climate
- Climate Change
- Mitigation and Adaptation to Climate Change

Hook: Your community is facing frequent floods. What weather related data would you collect to predict future floods, and how would you help the community prepare?

General Competence(s):

The general competences that will be acquired by learners in this topic include; environmental sustainability, problem solving, collaboration, analytical thinking and creativity and innovation



Key Terms

- Weather
- Climate
- Atmosphere
- Weather forecasting
- Climate change
- Mitigation
- Adaptation

Sub-Topic 1- Weather and Climate


2.5.1. Introduction

Weather changes from time to time. Climate is more stable and involves average atmospheric conditions of a large area over a long period of time for example 30 years. In order to understand weather and climate, one needs to observe and interpret daily atmospheric conditions such as temperature, rainfall, wind and humidity.

The sub-topic will focus on how learners will use knowledge of weather and climate, elements and factors influencing weather and climate in real-life experiences

Specific Competence(s); - Learners to: Apply knowledge of weather and climate in daily activities.

a.  **Learning Activities**

 **Activity 1:** Distinguishing weather from climate

b. **Learning Environment**

The environment set up for this activity will be indoor

Indoor set up:

- Prepare a resource corner with weather instruments, charts and newspapers with weather reports
- Cluster learners for interactive activities such as role plays
- Learners roleplay where they pretend to be weather forecasters or climate scientists. Weather forecasters give daily or weekly weather reports but climate scientists explain long term climate trends for a region
- Learners create a T-Chart where they list daily weather observations vs long term climate pattern

c.  **Content Tips**

- Weather refers to the state of the atmosphere at a particular time and place. It is a short term process and can change at any time and affects daily activities.
- Climate is the average weather conditions of a place over a long period of time. It is long term, consistent over time, affects ecosystems
- When we say it is hot, cloudy or windy we are referring to weather and not climate.
- These patterns of weather are recorded for many years to come up with climate of the region.
- When we say hot summers or cold winters we are referring to climate


d. **Teaching and Learning Materials**

- Climate zones world map
- Charts such as weather symbols charts, weather vs climate comparison chart

e. **Assessment**

Use a quick checklist while observing as learners roleplay

- Clear communication, accuracy of facts, team participation and creativity in presentation
- Conduct a quiz on weather and climate

 **Activity 2:** Identifying the various elements of weather and climate (*temperature, humidity, rainfall, cloud cover...*)

a. **Learning Environment**

The learning environment for this activity would be both indoors and outdoors.

Indoor set up:

- Learners in clusters to conduct inquiry-based research (with guiding questions):
What are different elements of weather-How do we measure the elements of weather -Why does weather change.
- Report to the whole class on the results

Outdoor set up:

- Conduct a tour to a weather station to observe weather instruments or:
- Carry out outdoor weather walks to allow for real-life observation of weather conditions
- Give learners observation sheets with the following categories: Temperature-is it hot, warm, cool or cold; Sky conditions - is the sky clear, cloudy, or overcast; Wind-which direction is it blowing (use flag or observe trees) Rainfall-is it raining, drizzling or dry; Humidity- does the air feel dry or humid
- Learners go outside to observe, record and describe the current weather conditions using senses and simple tools such as thermometer (temperature), wind vane or simple flags use thermometer if available (wind direction), stopwatch (timing cloud movement) plastic cup (rainfall)
- Make models of some weather instruments e. g rain gauge, wind vane...



b. Content Tips

Elements of Weather and Climate

- Temperature: Measure how hot or cold the atmosphere is. Temperature is measured by an instrument called Thermometer.
- Rainfall: Water falling from the atmosphere in form showers, hailstones (ice rain) heavy rainfall. It is measured by an instrument called Rain gauge.
- Wind speed and direction: Wind is air in motion that has speed and direction. It moves from a place of high pressure to a place of low pressure. Wind speed is measured by an instrument called Cup Anemometer while wind direction is measured by a Wind vane.
- Humidity: The amount of water vapour in the air (low humidity is when there is less water vapour in atmosphere, high humidity is when there is more water vapour in the atmosphere and saturated air when air cannot hold any more water vapour. It is measured by an instrument called Hygrometer.
- Cloud cover: The amount and type of cloud present in the sky. It is measured by mare observation.
- Sunshine: The intensity and duration of sunlight received. It is measured by an instrument called Sunshine Recorder.
- Atmospheric air pressure: The weight of air exerted on the earth's surface. It is measured by an instrument called Barometer.

c. Teaching and Learning Materials

- Weather instruments
- Models of weather instruments
- Observation sheets



d. Assessment

- a. Making of weather instrument models and create a mini weather station.
- b. Measure and record weather elements such as temperature, wind and rainfall.

