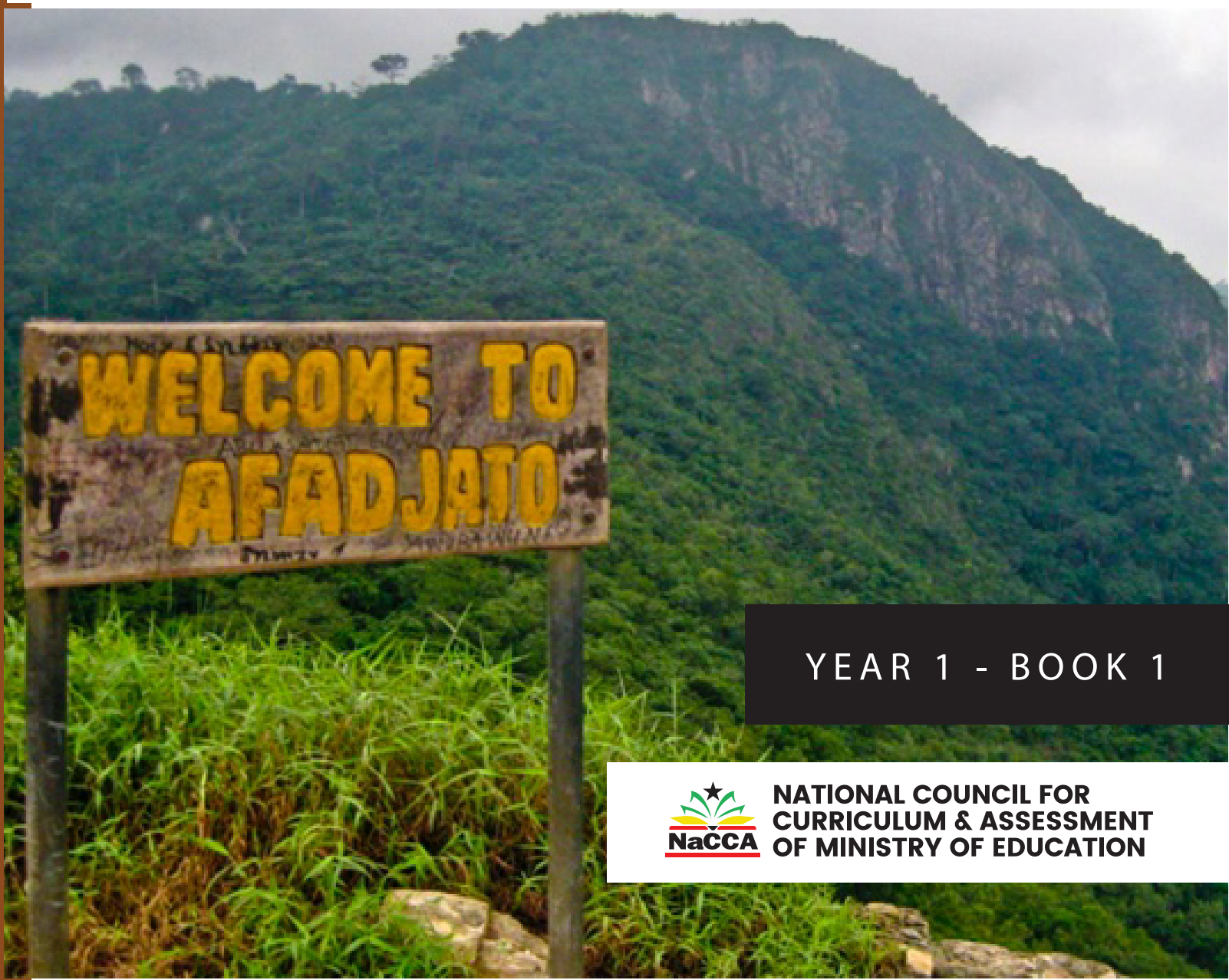
MINISTRY OF EDUCATION

Geography

TEACHER MANUAL



YEAR 1 - BOOK 1

NATIONAL COUNCIL FOR CURRICULUM & ASSESSMENT OF MINISTRY OF EDUCATION

MINISTRY OF EDUCATION

REPUBLIC OF GHANA

Geography

Teacher's Manual

Year One - Book One

NaCCA
NATIONAL COUNCIL FOR CURRICULUM & ASSESSMENT OF MINISTRY OF EDUCATION

GEOGRAPHY TEACHER'S MANUAL

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INTRODUCTION

The National Council for Curriculum and Assessment (NaCCA) has developed a new Senior High School (SHS), Senior High Technical School (SHTS) and Science, Technology, Engineering and Mathematics (STEM) Curriculum. It aims to ensure that all learners achieve their potential by equipping them with 21st Century skills, competencies, character qualities and shared Ghanaian values. This will prepare learners to live a responsible adult life, further their education and enter the world of work.

This is the first time that Ghana has developed an SHS Curriculum which focuses on national values, attempting to educate a generation of Ghanaian youth who are proud of our country and can contribute effectively to its development.

This Teacher Manual for Geography covers all aspects of the content, pedagogy, teaching and learning resources and assessment required to effectively teach Year One of the new curriculum. It contains this information for the first 12 weeks of Year One, with the remaining 12 weeks contained within Book Two. Teachers are therefore to use this Teacher Manual to develop their weekly Learning Plans as required by Ghana Education Service.

Some of the key features of the new curriculum are set out below.

Learner-Centred Curriculum

The SHS, SHTS, and STEM curriculum places the learner at the center of teaching and learning by building on their existing life experiences, knowledge and understanding. Learners are actively involved in the knowledge-creation process, with the teacher acting as a facilitator. This involves using interactive and practical teaching and learning methods, as well as the learner's environment to make learning exciting and relatable. As an example, the new curriculum focuses on Ghanaian culture, Ghanaian history, and Ghanaian geography so that learners first understand their home and surroundings before extending their knowledge globally.

Promoting Ghanaian Values

Shared Ghanaian values have been integrated into the curriculum to ensure that all young people understand what it means to be a responsible Ghanaian citizen. These values include truth, integrity, diversity, equity, self-directed learning, self-confidence, adaptability and resourcefulness, leadership and responsible citizenship.

Integrating 21st Century Skills and Competencies

The SHS, SHTS, and STEM curriculum integrates 21st Century skills and competencies. These are:

- **Foundational Knowledge:** Literacy, Numeracy, Scientific Literacy, Information Communication and Digital Literacy, Financial Literacy and Entrepreneurship, Cultural Identity, Civic Literacy and Global Citizenship
- **Competencies:** Critical Thinking and Problem Solving, Innovation and Creativity, Collaboration and Communication
- **Character Qualities:** Discipline and Integrity, Self-Directed Learning, Self-Confidence, Adaptability and Resourcefulness, Leadership and Responsible Citizenship

Balanced Approach to Assessment - not just Final External Examinations

The SHS, SHTS, and STEM curriculum promotes a balanced approach to assessment. It encourages varied and differentiated assessments such as project work, practical demonstration, performance assessment, skills-based assessment, class exercises, portfolios as well as end-of-term examinations and final external assessment examinations. Two levels of assessment are used. These are:

- Internal Assessment (30%) – Comprises formative (portfolios, performance and project work) and summative (end-of-term examinations) which will be recorded in a school-based transcript.
- External Assessment (70%) – Comprehensive summative assessment will be conducted by the West African Examinations Council (WAEC) through the WASSCE. The questions posed by WAEC will test critical thinking, communication and problem solving as well as knowledge, understanding and factual recall.

The split of external and internal assessment will remain at 70/30 as is currently the case. However, there will be far greater transparency and quality assurance of the 30% of marks which are school-based. This will be achieved through the introduction of a school-based transcript, setting out all marks which learners achieve from SHS 1 to SHS 3. This transcript will be presented to universities alongside the WASSCE certificate for tertiary admissions.

An Inclusive and Responsive Curriculum

The SHS, SHTS, and STEM curriculum ensures no learner is left behind, and this is achieved through the following:

- Addressing the needs of all learners, including those requiring additional support or with special needs. The SHS, SHTS, and STEM curriculum includes learners with disabilities by adapting teaching and learning materials into accessible formats through technology and other measures to meet the needs of learners with disabilities.
- Incorporating strategies and measures, such as differentiation and adaptative pedagogies ensuring equitable access to resources and opportunities for all learners.
- Challenging traditional gender, cultural, or social stereotypes and encouraging all learners to achieve their true potential.
- Making provision for the needs of gifted and talented learners in schools.