Activity 3: Identifying factors influencing weather and climate (*latitude, altitude, seasons, continentality, prevailing winds...*)

a. Learning Environment

This activity will be done both indoors and outdoors.

Indoor set up:

- Create different activity stations such as research table with books, weather observation station near windows and experiment corner

Outdoor set up:

- Use school spaces to observe local weather conditions and factors such as vegetation or landforms that influence climate
- Learners to use weather tools such as thermometers, wind vanes and rain gauges and focus on environmental features such as vegetation, clouds and water bodies
- Learners to rotate through focus points depending on the environment and do weather element observation tasks
 - i. For temperature use thermometer to measure air temperatures in shade vs sunlight and record
 - ii. For wind speed and direction observe moving objects such as trees and flags to estimate speed and use wind vane for direction
 - iii. For cloud cover look at the sky and describe cloud types and coverage
 - iv. For rainfall use rain gauge or observe puddles and surface runoff
- Note nearby waterbodies, vegetation, buildings, landforms discuss how they might influence local weather, for example, does the area near the trees feel cooler?
- Learners record observations on the data sheets
- Learners can now gather to discuss what they noticed



b. Content Tips

- Latitudes; areas near the equator are warmer than those farther away
- Altitude; temperatures reduces as one ascends (The higher you go the cooler it becomes).
- Water bodies such as lakes and oceans make places cooler or warmer, depending on the season.
- Vegetation; forest areas cooler than open areas
- Areas near the sea are cooler than those in the interior.
- Winds and ocean currents move heat and moist around the globe.
- Our environment influences the weather and human activities can also change local climates
- Weather and climate affects everyone farmers, pilots fishermen, sports players rely on weather forecasts

c. Teaching and Learning Materials

- Weather instruments
- Models of weather instruments
- Maps and globes
- Charts for research

d. Assessment

- Observe learners demonstrate how to measure and record weather elements.
- Learners to report their observations.

Activity 4: Analysing the climate of Zambia (*Savanna, winds/Air masses, seasons...*)

a. Learning Environment

The learning environment will comprise of both indoor and outdoor activities

Indoor set up

- Learners to be in small groups
- Display map of Zambia showing different climate zones
- Learners to discuss the climate of Zambia
- Learners analyse and interpret the map based on temperature and precipitation, vegetation
- Learners compare and contrast climate patterns of Zambia based on temperature and precipitation

Outdoor set up

- Learners to conduct field measurements at a local weather station on climate parameters such as temperature, humidity and wind speed.
- Conduct a survey of local vegetation to understand how climate affects plant growth and distribution.

b. Content Tips

Vegetation

- Zambia has Savanna type of vegetation characterized by tall grasses and scattered trees.
- This type of climatic region influences vegetation characteristics and human activities.

Seasons

- Zambia has a tropical climate with three distinct seasons namely cold season, hot season and rainy season.

Regional climate variation

- The South western part of the country is drier and hotter, the Eastern region is cooler and wetter and lastly the Northern region is warmer and more humid.

Winds

- Zambia experiences trade winds from the southeast which bring warm, moist air from the Indian Ocean while westerly winds bring warm dry air from the Atlantic Ocean.
- During winter, the country experiences easterly winds which bring cool, dry air from the Indian Ocean.

Air masses

- Zambia is influenced by the tropical air mass which is characterized by high temperatures and high humidity


- During winter months the country is influenced by cool South African air mass with low humidity while in summer the country is influenced by the warm moist Congo air mass with high humidity.

c. Teaching and Learning Materials

- Maps, atlases, charts showing climatic regions of Zambia

e. Assessment

- Observe learners participation on discussion on the climatic regions of Zambia
- Use the maps, charts of Zambia to identify climatic regions based on temperature, precipitation and vegetation

 **Activity 5:** Using knowledge on weather and climate (*planning outdoor activities, clothing and preparedness, health and wellbeing travel, agriculture...*)

a. Learning Environment

Learning environment will comprise of indoor and outdoor activities

Indoor Set up

- Put learners in small groups to prepare recording sheets.
- Learners to prepare and plan for suitable locations for outdoor activities considering factors like accessibility, safety and relevance.

Outdoor set up

- Field trip to weather stations to enable learners observe and record weather patterns such as precipitation and temperature.
- Measure wind direction using locally made materials

 **b. Content Tips**

- Check weather forecasts before engaging in outdoor activities
- Encourage learners to dress appropriately for weather, including wearing sun glasses, hats rain coats and warm clothes
- Learners to stay hydrated during outdoor activities
- Plan for outdoor games on days with favourable weather. (Not too cold, hot or rainy).
- Learners to plant and maintain garden/field by incorporating knowledge of weather and climate.
- School tours should take into account weather and climate

c. Teaching and Learning Materials

- Maps where learners can explore weather patterns and plan outdoor activities
- Websites providing weather forecasts, climate data and educational resources
- Videos on weather and climate and their applications to daily activities.

d. Expected standard

Knowledge of weather and climate applied correctly

e. Assessment

- i. Observe learners' participation and engagement during outdoor activities
- ii. Check learners use of knowledge of weather and climate in daily activities. For example:
 - o Preparedness in terms of attire suitable on a hot, cold and rainy days.


Sub -Topic 2: Climate Change

2.4.1. Introduction:

Climate change refers to long-term shifts in temperatures and weather patterns. Such shifts can be natural, due to changes in the sun's activity or large volcanic eruptions or can be due to human activities such as the burning of fossil fuels like coal, oil and gas. The topic is about identifying the causes of climate change and assessing the impact of climate change on human activities. It will also look at disseminating the information on climate change to family and community members for the sake of awareness.

Specific Competence(s) – Learners to: Analyse climate change

a. Learning Activities

 **Activity 1.** Identifying the causes of climate change (*Human causes such as the burning of fossil fuels, agriculture, deforestation...Natural causes such as fumes from volcanic eruption...*)

b. Learning Environment

This activity will use both indoor and outdoor

Indoor set up

- o Put learners in groups
- o Display chart or pictures or show a short video clip of activities such as charcoal burning, agricultural activities and volcanic eruption.
- o Learners study and discuss displayed charts, pictures or videos shown on climate change
- o Learners to share their observations to the whole class

Outdoor set up

- o Conduct an observation walk and let learners observe and identify natural features (trees, waterbodies, soil) and human activities (littering, burning waste, construction activities, deforestation)
- o Regroup and let groups share observations
- o Learners to record and report on the causes of climate change on the environment.

c. Content Tips

Climate change is as a result of natural and human forces impacting on the environment.

Human causes of climate change include:

- o Burning of fossil fuels such as oil, gas, and coal.
- o Deforestation

- Agriculture activities
- Pollution

Natural causes of climate change include:

- El Niño Southern Oscillation (ENSO) effects
- Solar irradiance
- Volcanic eruptions
- Plate tectonics and continental drift

d. Teaching and Learning Materials

- Charts, Pictures, diagrams showing causes and effects of climate change.
- Flash cards with causes and effects of climate change
- Short video clip on the causes and effects of climate change



e. Assessment

- Observe learners' participation in discussions, ability to identify and explain causes of climate change and how well they collaborate
- Ask learners to report on the causes and effects of climate change.



Activity 2: Analysing the impact of climate change on human activity (extreme temperatures, drought, heat waves, loss of habitat...)

a. Learning Environment

This activity will mainly be indoor

Indoor set up

- Learners should sit in circles, groups or u-shaped for face - to - face interaction
- Show short video /images of climate related risks and disasters (floods, droughts, wild fires to spark curiosity) and discuss on climate related risks and disasters
- Learners to be in breakout spaces or corners for each group to work without distractions
- Provide learners with simple case studies showing climate change impacts in different regions



.Case study: Flooding in Zambia

Flooding is a major issue in urban areas particularly in Lusaka. Heavy rains exacerbated by deforestation, and poor urban planning have led to frequent flooding causing damage to infrastructure and homes

Discussion questions

- What are the main factors contributing to flooding?
- How do floods impact urban communities?
- What solutions can be implemented to reduce the frequency and impact of flooding in Zambia?