Social and Emotional Learning

Social and emotional learning skills have also been integrated into the curriculum to help learners to develop and acquire skills, attitudes, and knowledge essential for understanding and managing their emotions, building healthy relationships and making responsible decisions.

Philosophy and vision for each subject

Each subject now has its own philosophy and vision, which sets out why the subject is being taught and how it will contribute to national development. The Philosophy and Vision for Geography is:

Philosophy: All learners can be supported to develop their full potential in the geographical skills of space-time and human-environment interrelationships, build on contemporary and emerging technologies and competencies for further studies, the world of work and adult life.

Vision: Learners equipped with 21st Century skills and competencies in critical thinking and spatial analysis of the earth's physical and human patterns and processes to be interdisciplinary innovators, advance new world-changing discoveries in geospatial science and the interrelationship between the natural and the built-environment.

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SCOPE AND SEQUENCE

Geography Summary

S/N	STRAND	SUB-STRAND	YEAR 1			YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI	CS	LO	LI
1.	The Earth and its Neighbourhoods	The Earth and its features	4	4	8	2	2	4	1	1	2
		Rocks, weathering, soils and mass wasting	1	1	3	1	1	2	1	1	3
		The earth's atmosphere	1	1	3	1	1	3	1	2	3
2	Navigating the Environment	Maps: Their elements and analysis	2	2	4	1	2	4	1	1	3
		Geospatial data collection, representation and interpretation	1	1	2	1	1	3	1	1	2
3	Human and Environment	Physical settings and people	1	1	3	1	1	2	2	2	5
		Economic activities	1	1	2	1	1	2	1	1	3
		Environmental degradation	1	1	2	1	1	2	1	1	3
		Environmental hazards and their management	1	1	2	1	1	2	1	1	2
Total			**13**	**13**	**29**	**10**	**10**	**24**	**10**	**10**	**26**

Overall Totals (SHS 1 – 3)

Content Standards	**33**
Learning Outcomes	**33**
Learning Indicators	**79**

SECTION 1: THE CONCEPT OF GEOGRAPHY

Strand: The Earth and its Neighbourhood

Sub-Strand: The Earth and its Features

Learning Outcome: *With your understanding of the environmental features, explain the meaning of Geography and identify its branches and career prospects.*

Content Standard: Demonstrate understanding of Geography as a subject of study.

INTRODUCTION AND SECTION SUMMARY

This section uncovers the multifaceted discipline of Geography, encompassing the study of Earth's physical landscapes, diverse human populations, and their complex interactions. Learners will delve into the fundamental principles of this subject, exploring its various branches, including physical, human and practical Geography. Additionally, learners will examine the diverse and compelling career opportunities pursuing Geography can unlock. Through engaging learners in interaction pedagogical approaches such as talk for learning in the study of Geography, learners will acquire a profound understanding of the intricate fabric of our world, encompassing the formation of landforms, spatial differentiation and global resource distribution. This knowledge transcends mere theory, equipping learners with critical thinking and problem-solving skills invaluable in numerous professional fields, such as environmental management and urban planning. This section can be linked to the Basic School Social studies curriculum where learners are introduced to the introductory aspect of the branches of Geography.

The week(s) covered by the section is/are:

***Week 1**: Meaning of Geography, its branches, career prospects and importance.*

SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher should make use of talk for learning approaches, specifically questions and answers. This approach will help the teacher to give opportunity to their learners to express their ideas on the concept to be discussed. Learners will be encouraged to share their personal reflections and engage in class discussions to deepen comprehension. Collaborative and problem-based learning approaches using mixed-ability groups, will also be employed to help learners clearly indicate their understanding of the depth and breadth of topics Geography encompasses, the diverse nature of careers open to Geographers and the important contributions they make to the economic, physical and social fabric of society. The teacher must also adopt an exploratory learning approach by embarking on a trip to institutions of interest. Alternatively, where it is impossible for a trip to be organised, the teacher must present videos or invite resource persons.

ASSESSMENT SUMMARY

In line with the concepts to be discussed, the teacher is encouraged to use formative assessment strategies such as short answers, and a mini essay for class presentations. These strategies would help the teacher to elicit individual responses that may show the depth of understanding of the learners on the concepts taught. Key assessments, typically summative, evaluate student mastery after instruction. These are often given as homework, mid-semester exams or end-of-semester exams, usually done outside the class. The teacher has the flexibility to choose the assessment types that best suit their learners and learning objectives. However, it is advisable that the teacher at least guides learners to do one of the learning tasks. The teacher should be mindful of the varied abilities of their learners. In using the above assessment strategies, the teacher can also take into consideration learners' gender.

Week 1

Learning Indicator(s):

1. *Explain Geography and identify its branches*
2. *Discuss career prospects and the importance of studying Geography*

THEME/FOCAL AREA 1: MEANING OF GEOGRAPHY AND ITS BRANCHES

The meanings of Geography

Geography was derived from the Greek word '*ge*' or '*geo'* which means 'earth' and '*graphein*' or '*graphos*' meaning to 'write' or 'describe' or 'draw'. Geography simply means the writing about or description of the Earth. However, Geography extends beyond mere description of the Earth. Geography can therefore be explained as the study of the physical features of the earth, its atmosphere and the relationship between them and humans.

Branches of Geography

1. **Physical Geography**: Physical Geography focuses on the Earth's natural features, which includes its landforms such as mountains, valleys, plains, and plateaus; rivers; distribution of flora and fauna, weather and climate.
2. **Human Geography**: Human Geography looks at the role and activities of humans and their relation to the physical environment. It also includes the built environment under which human activities are conducted such as schools, markets, road and railways, airports, and farmlands, among others.
3. **Practical Geography**: Practical Geography is a branch of Geography that equips learners with practical skills to enhance their understanding and interpretation of human, physical and geographical information. Examples: Statistical methods, Map work and Field work (Lambert, & Balderstone, 2012; Whalley et al, 2011).

THEME/FOCAL AREA 2: CAREER PROSPECTS AND THE IMPORTANCE OF STUDYING GEOGRAPHY.

Career prospects in Geography include:

1. Surveyor
2. Teaching
3. Health/Medical Geographer
4. Town and Country Planning
5. GIS Specialist/Analyst
6. Cartographer
7. Environmental Protection Specialist
8. Aviation
9. Meteorologist

Fig. 1.1: A surveyor at work (Copilot AI, 2024)

Fig. 1.2: A cartographer making maps (Copilot AI, 2024)

Fig. 1.3: Geography teacher with a globe and atlas as learning resources (Copilot AI, 2024)

The importance of studying Geography includes:

1. Appreciate spatial differentiation of human and physical features globally.
2. Understand the distribution of landforms.
3. Helps us to understand and appreciate the ways of life of other people around the world.
4. Understand the processes of formation of landforms.
5. Appreciate the variations in population distribution.
6. Understand people and their economic activities.
7. Understand cultural differences among people.
8. To understand area differentiation.
9. It enables us to know the relevance of environmental resources around us and how they can be harnessed for human use.
10. Geography enhances our spatial awareness, allowing us to interpret and navigate the world around us.

LEARNING TASKS

The **teacher should help learners engage with the following learning tasks to help reinforce understanding and acquire new knowledge or skills.**

1. Learners explain the meaning of the word Geography. Paired groups discuss the meaning the word Geography and write down their thoughts on a card. The teacher provides help and guidance, mindful of differing abilities. Prompts can be used like 'split the word up'. 'What is a graph?' 'Any other words begin with 'geo'?, Geology. After a short time ask for feedback from each pair and share the entomology with students. The teacher might make a point of writing a working definition of Geography based on the thoughts of the students.
2. Learners identify the important areas of study in the three branches of Geography. The teacher prepares a resource set of pictures as digital slides. The teacher should choose 6 visually attractive slides for each branch of Geography, mindful of those students with visual impairments who might be paired with an appropriate individual who can describe the resource. The teacher should have the three branches displayed in a prominent place, for example on a flip chart or whiteboard. While the teacher shows the slide, they should ask students to note what the slide shows and then identify the correct branch and write it down in their notebook. Once the slides have finished the teacher should review them again this time telling students what branch of Geography it aligns with. Teachers should use appropriate geographical terminology including landforms, maps, economic activities, environment, culture and probe learners with questions to elicit critical thinking, especially where a slide might fit into two branches: logging in a tropical forest for example.
3. Learners discover the career prospects that someone who has studied Geography can look forward to. This can be either an individual research topic using the internet, where the research parameters need to be carefully specified and data gathered in a table or short written essay, or visiting Geography graduates might be invited in to speak and share their views. A resource might be the Geography teacher who might have a related qualification.

PEDAGOGICAL EXEMPLARS

Talk for learning:

Through questioning, explore what learners *Know, Want to know and Learn (KWL)* about the concept of Geography. The teacher should create a KWL chart on the board or provide individual worksheets for learners to record their ideas. The teacher should moderate discussions, being mindful of the different abilities of learners and ask probing questions of increasing difficulty that will stretch and challenge all individuals. The questions posed in Talk for Learning should be developed to challenge learners to reason, explain, and account for their answers, providing guidance in the right direction if necessary.

In pairs learners think and share the meaning of Geography and some elements that constitute Geography *ensuring the inclusiveness of learners from diverse ethnic and socio-economic backgrounds, taking note of the emotions of others and tolerating the views of others. Learners acquire collaborative skills and self-confidence as they work with their friends.*

1. Give learners a few minutes to think independently about their understanding of Geography.
2. Encourage them to jot down their thoughts or ideas during this thinking phase.
3. Remind learners that there are no right or wrong answers, and their ideas and perspectives are valuable.
4. Consider the needs and dynamics of the class when forming pairs.

5. Pair learners with different strengths or skill levels to promote peer learning and support.
6. Guide how to actively listen, take turns and respectfully share ideas during the pair discussion.
7. Supervise pairs to monitor their discussions and offer assistance as needed.
8. Provide clarifications or additional explanations when learners encounter difficulties or misconceptions.
9. Encourage learners to provide reasoning or evidence to support their understanding of Geography.

Talk for learning:

Using questions and answers learners identify and classify environmental features into the various branches of Geography. Learners learn to respect the environment as they classify environmental features.

1. Pose questions to learners that will help them identify and classify environmental features into the appropriate branches.
2. For physical Geography, ask questions related to the natural characteristics of the environment such as "*What landforms are present in this region?"* or "*What climate patterns can be observed in this area?"*
3. For Human Geography, ask questions related to human activities and their impact on the environment, such as "*How has urbanisation affected the local environment?"* or *"What cultural practices shape the landscape of this region?"*
4. For Practical Geography, ask questions related to map interpretation and analysis such as "*What are some of the methods used to represent relief features on maps*?" or "*What is the purpose of using a map scale?*" or "*How can a human geographical concept such as population density be represented on a map*?"
5. Allow learners time to think and discuss their answers with their peers.
6. Encourage them to explain their reasoning and provide examples to support their classifications.
7. Facilitate a class discussion where learners can share their responses and engage in a dialogue to refine their classifications.
8. Offer feedback and reinforcement to learners' answers, acknowledging their efforts and contributions.
9. Clarify any misconceptions or provide additional information as needed.

Talk for learning:

Through *think-pair-share*, discuss the importance of studying Geography in our daily lives, *taking into consideration the emotions of others, being open-minded and valuing the thoughts of others, emphasising equal career paths for both sexes.*

1. Encourage learners and give them a few minutes to individually think about and reflect on the importance and impact of Geography in their daily lives.
2. Prompt them to jot down their thoughts or examples for reference during the subsequent pair and share stages.
3. Form pairs, either randomly or by considering learners' readiness levels and share their thoughts and examples related to the importance of studying Geography.
4. Encourage active listening and respectful engagement, with one learner sharing while the others actively listen and take notes.

5. Supervise pairs to monitor their discussions and offer assistance as needed.
6. Encourage learners to provide reasons and evidence to support their views on the importance of Geography.
7. Engage learners in a follow-up activity where they apply their understanding of the importance of Geography to analyse a real-life scenario or problem. (EXTENDED ACTIVITY)

Exploratory Learning:

Using videos (taking note of the different visionary needs of some learners) or embarking on a trip to institutions (e.g., Land Use and Spatial Planning Authority, Lands Commission, EPA) or using resource persons, discuss the career prospects of studying Geography, *bearing in mind the different economic backgrounds of learners that might affect their participation in long-distance trips.*

Option 1-Using Video

Find and present videos that showcase different professionals working in various sectors such as urban planning, environmental management, GIS analysis, cartography, and tourism, highlighting the nature of their work, required skills, educational background, and potential career progression.

Option 2-Embarking on a trip to institutions

Organise field trips to relevant sites or institutions where learners can observe Geography-related work such as urban planning offices, environmental research centres, mapping agencies, or conservation organisations. Provide opportunities for learners to interact and engage in discussions to deepen their understanding of career prospects in Geography.

Option 3- Using Resource Person

Invite guest speakers who are professionals in Geography-related fields to share their skills, qualifications, experiences and job responsibilities. Allow learners to ask questions and seek advice on pursuing careers in Geography.

1. Facilitate class discussions after watching videos, going on educational trips, or listening to resource persons.
2. Use class discussions and structured probing questions to encourage learners to critically reflect on the information they have discovered on the career prospects of studying Geography.
3. Guide learners of differing abilities using appropriate scaffolding, if appropriate to provide written summaries or mini essays which present key points and encourage peer review to check and secure individual understanding.
4. Guide learners in exploring how their skills and passions align with specific Geography-related professions concerning the various careers discussed.
5. Assign individual or group projects that require learners to delve deeper into specific Geography-related careers.
6. Ask learners to research job descriptions, salary ranges, required qualifications, and potential employers in their chosen field of interest and present the data they gather in the form of graphs, charts and tables.
7. Encourage learners to present their findings and insights to the class, fostering peer learning and exchange of information.

KEY ASSESSMENT

Focal Area 1

Level 1: Name one branch of Geography.

Level 2: Describe what is studied in physical Geography.

Level 2: Make mind map to show the contrasting things studied in Physical, Human and Practical Geography.

Level 3: Draw a Venn diagram to show the interconnections between Physical, Human and Practical Geography.

Focal Area 2

Level 1: Identify five careers that can be linked to Geography.

Level 2: Explain the role of a Geographer in Cartography, Surveying, Meteorology and Town Planning.

Level 3: Research using the Internet the career opportunities for individuals with expertise in Geography. Prepare a set of informative and illustrated slides to present your findings and add a summary to showcase previously unknown careers that are open to Geographers.

Section Review

This week was concerned with two focal areas, the branches of Geography and the career prospects for individuals with expertise in Geography. Learners acquired detailed knowledge about the various branches of Geography: physical, human, and practical geography. They developed an understanding and appreciation of the many diverse topics that these branches of Geography covered and their interrelationships. They developed an understanding of the important role of Geography in the real world and discovered the many career opportunities open to individuals with expertise in the subject. Learners applied collaborative skills when undertaking paired learning, built confidence when sharing findings in class, research skills, critical thinking, and problem-solving, which are essential for understanding and addressing the complex and interconnected nature of geographical phenomena.

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2. Tsibu, B. (2022). *Physical Geography for Senior High Schools*, Abundance of Grace Ent: Kumasi

SECTION 2: **THE SOLAR SYSTEM**

Strand: The Earth and its Neighbourhoods

Sub-Strand: The Earth and its Features

Learning Outcome: *Explain the constituents and characteristics of the Solar System*

Content Standard: Demonstrate knowledge of the Solar System and its constituents

INTRODUCTION AND SECTION SUMMARY

This section discusses the vastness of our Solar System. We will begin with an examination of our primary Star, the Sun, around which all other celestial bodies in the system orbit. Our exploration will encompass the main features of the eight planets, ranging from the inner planets, such as Earth and Mars, to the gaseous giants like Jupiter and Saturn, and extend to the remote, icy domains of Uranus and Neptune. This section can be linked to General Science at the Senior High School level and Social Studies at the Junior High School level.

The week*(s) covered by the section is/are:*

***Week 2**: The Solar System and Its Constituents and Characteristics of the Eight Planets*

SUMMARY OF PEDAGOGICAL EXEMPLARS

Through the use of an *Exploratory Learning approach*, the teacher employs videos, pictures and other resources to engage learners in constructing their understanding of the solar system. This approach will not only enhance learners' learning process awareness but also stimulate learners' creativity and flexibility. Again, *group work or collaborative learning* must be utilised by the teacher. This can be done in pairs or manageable groups ensuring all-inclusiveness of diversity and inclusion of learners with different intellectual abilities, gender, emotions and respect for each other. By adopting this approach, learners gain the self-confidence to participate in group activities, thereby developing their communication and critical thinking skills.