.Case study: Drought in Zambia

Frequent and severe droughts are experienced especially in the Southern and Western parts of Zambia. Recurring droughts have led to crop failures, food insecurity and water scarcity

Discussion questions

- i. What are the causes of drought in Zambia?
- ii. How do droughts affect people living in rural areas?
- iii. What measures can be taken to mitigate the impact of drought on agriculture in Zambia?



.Case study: Rising temperatures

As temperatures rise due to climate change, Zambia experiences more intense heat waves. These extreme temperatures contribute to increased health risks particularly among the elderly and children

Discussion questions

- i. What are the health risks of rising temperatures in Zambia?
- ii. How can communities adapt to these rising temperatures?
- iii. What policies can be introduced to reduce health risks from heat waves?



Case study: Forest loss and soil degradation

Deforestation especially in Eastern and Central provinces is causing soil erosion and reducing Zambia's ability to manage the impacts of climate change. Bad farming practices, logging and charcoal production contribute to this issue

Discussion questions

- i. How does deforestation contribute to soil degradation?
- ii. What are long term effects of soil erosion on agriculture?
- iii. How can sustainable farming and forest management practices help mitigate these effects?



Case study: Climate change and fisheries in Lake Tanganyika

Climate change with its effects such as changes in water temperature, rainfall patterns, and extreme weather events is threatening livelihoods on people that depend on fishing on Lake Tanganyika in northern Zambia

Discussion questions

- i. How does climate change affect the fishing industry in Lake Tanganyika?
- ii. What can be done to ensure sustainability of fisheries on Zambian lakes?
- iii. How help can be given to fishing communities to adapt to the impacts of climate change?
 - o Each group to should make presentations on their case study findings to the class



b. Content Tips

Climate change has got serious impacts on the environment, human health, the economy and social dynamics.

Environmental impacts

- o Rising temperatures; the Earths average temperature has increased leading to more heatwaves.
- o Extreme weather events leading to increased frequency of heat waves, drought and heavy rainfall
- o Loss of biodiversity due to changes in temperature and precipitation patterns leading to loss of plant and animal life

Human impacts

- o Respiratory problems due to changes in air quality

Economic impacts

- Damage to infrastructure – floods can damage roads, bridges and buildings
- Agricultural decline; unpredictable rainfall and drought reduce crop yields especially for maize Zambia's staple food
- Loss of livestock due to temperature and precipitation changes
- Energy crisis; Hydro- electric power plants depend on water levels which are affected by droughts leading to power shortages
- Loss of livelihoods; farmers, fishermen, and people who rely on natural res struggle as climate conditions change

Social impacts


- Displacement of people due to natural disasters such as floods and droughts
- Vector borne diseases due to changes in temperature and precipitation patterns that support the habitats of disease carrying insects like mosquitoes
- Mental health impacts due to temperature changes leading to increased stress, anxiety and trauma.
- Heat related illness such as heat exhaustion and heat stroke
- Conflicts of resources such as scarce water and arable land can lead to conflicts between communities
- Food security due to less food production leads to hunger and malnutrition especially in rural areas

c. Teaching and Learning Materials

- Case studies, charts showing images of climate change impacts
- Short video clips of climate change causes and effects

d. Assessment

- Observe learner's participation as they brainstorm on the impacts of climate change from the materials provided
- Check on the learners' reports as they identify the impacts of climate change on the environment, Human life, the economy and social amenities.

 **Activity 3.** Sharing information with family and community members on the causes and impact of climate change

a. Learning environment

The learning environment for this activity is outdoor based.

Outdoor set up

- Learners to share with family members real life experiences on the causes of climate change such as flooding or drought.

b. Content Tips

- Family discussions about climate change are a critical factor influencing communities' perceptions and behaviors.
- Encourage learners to discuss climate change impacts with family members, sharing their knowledge, experiences and concerns
- Engage learners and family members in joint projects such as creating a climate resilient gardens or reduce energy consumption.