ASSESSMENT SUMMARY

In line with the themes to be discussed, the teacher is encouraged to use formative assessment strategies such as a case study, project work or research. These strategies are learner-centred, encouraging active learning and engagement, autonomy and independence as well as fostering intellectual curiosity. They also promote learners with skills of lifelong learning. This section seeks to provide learners with critical thinking and reasoning. Key assessments, typically summative, evaluate student mastery after instruction. These are often given as homework, mid-semester exams or end-of-semester exams, usually done outside the class. The teacher has the flexibility to choose the assessment types that best suit their learners and learning objectives. However, it is advisable that the teacher at least guides learners to do one of the learning tasks. The teacher should be mindful of the differences in abilities of their learners and provide scaffolding strate.

Week 2

Learning Indicator(s):

1. *Describe the solar system and its constituents*
2. *Discuss the characteristics of the planets in the solar system*

THEME/FOCAL AREA 1: THE SOLAR SYSTEM AND ITS CONSTITUENTS

- Our solar system consists of the sun and eight planets.
- It is one of the million solar systems in a galaxy, known as the Milky Way.

Components of our Solar System

1. **Sun**: The sun is the star at the centre of the Solar System. It is the largest and brightest object in the solar system. The sun consists of 73% hydrogen, 25% helium and 2% of the remaining consists of carbon, oxygen, iron, neon and other elements. It has a surface temperature of about 5,500°C.
2. **Planets:** Eight planets revolve around or 'orbit' the sun. These eight planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune

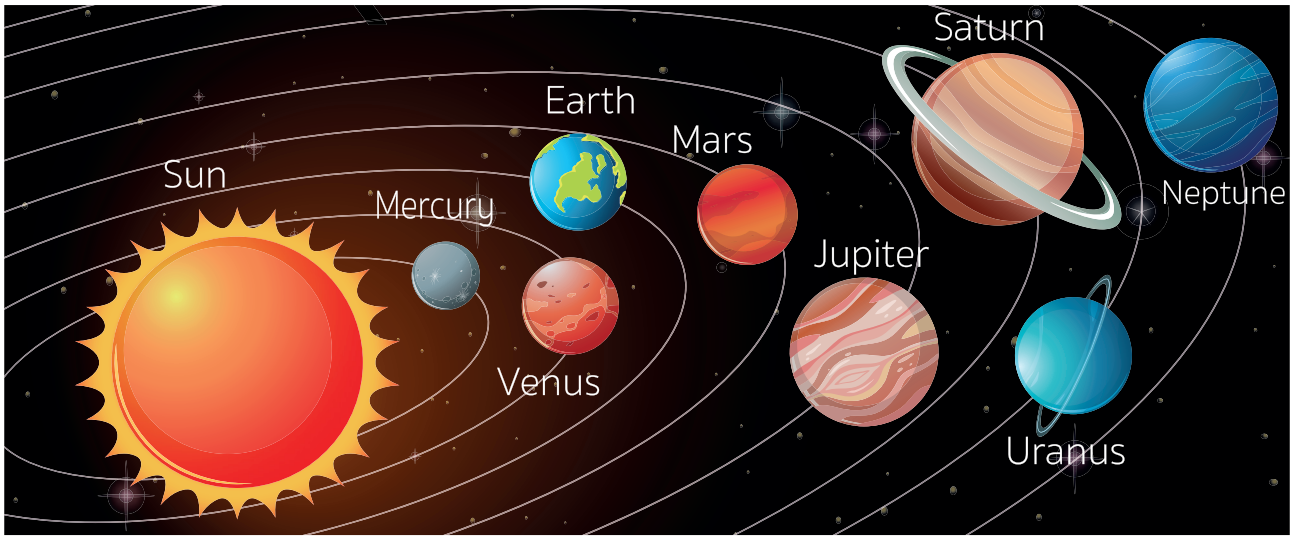

Fig. 2.1: The Solar System

THEME/FOCAL AREA 2: CHARACTERISTICS OF THE EIGHT PLANETS

The planets have the following characteristics:

1. **Mercury:**
   a. first in order of distance from the sun
   b. smallest planet
   c. takes 88 Earth-days to complete one revolution on its orbit
2. **Venus**
   a. spherical in shape
   b. hottest planet
   c. similar in size and mass to Earth, has a thick atmosphere

3. **Earth:**
    a. the only known planet that supports life
    b. it is spherical
    c. takes 365¼ days to complete one revolution on its orbit
4. **Mars:**
    a. also called the red planet
    b. it is the fourth planet in terms of its position from the sun
    c. it is spherical
5. **Jupiter:**
    a. the largest planet in the solar system
    b. it has rings around it
    c. made up of gases
6. **Saturn**
    a. second largest planet in the solar system
    b. it takes 29 earth years to make one complete revolution in its orbit
    c. it is composed of gases, predominantly hydrogen
7. **Uranus**
    a. third largest planet
    b. the only planet that rotates on its sides- at nearly 90°
    c. the coldest in the solar system
8. **Neptune:**
    a. the planet that is farthest away from the sun
    b. it is the fourth largest in the solar system
    c. it has an average distance of 4.5 billion km away from the sun

Note: *The teacher/facilitator should bear in mind that the natural satellites of the various planets keep changing with the advancement in technology and space discovery. Therefore, they must research and provide updated information on the natural satellites*.

LEARNING TASKS

1. Learners watch a video of the solar system and use available resources to make a model to show the position of the sun and planets.
2. In groups, learners discuss the features of the planets and their differences and similarities.

PEDAGOGICAL EXEMPLARS

Exploratory Learning:

Using pictures/videos (Taking note of the different visionary needs of some learners) and other making resources, the teacher selects mixed ability groups and provides a differentiated task challenge for learners to build a model of our solar system being sensitive to diversity and inclusion of learners from different geographical areas. The teacher should moderate discussions, being mindful of the

different abilities of learners and ask probing questions of increasing difficulty that will stretch and challenge all individuals.

1. Present a video or a series of pictures that demonstrate how to build a model of the solar system. The teacher should be mindful that not all groups will be able to produce a model which shows accurate size and orbital movement, however all pupils should be actively encouraged using praise and reward, so all mixed ability groups are stretched and challenged to achieve the L3 key assessment.
2. Break down the process into manageable steps, highlighting each component's characteristics and placement within the model.
3. Emphasise the importance of scale and proportion to accurately represent the sizes and distances of the components, most especially the Sun and the eight planets.
4. Provide learners with the necessary resources to construct their models of the solar system.
5. Assist and guide learners as they assemble their models, ensuring they understand the significance of each component and its placement.
6. Encourage learners to work in pairs or small groups to build their models collaboratively.
7. Foster discussion and interaction among learners as they share their ideas, ask questions and exchange knowledge about the solar system.
8. Allocate time for each group or pair to present their completed models to the class.
9. Encourage learners to explain their design concepts, the choices they made for each component, and how their models represent the characteristics of the solar system.
10. Facilitate a class discussion where learners can ask questions, provide feedback, and make connections between different models.
11. Assign projects or tasks that require learners to investigate specific aspects of the solar system, such as the formation of planets, the role of gravity, or the exploration of other celestial bodies. (EXTENDED ACTIVITY)

Group work/collaborative learning:

The teacher divides the class into mixed ability groups to discuss the interrelationships between the planetary bodies, using the model of the solar system. The teacher should moderate discussions, being mindful of the different abilities of learners and ask probing questions of increasing difficulty that will stretch and challenge all individuals. The questions posed by the teacher should be developed to challenge learners to reason, explain, and account for their answers, providing guidance in the right direction, if necessary. Groups for collaborative learning should be selected to ensure the inclusion of learners with different intellectual abilities, gender, emotions and respect for each other. Learners become tolerant, friendly, open-minded, patient, hardworking and humble as they learn with their peers.

1. Provide clear instructions on the tasks and objectives of the discussion. Explain that learners will be exploring and discussing the interrelationships between planetary bodies within the solar system using their models.
2. Allow time for learners to examine and explore their models as well as those of their peers.
3. Encourage them to closely observe the placement, distances, and relative sizes of the planetary bodies in each model.
4. Provide a set of guided discussion questions to help learners reflect on and analyse the interrelationships between the planetary bodies.

Examples of questions include:

a. *What impact does distance from the sun have on planets?*
b. *How does the size of planets compare to the sun?*
c. *Do all planets have an atmosphere/can support life, like earth?*
5. Encourage learners to engage in meaningful discussions within their pairs or groups.
6. Monitor the discussions, providing guidance and support as needed.
7. Encourage active participation from all group members, ensuring that everyone has an opportunity to share their observations and insights.

8. Monitor and assess the quality and value of individual contributions during discussions, providing encouragement and direction where necessary so each learner engages productively. Apply praise and reward strategies to promote engagement where necessary.

9. Provide extended activity guidance to enable learners to develop and enrich their learning by through further research. The teacher/Facilitators should be mindful of differing abilities in the preparation of materials and suggested topics, providing scaffolding where necessary or considering pairing different abilities to encourage peer to peer learning.

Group work/collaborative learning:

In mixed ability/gender groupings, identify and discuss the position of planets in relation to the sun using a model of the solar system. *Learners should control their emotions during discussions to accept the views of others and share them with the whole class. Learners develop analytical and collaborative skills and information literacy through watching videos on the solar system and having group discussions.*

1. Carefully consider the composition of the groups to ensure a mix of abilities and genders.

2. Create a supportive and inclusive environment where all learners feel valued and encouraged to contribute their ideas.

3. Provide clear instructions on the task and assign specific roles within each group to ensure equal participation.

4. Ensure that all learners have a basic understanding of the solar system and the position of planets to the sun.

5. Provide resources or a brief review session to refresh their knowledge before the group discussion.

6. Consider providing differentiated materials or resources to accommodate different learning styles and abilities.

7. Prepare a set of scaffolded questions that guide the group discussion and encourage deeper thinking.

8. Start with basic questions that focus on identifying the position of planets in relation to the sun, such as their order and distances.

9. Gradually progress to more complex questions that explore the reasons behind the positions and the impact of gravity on planetary orbits.

10. Encourage learners to work collaboratively within their groups, discussing and sharing their ideas and observations.

11. Foster an environment where learners feel comfortable seeking help from their peers and offering support to one another.

12. Encourage learners with higher abilities to mentor and support their peers who may require additional assistance.

13. Offer EXTENSION TASKS or projects that allow learners to explore related topics in greater depth, catering to their specific interests and abilities.

In groups made up of learners from different locations, analyse the features of the eight planets, their differences and similarities iteratively. While at it, ensure all-inclusiveness emphasising gender differences and taking into consideration learners with different learning capabilities.

1. Divide the class into groups made up of learners from different locations, ensuring that each group consists of learners with a range of abilities and backgrounds.
2. Assign each group a specific planet to focus on and analyse.
3. Provide resources such as books, articles, or online materials that contain information about the planets.
4. Instruct each group to collect relevant data about their assigned planet, including its size, composition, atmosphere, distance from the sun, number of moons, and any unique features or characteristics.
5. Encourage learners to use a variety of sources and note-taking strategies to gather and record their findings.
6. Facilitate collaborative discussions within the groups made up of learners from different locations, where learners can share and compare the data they collected for their respective planets.
7. Encourage learners to identify similarities and differences among the planets based on their data.
8. Provide guiding questions to prompt critical thinking and analysis, such as:
    a. *What are the commonalities and differences in size and composition among the planets?*
    b. *How do the atmospheres of the planets compare? Are there any notable variations?*
    c. *Are there any patterns or trends in the number of moons or unique features among the planets?*
9. Encourage groups to create visual representations of their analysis, such as charts, graphs, or diagrams, to highlight the similarities and differences among the planets.

KEY ASSESSMENT

Level 1: List the constituents of our solar system.

Level 1: Place the planets in their correct order, nearest to furthest from the sun

Level 1: Order the planets in size, smallest to largest

Level 2: State 2 key characteristics of each of the eight planets

Level 2: Working in mixed gender groups and utilising materials such as clay, paper, different shapes of balls, pieces of clothes and wire, design and make a static model of the solar system. Ensure the relative sizes are accurately represented and positions of the planets are placed in the correct order.

Level 3: Working in mixed gender groups, and with access to materials such as clay, paper,

different shapes of balls, pieces of clothes, and wire, design and make a ***working*** model of the solar system to demonstrate how planets orbit the sun. Ensure the relative sizes are accurately represented and positions of the planets are placed in the correct order.

Section Review

This section focused on two focal areas for Week 2. Learners explored the solar system and its components with more emphasis on the characteristics of the eight planets. Upon the section's completion, learners have gained a deeper understanding of the characteristics of each unique planet, and how they all move around the Sun in their orbits. Learners made a model of our solar system to show the relative size of each planet, the correct position in relation to the sun and their orbital paths. This hands-on approach helps learners to truly understand Earth's place in our solar system.

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2. Timesofindia.com (2023). Planets in our Solar System explained. *The Times of India*. https://timesofindia.indiatimes.com/education/learning-with-toi/planets-in-our-solar-system-explained/amp_articleshow/99595058.cms

SECTION 3: EXPLORING EARTH'S SHAPE, MOTIONS AND COORDINATES

Strand: The Earth and its Neighbourhoods

Sub-Strand: The Earth and its Features

Learning Outcome:

1. *Describe the shape of the Earth and the effects of its rotation and revolution on our daily lives.*
2. *Explain latitudes and longitudes and outline their significance to our everyday life*

Content Standard:

1. Demonstrate knowledge and skills in describing the shape and movements of the Earth, and the effects of the earth's rotation and revolution.
2. Demonstrate skills in locating places using latitudes and longitudes

INTRODUCTION AND SECTION SUMMARY

This section embarks on a journey to unveil compelling evidence supporting the Earth's shape, its rotational and revolutionary movements, and the intricate coordinate system of latitudes and longitudes. We will explore the scientific and photographic proofs which confirm the that the shape of the earth is a sphere. Furthermore, we will explore the consequences of the Earth's rotation on its own axis and revolution around the Sun can be related to day and night and the seasons. Finally, we will illuminate the significance of the latitudinal and longitudinal coordinate system, crucial for pinpointing locations, navigating our vast planet, and determining distances and time of places.

The weeks covered by the section is/are:

***Week 3**: Evidence of the Earth's Shape*

***Week 4**: Earth's Rotation and Revolution*

***Week 5**: Latitudes and Longitudes*

***Week 6**: Using Latitudes to determine Distances between Places and Longitudes to Calculate the Local Time of a Place*

SUMMARY OF PEDAGOGICAL EXEMPLARS

This section employs diverse pedagogical approaches to ensure participation and differentiation. These learning approaches are relevant because they cater for diverse learning styles and promote active engagement. "Talk for Learning" methods like question-and-answer sessions, encourage critical thinking and verbal communication skills. "Exploratory Learning" through research and tools like globes, atlases, and Google Earth fosters curiosity and allows learners to discover information independently. "Activity-Based Learning" such as role plays makes abstract concepts tangible and enhances memory retention. Lastly, "Collaborative Learning" in mixed ability and GESI-responsive groups promotes teamwork, exposes learners to different perspectives, and fosters a sense of community. These methods collectively create a comprehensive, inclusive, and engaging learning environment.

ASSESSMENT SUMMARY

Following the themes to be discussed, the teacher is expected to deploy various formative assessment strategies such as individual and group projects. These strategies are learner-centred, testing various depths of knowledge of the learners, again it promotes autonomy and independent learning as well as fostering collaboration among the learners. They also encourage learners to develop lifelong learning skills. This section aims to equip learners with critical thinking and reasoning abilities Key assessments, typically summative, evaluate student mastery after instruction. These are often given as homework, mid-semester exams or end-of-semester exams, usually done outside the class. The teacher has the flexibility to choose the assessment types that best suit their learners and learning objectives. However, it is advisable that the teacher at least guide learners to do one of the learning tasks. The teacher should be mindful of the differences in abilities of their learners and provide scaffolding strategies. Consequently, the teacher should formulate their questions based on the appropriate Key assessment sections. The teacher should also be attentive to variances in their learners' abilities and offer support accordingly.