- Invite learners to share personal stories or family experiences related to climate change.
- Learners to participate in community events involving climate change affairs.
- Appoint learners to be climate change ambassadors to share knowledge and promote climate action within their communities.

c. Teaching and Learning Materials

- Videos and documentaries on climate change
- Charts, diagrams, pictures on impact of climate change

d. Expected standard

Climate change analysed properly



e. Assessment

- Observe learners as they discuss impacts of climate change based on their family experiences
- Ask open ended questions to determine their ability to share information with their families and communities such as:
 - i. What did you learn about climate change?
 - ii. How does climate change affects your family and community?
 - iii. What actions can you take to reduce the impact of climate change?

Sub-Topic 3 - Practice Mitigation Measures to Climate change

2.4.2. Introduction

The topic focuses on efforts aimed at coming up with actions and strategies that can reduce or prevent long-term climate change risks. The goal of mitigation is to address the root causes of climate change thereby reducing the severity of climate-related risks such as extreme weather events, rising sea levels, and biodiversity loss.

As climate change intensifies, communities around the world face increasing risks from extreme weather events, rising temperatures, and shifting environmental patterns. From hurricanes and wildfires to droughts and floods, these climate-related disasters threaten lives, infrastructure, and livelihoods. The topic focuses on efforts aimed at coming up with actions and strategies that can reduce or prevent long-term climate change risks.

To build resilience, individuals and communities must adapt their lifestyles to local climate risks, ensuring they can withstand and recover from environmental hazards more effectively.

Adaptation strategies include designing climate-resilient homes, adopting sustainable agricultural practices, modifying daily routines, and leveraging technology for early warnings and disaster preparedness. By understanding local climate vulnerabilities and integrating risk-reducing measures into everyday life, people can safeguard their health, homes, and economies while contributing to broader climate resilience efforts.


This topic therefore explores practical approaches to adapting lifestyles to local climate risks, emphasizing proactive solutions that enhance preparedness, reduce vulnerability, and foster sustainable living in an increasingly unpredictable world.

Specific Competence(s):-Learners to:

1. Practise mitigation measures to climate change
2. Adapt lifestyles to local climate risks and disasters

Specific Competence 1: Practise mitigation measures to climate change

Learning Activities

 **Activity 1;** Identifying mitigation measures to climate change (reducing on waste generations, using renewable energy, conserving water, planting trees, ...)

a. Learning Environment

This activity would be indoor set up.


Indoor Set up;

- Arrange learners in small groups for them to collaborate
- Learners to discuss the mitigation measures to climate change.
- Each small group to share key ideas to the class.
- Key responses should be written down and similar ideas should be consolidated.

b. Content Tips

Zambia is taking steps to reduce its greenhouse gas emissions and mitigate the effects of climate change. For instance:

- **Solar Energy:** Encourage the use of solar lamps and chargers, which are becoming more accessible in Zambia. It's a great way to harness renewable energy and reduce reliance on non-renewable sources.
- **Tree Planting:** Join or start a tree-planting initiative. Zambia is known for its Miombo woodlands, and planting indigenous trees can help preserve the environment.
- **Climate Clubs:** Participate in school or community climate clubs that focus on local issues and solutions, such as managing waste or conserving water.
- **Sustainable Transportation:** Encourage walking or biking to school if it's safe and feasible. This not only reduces carbon emissions but also promotes physical health. **Learners can also be encouraged to** use local buses or shared taxis to reduce the number of individual cars on the road.
- **Local Foods:** Support local farmers by choosing fruits and vegetables that are in season. This reduces the carbon footprint associated with transporting goods.
- **Reduce Plastic Use:** Use alternatives to plastic, such as cloth bags for shopping and reusable containers for food and drinks.
- **Education and Advocacy:** Work with local organizations to spread awareness about climate change and sustainability practices. This can be done through community meetings, social media, and local events.
- **Gardening Projects:** Start or join community gardens where families can grow their own vegetables. This promotes local food production and reduces dependence on imported goods.