Week 3

Learning Indicator(s):

1. *Discuss the evidence of the shape of the Earth*

THEME/FOCAL AREA 1: EVIDENCE OF EARTH SHAPE

The Shape and Size of the Earth

1. The Earth is spherical
2. The equatorial diameter of the earth is about 12,800 km
3. The polar diameter is about 12,722 km
4. The equatorial circumference is about 40,075 km
5. The polar circumference is about 40,008 km
6. The total surface area is about 510,000,000 square kilometres
7. It slightly flattened at the poles and bulges at the equator - oblate spheroid
8. It is called *geoid* which means *earth-shaped*

** The teacher is encouraged to explain how the differences e.g., in the equatorial and polar diameter support the concept of a spherical Earth*

Empirical Evidence for the spherical shape of the Earth

1. Circumnavigation of the earth

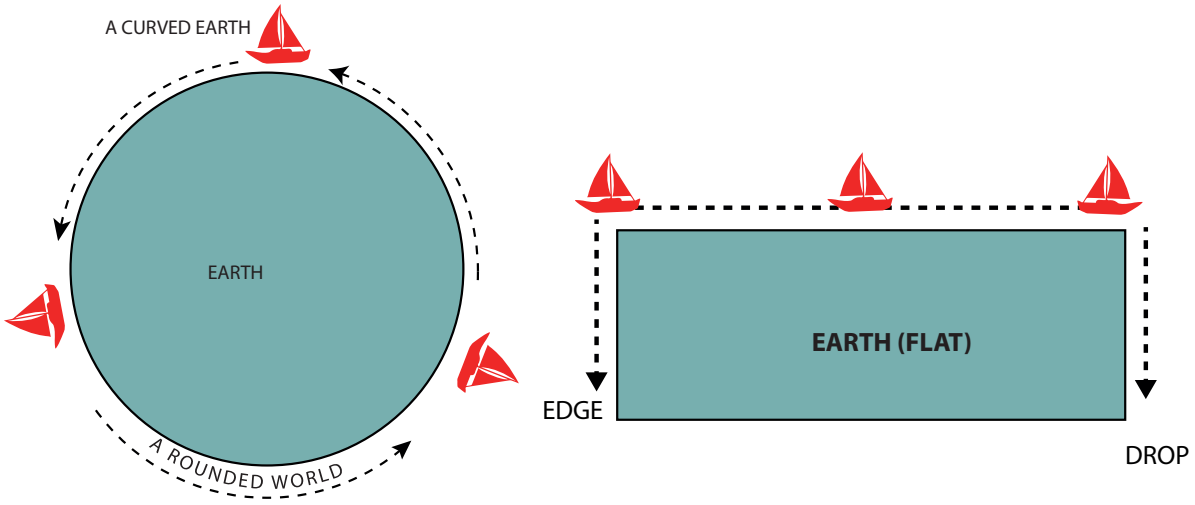

Fig. 3.1: Circumnavigation (Goh Cheng Leong. 2014)

2. Bedford Level Canal Experiment

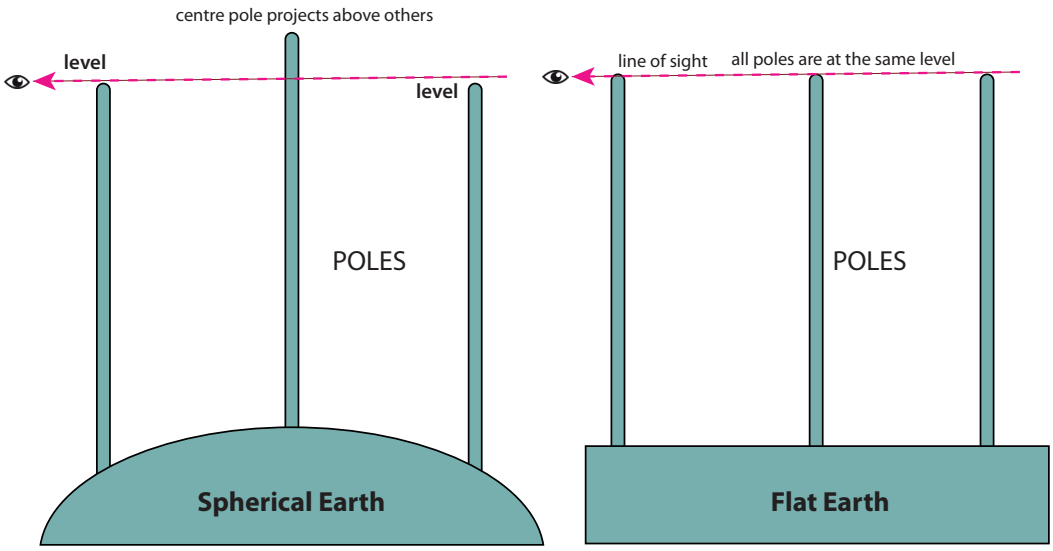

Fig. 3.2: Bedford Level Canal Experiment (Goh Cheng Leong. 2014)

3. Circular Horizon

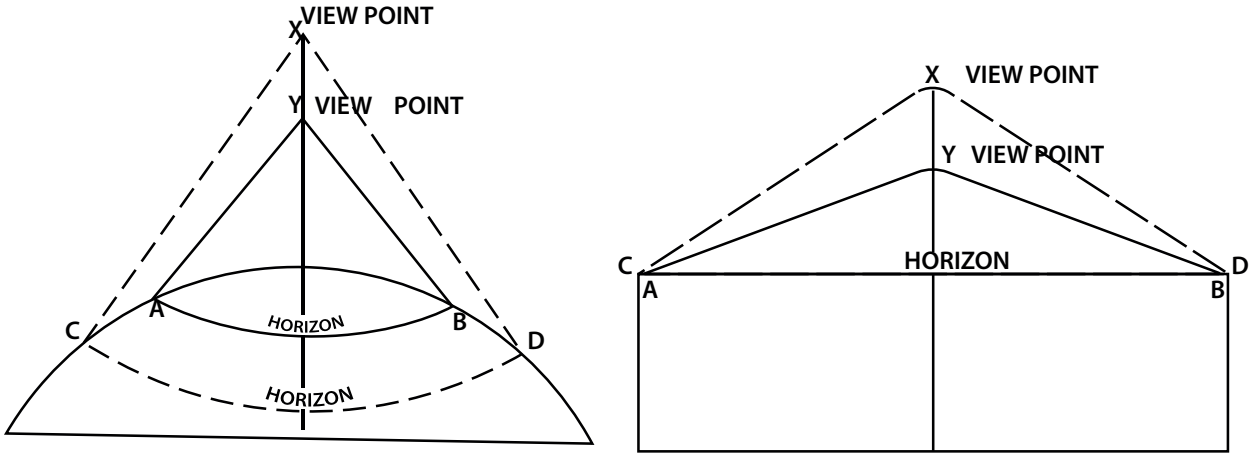

Fig. 3.3: Circular Horizon (Goh Cheng Leong. 2014)

4. Sunrise and Sunset

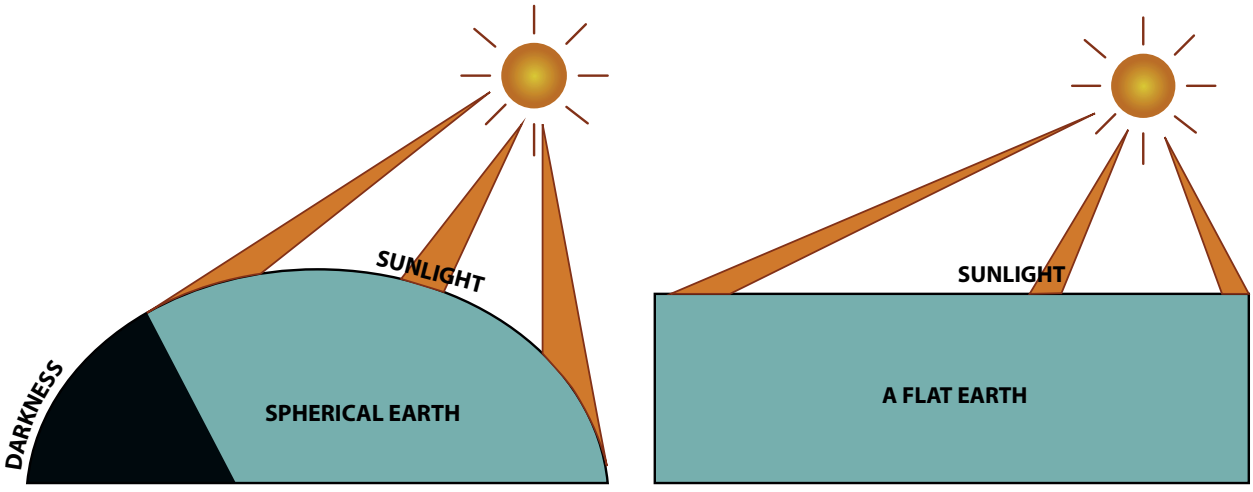

Fig. 3.4: Sunrise and Sunset (Goh Cheng Leong. 2014)

5. Lunar Eclipse or Eclipse of the Moon

Figure 3.5: Lunar Eclipse or Eclipse of the Moon (Copilot AI, 2024)

6. Satellite images of the earth

Fig. 3.6: Satellite images of the Earth (Copilot AI, 2024)

7. Ship Visibility

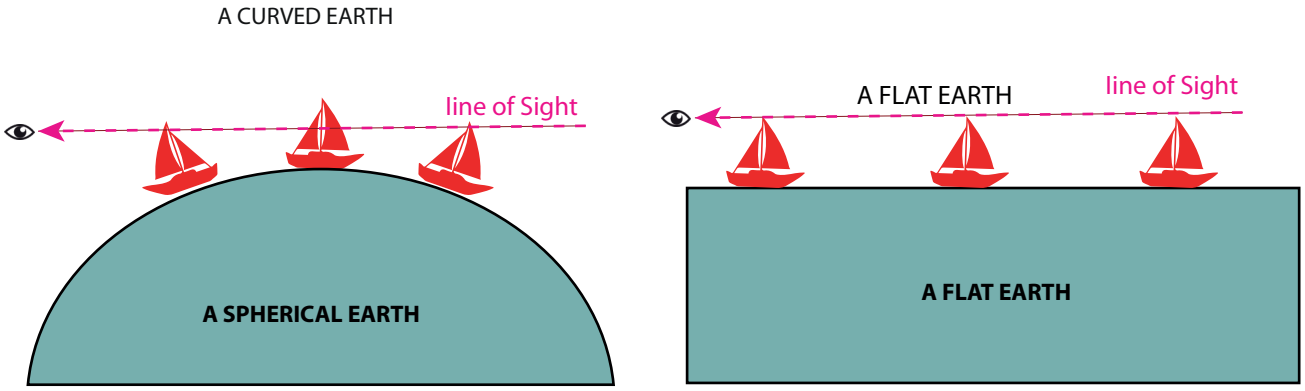

Fig 3.7: Ship Visibility (Goh Cheng Leong. 2014)

8. The Shape of other Planetary Bodies

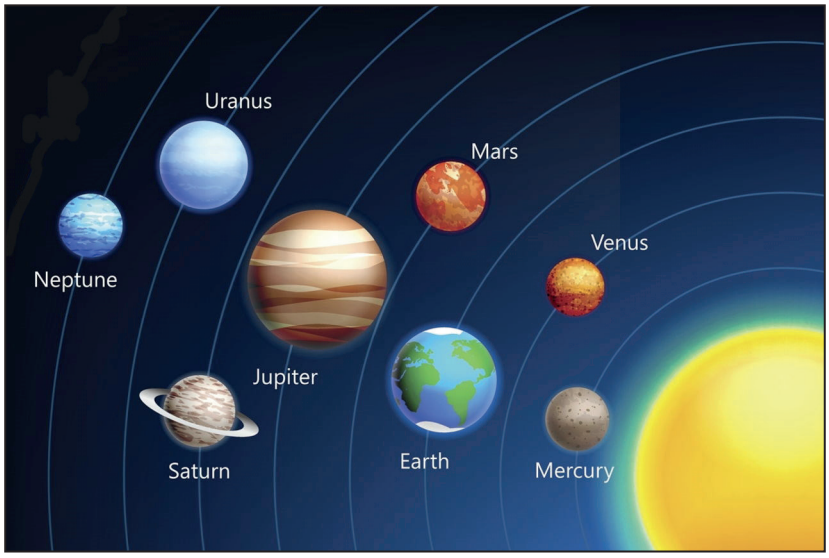

Fig. 3.8: Planetary bodies (Copilot AI, 2024)

**Note: The teacher should use diagrams, photos and videos to further explain the above points to learners.*

LEARNING TASK

1. Learners discover what they know about the shape of the Earth to enable them to acquire new knowledge and understanding. This could be delivered using flash cards or by asking for individual contributions. Give time for students to think and write down their thoughts. When asking for contributions consider different abilities and use probing questions to challenge learners to provide explanations for their contributions. This short exercise should draw out key terms (sphere, orb, equator, poles, north south, east, west) and any known dimensions.

2. Learners, with the aid of well-annotated diagrams where applicable, explain the proofs of the Earth's shape. This can be based on slides, the number depending on time and what proofs are used. The teacher should show each slide and explain the proof first; choose the vocabulary carefully, being prepared to explain terms like circumnavigation, horizon, Sun's rays. Prepare scaffolded resources according to ability, having prompt sheets available, take

account of visually impaired learners. Following the slides, they are then given to learners as a hard copy. The primary question at this stage should be directed to learners: 'Why does this diagram prove the earth is spherical?' Working in pairs, learners could choose one proof each and write an explanation which is then exchanged and peer reviewed. The teacher should be available to provide verbal support, question explanations and use praise and reward in a positive way. Learners demonstrate listening skills and critical thinking skills when appraising each other's explanations. Challenge more able learners to write an explanation without a diagram and accept that some learners will need to explain using visual/diagrammatic representations.

PEDAGOGICAL EXEMPLARS

Talk for learning: The teacher leads a discussion on the shape of the Earth. The teacher should accept voluntary contributions and collect these on a display. Once information is collected the teacher should use probing questions and an awareness of individual ability to develop the general information including distances and terms, removing inappropriate contributions like 'circle' and 'round' and explaining terms like 'globe'. The teacher might compare local distances with those used when dealing with the shape of the Earth. The teacher should moderate the discussion being mindful of different abilities yet asking questions that will stretch and challenge all when eliciting a general idea of the shape of the Earth, ensuring all-inclusiveness with emphasis on people from different geographical areas.

Talk for learning: The teacher should present several pieces of empirical evidence for the shape of the Earth shape being 'round'. Evidence could be presented on a projector, whiteboard or paper. The teacher leads a discussion on each piece of evidence as to how it shows that the Earth is round. The teacher should NOT focus on the idea that the earth is flat, and the empirical evidence is used to disprove this. The teacher should moderate the discussion, being mindful of different abilities yet asking questions that will stretch and challenge all when eliciting explanations as to how each piece of evidence shows the Earth is round. Individual explanations can be used as formative assessment opportunities to gauge the level of understanding of the proofs of the shape of the Earth involving all participants. Learners should be self-reflecting and finding confidence in sharing their views in a class environment.

1. Pose questions to the class and give learners time to think and formulate their answers.
2. Encourage active participation by allowing learners to respond individually to the proofs or in small groups before sharing their answers with the entire class.
3. Provide opportunities for learners to ask their own questions and engage in peer-to-peer discussions.
4. Supplement the discussion with pictures, videos, model designs and demonstrations that support the concept of Earth's shape.
5. Use models, globes, or diagrams to illustrate the spherical shape of the Earth.
6. Show images or videos taken from space that depict the Earth as a round object.
7. Use a scaffolded approach when asking questions to guide learners through the discussion.
8. Begin with more straightforward questions that assess their prior knowledge and understanding.
9. Gradually progress to more challenging questions that require critical thinking and analysis of evidence.
10. Be prepared to address common misconceptions about Earth's shape, such as the belief in a flat Earth.

KEY ASSESSMENT

Level 1: List 3 key facts about the size and shape of the Earth.

Level 1: Describe how has space travel helped us to confirm the Earth has a spherical shape

Level 2: Outline the evidence which shows the Earth is not a perfect sphere.

Level 2: Explain using diagrams why early sailors knew the Earth was not flat.

Level 3: Use a watermelon (Earth), two toothpicks and a torch (Sun). Stick the toothpicks into the upper side of the watermelon one inch apart. Shine the torch towards the toothpicks and determine the length of the shadow. Write up your experiment and explain in your conclusion how the length of the shadows shows that the surface of the Earth is curved.

Week 4

Learning Indicator(s):

1. *Examine the effects of the Earth's rotation and revolution*

THEME/FOCAL AREA 2: EARTH'S ROTATION AND REVOLUTION

The Earth undergoes two movements, namely, rotation and revolution.

Rotation is the spinning or movement of the Earth around its axis from west to east. This axis is an imaginary line passing through the North and South Poles. The Earth's axis is tilted at an angle of 23½ ° to the vertical of the plane of its orbit. It takes 24 hours (i.e., a day) for the Earth to complete one rotation.