- **Upcycling Workshops:** Hold workshops to teach others how to repurpose old items into new, useful products. This can include turning plastic bottles into planters or old clothes into reusable shopping bags.
- **Renewable Energy Projects:** Encourage small-scale renewable energy projects, such as building solar cookers or wind turbines, to demonstrate sustainable practices.
- c. Teaching and Learning Materials**
 - Fact Sheets and Infographics
 - Greenhouse Gas Emission Reduction Charts
 - Carbon Cycle Diagrams, pictures, charts
-  **d. Assessment**
 - Ask learners to propose measures to climate change
 - Ask learners to practice conservation measures within the school premises

Activity 2; Engaging in Mitigation measures to Climate change.

a. Learning Environment

This activity would include both indoor and outdoor

Indoor Set up;

- Divide learners into smaller groups
- Discuss on how to participate in mitigating measures to climate change effects at individual and community levels

Outdoor set up;

Learners can work in groups on some of the sample projects itemized below:

Reduce waste and promote recycling

- Collecting plastic waste and reuse materials creatively
- Setting waste segregation bins in classrooms/school and monitor usage

School and community tree planting project

- Plant trees and care for them
- Keep a record of tree growth
- Partner with ZEMA for deeper impact

Energy audit and conservation plan

- Learners check energy use in schools
- Suggest ways to reduce energy consumption at school and home
- Share findings in class and implement energy saving strategies at school and home

School garden with climate smart farming

- Establish a small garden using organic compost, mulching, and crop rotation
- Discuss how conservation farming helps reduce emissions
- Share experiences from families that practise sustainable farming

b. Content Tips

- Engaging in mitigation measures is essential at individual and community levels
- Engaging in mitigation measures means actively taking steps to reduce or prevent the release of greenhouse gases (GHGs) that contribute to climate change.
- Engaging in mitigation means making conscious choices at individual, community, levels to create a low-carbon and sustainable future.
- The goal of mitigation is to slow down global warming and minimize its harmful effects on the environment, human health, and economies.

Levels of engagement may be as follows;

Individual Level

- ❖ Energy Efficiency & Renewable Energy
 - Use energy-efficient appliances (LED bulbs, Energy Star-rated devices).
 - Reduce electricity use by turning off unused lights and electronics.
 - Install solar panels or opt for renewable energy sources if available.
- ❖ Sustainable Transportation
 - Use public transport, biking, or walking instead of driving.
 - Carpool or drive fuel-efficient, hybrid, or electric vehicles (EVs).
 - Support policies that invest in clean public transportation.
- ❖ Waste Reduction & Sustainable Consumption
 - Reduce, reuse, and recycle to minimize landfill waste.
 - Compost organic waste to lower methane emissions.
 - Choose sustainable, low-carbon footprint products and reduce plastic use.
- ❖ Food & Agriculture Choices
 - Eat more plant-based meals and reduce food waste.
 - Support local and organic farming to reduce emissions from food transportation.
 - Grow home gardens or participate in community gardens.

Community level

- Participate in tree planting programs (trees absorb CO₂).
- Advocate for bike lanes, green spaces, and energy-efficient buildings.
- Support or join local sustainability projects and climate action groups.

c. Teaching and Learning Materials

- Charts, infographics, posters on people being engaged in mitigation measures on climate change effects.
- Educational Videos & Documentaries

d. Expected Standard;

Mitigation measures to climate change practised appropriately.



e. Assessment

- Give two examples of how individuals can engage in climate change mitigation.
- How can businessmen contribute to climate change mitigation?
- "Your city is experiencing high air pollution due to excessive vehicle use. How can individuals and the government engage themselves to help reduce emissions?"
- Debate Topic: "*Should governments enforce strict laws to reduce carbon emissions?*"
- I can personally contribute to climate change mitigation by ...



Activity 3: Sharing information on the climate change with family and community members.

a. Learning Environment

Indoor Set up;

- Watch documentaries or educational films about climate change. After watching, have a discussion to reflect on key points.

- Design a "climate change bingo" game with various climate-related actions (e.g., using a reusable bag, recycling, eating a plant-based meal). Family members or participants can check off actions they have already done or want to try.
- Organize a structured discussion or debate where everyone can voice their thoughts on climate change. Questions like "How does climate change affect our daily lives?" or "What steps can we take in our community?"
- Invite an environmental expert or organize a virtual talk with a professional in climate science or sustainability. This adds authority to the discussion and provides insights that may inspire action.

Outdoor Set up;

- Take a walk in a local park, forest, or nature reserve, and observe the environment around you. Let the participants discuss how climate change affects ecosystems, wildlife, and plant life. Point out changes in the environment (such as unusual weather patterns, drought, or altered plant species) to show how it's impacting the natural world.
- Host a tree planting or community garden event. Talk about the role trees and plants play in absorbing carbon dioxide and combating climate change.
- Take a tour of a local farm, eco-friendly business, or sustainable energy facility (like a wind farm or solar installation). This gives you the chance to learn about sustainable practices in real life and discuss how these methods help combat climate change.



b. Content Tips

- Sharing information on climate change with family and community members means educating and informing those around you about the causes, effects, and potential solutions to climate change.
- It involves explaining the science behind global warming, its impact on the environment, economy, and society, and the importance of collective action to address the crisis.
- This can include discussing topics like carbon emissions, renewable energy, sustainable practices, and how individuals can reduce their carbon footprints.
- The goal is to raise awareness, inspire action, and encourage positive environmental behaviors within your community.
- It's also about fostering a sense of responsibility and urgency, helping others understand how climate change may personally affect them and what steps can be taken at the local level to make a difference.

c. Teaching and Learning Materials

- Visual aids like infographics, short videos, or online resources to help explain climate change concepts more clearly.
- Charts showing community members involved in activities meant to reduce climate change such as tree planting.




d. Assessment

- Learners to visit community members and interview them on causes, effects and mitigation measures on climate change then write a 2-3 page report.
- Let learners in groups demonstrate activities on how individuals, families, and communities engage themselves in combating climate change effects.
- Learners to develop a sustainability action plan for the family or community, the plan should identify 3-5 concrete actions that can be taken to reduce causes of climate change at home or in the community.

- Create a visual representation (poster, infographic, or video) that illustrates the impact of climate change on the environment and the community. The visual should include Actions that individuals and communities can take to reduce their impact.
- Keep a journal over the course of a week where you reflect on your understanding of climate change, actions you've taken, and discussions you've had with family or community members.

Specific Competence 2: Adapt lifestyles to local climate risks and disasters

e. Learning Activities

 **Activity 1:** Identifying ways of adapting to climate risks and disasters (*growing early maturing and drought resistant crops, water harvesting, limiting consumption, staying informed, having a family emergence plan...*)

Learning Environment

The activity will be undertaken both within the classroom and outside:

Indoor Set up:

- Divide learners in small groups
- Assign roles (e.g., government official, business leader, scientist, activist) and have students debate solutions on a topic; "*Should governments prioritize adaptation over mitigation?*" **Evaluate** logical reasoning, evidence-based arguments, participation...
- Your city is experiencing frequent flooding due to heavy rainfall. What are some of the adaptation strategies that could help reduce risks?

Outdoor Set up:

Observation and data collection

- Learners in small groups observe their local environment to identify common climate related disasters such as floods and droughts
- They can record the effects of these disasters in their community
- Encourage learners to interact with elders, local farmers and community leaders to learn ways of coping with climate disasters
- Learners can discuss their findings

f. Content Tips

- Build climate-resilient buildings, on higher ground away from river banks with improved drainage systems,
- Develop early warning systems: Listen to weather forecasts and be aware of flood prone areas
- Emergence preparedness; Keep emergence supplies such as food, clean water and first aid kit ready
- **Water Conservation:** During the dry season, water can be scarce. Simple habits like reusing water for plants and fixing leaks quickly can make a big difference.
- Adjust to food shortages by growing vegetables in small gardens, learning traditional ways of preserving food (drying and smoking) and diversifying diet variety of food including wild fruits and local plants
- Promote drought-resistant crops such as millet, cassava and sorghum that survive with less water

- Cope with extreme heat by planting trees around schools and homes for natural cooling and taking a lot of fluids
- Protect against climate related diseases such as malaria, maintain hygiene to prevent water borne diseases during floods and encourage regular health check-ups and vaccinations
- Educate and involve local communities in climate adaptation strategies and decision-making.

a. Teaching and Learning Materials

- Visual aids such as charts infographics, short videos, or online resources showing ways of adapting to climate change



b. Assessment

- **Observe learners as they prepare, plan for climate disaster observation in the community**
- **Observe learners as they make report presentations on their findings**



Activity 2: Engaging in adaptation measures to climate change

a. Learning Environment

Indoor Set up;

- Divide participants into small groups, each group represents an area, town or city facing climate change challenges and identify the challenge/s and suggest the measures to minimize risks associated with climate change challenges identified.
- Each group randomly selects or is assigned a climate scenario (e.g., drought, flooding, extreme heat, heavy rainfall...), then let them come up with measures of adaptation to the challenge assigned.
- Groups design a community that incorporates adaptation strategies to minimize climate change risks and create a visual representation of their community on a poster or whiteboard. Each group presents its community and explains the adaptation strategies used.

Outdoor Setup;

- Learners to explore their local environment to identify real-world examples of climate adaptation strategies and brainstorm new ways to make their community more climate-resilient.
 - Learners explore their local environments and look for and document adaptation features such as: trees providing shade (urban heat reduction), permeable pavement or rain gardens (flood prevention), water-saving irrigation systems (drought adaptation), windbreaks or coastal barriers (storm protection) and energy-efficient or weather-resistant buildings.



b. Content Tips

Zambia is also implementing strategies to adapt to the changing climate for the learners. For example:

- Build climate-resilient buildings, on higher ground away from river banks with improved drainage systems,
- Develop early warning systems: Listen to weather forecasts and be aware of flood prone areas

- Emergence preparedness; Keep emergence supplies such as food, clean water and first aid kit ready
- **Water Conservation:** During the dry season, water can be scarce. Simple habits like reusing water for plants and fixing leaks quickly can make a big difference.
- Adjust to food shortages by growing vegetables in small gardens, learning traditional ways of preserving food (drying and smoking) and diversifying diet variety of food including wild fruits and local plants
- Promote drought-resistant crops such as millet, cassava and sorghum that survive with less water
- Cope with extreme heat by planting trees around schools and homes for natural cooling and taking a lot of fluids
- Protect against climate related diseases such as malaria, maintain hygiene to prevent water borne diseases during floods and encourage regular health check-ups and vaccinations
- Educate and involve local communities in climate adaptation strategies and decision-making.

c. Teaching and Learning Materials

- Notebooks or smartphones for taking notes/photos
- Large sheets of paper or whiteboards
- Markers, pens, sticky notes
- Printed climate scenarios (floods, heatwaves, droughts, etc.)

d. Expected Standard; Lifestyles adapted to climate risks and disasters appropriately.

e.  Assessment

- Assess ability to categorize and differentiate between mitigation and adaptation strategies.
- Observe learner participation in local adaptation efforts (For example, tree planting and caring).

f.  Summary

Weather and Climate

- **Weather:** In Zambia, weather changes from day to day. For example, during the rainy season (November to April), you might experience heavy rains and thunderstorms, while the dry season (May to October) is characterized by clear skies and cooler temperatures, especially in the mornings and evenings.
- **Climate:** Zambia has a tropical climate with three distinct seasons: Rainy Season (November to April): Warm and wet, with most of the country's annual rainfall occurring during this period. Cool Dry Season (May to August): Mild temperatures and dry conditions. Hot Dry Season (September to October): High temperatures and very dry conditions.

Climate Change

- In Zambia, climate change is observed through increasing temperatures, changing rainfall patterns, and more frequent extreme weather events such as droughts and floods.
- **Causes:** Activities like deforestation for agriculture, charcoal production, and the burning of fossil fuels contribute to greenhouse gas emissions.
- **Effects:** Climate change impacts agriculture, water resources, and health. For example, prolonged droughts can lead to reduced crop yields and water shortages, affecting food security and access to clean water. Increased temperatures and changes in precipitation patterns can also influence the spread of diseases like malaria.

Mitigation: Zambia is taking steps to reduce its greenhouse gas emissions and mitigate the effects of climate change by engaging in initiatives such as tree planting and caring, use of sustainable mobility, waste disposal in waste receptacles and waste cycling.

Adaptation: Zambia is also implementing strategies to adapt to the changing climate such as , building climate resilient houses, promoting drought resistant crops, coping with extreme heat and overall disaster preparedness