Effects of Earth Rotation

1. Day and night
2. Difference in time from place to place
3. Deflection of winds and ocean currents
4. Daily rising and falling of tides
5. Dawn and Twilight
6. Sunrise and sunset

**The teacher should employ practical examples to explain further the points listed above*.*

Revolution is the movement of the Earth in its orbit around the sun. The Earth's axis is tilted at an angle of 66½° to the plane of orbit around the Sun. It takes the Earth 365¼ days to complete one revolution around the Sun and this marks a year. A calendar or normal year is 365 days while a leap year is 366 days (Read also, Petersen & Gabler, 2014)

Effects of the Revolution of the Earth

1. It determines the length of a year
2. It causes the four seasons
3. It causes varying lengths of days and nights
4. It determines changes in the altitude of the midday sun

**The teacher should employ practical examples to explain further the points listed above*.*

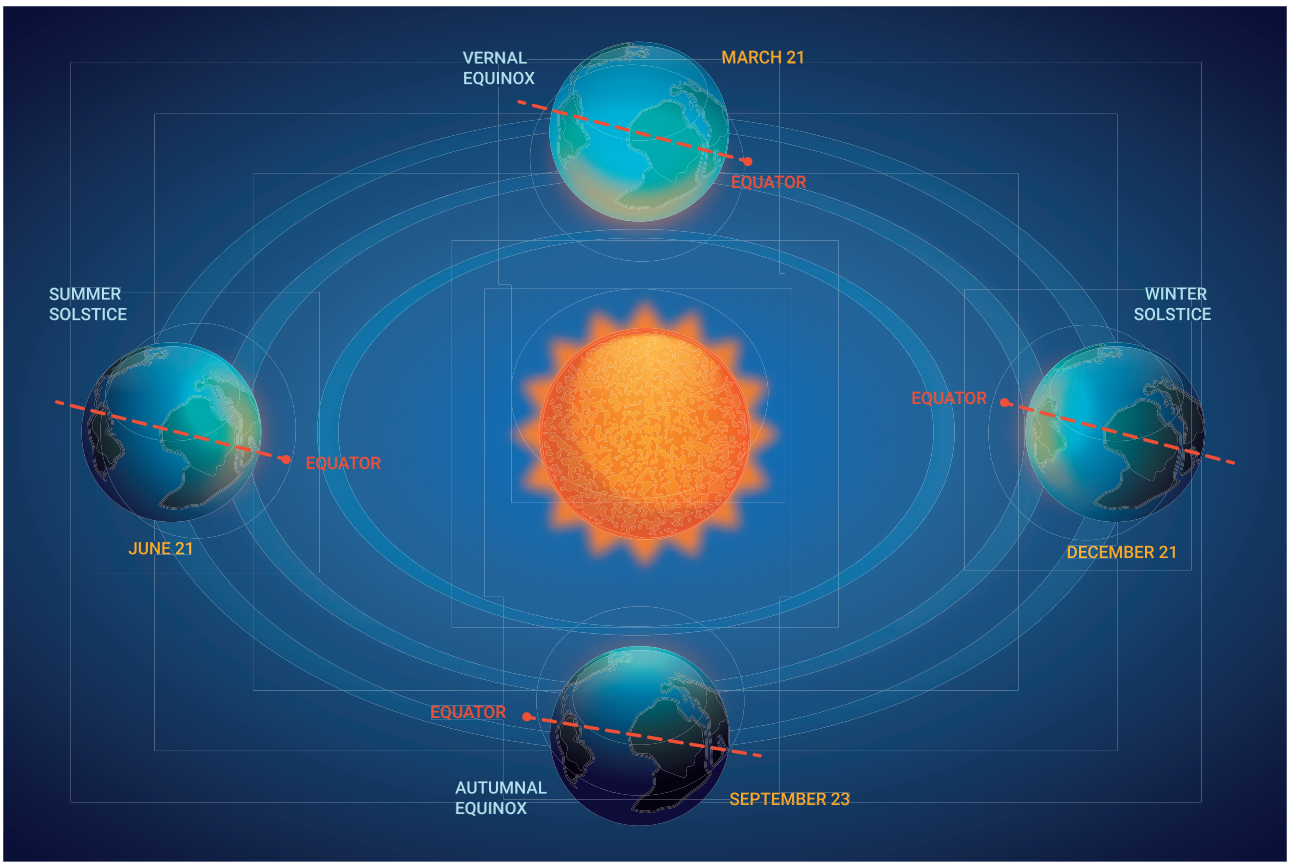

Fig. 4.1: Equinoxes and solstices: The changes in the position of the midday sun at different times of the year cause the summer solstice, winter solstice, spring/vernal equinox and autumn equinox. (National Weather Service, n.d.)

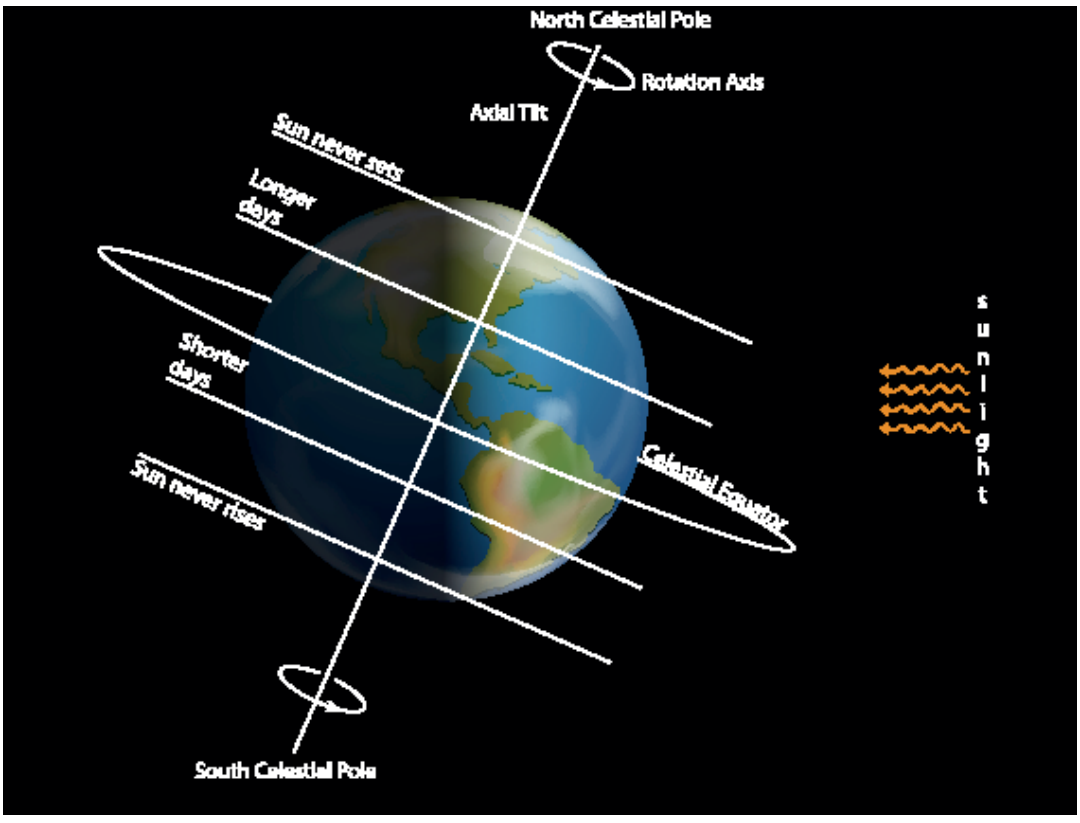

Fig. 4.2: The inclination of the Earth on its axis and orbit (Bunnett, 2014)

Eclipse

- An eclipse is formed when three bodies-the Sun, the Earth and the Moon- are in a straight line during the movements (rotation and revolution) of the Earth.
- The Moon revolves around the Earth once every 27 days.
- The Earth and the Moon move together to complete one revolution around the Sun.
- During these movements, there comes a time when the Sun, the Earth and the Moon will be in a straight line (syzygy) resulting in the formation of an eclipse (Hoskin (Ed.), 1999).

Types of Eclipse

1. **Eclipse of the Sun (Solar Eclipse)**

   This occurs when the Moon comes between the Sun and the Earth, thereby causing partial or total darkness on the Earth. It occurs during the day.

Fig. 4.3: Eclipse of the Sun (Oregon State University, 2017) Image link:https://communications.oregonstate.edu/space/what-solar-eclipse

2. **Eclipse of the Moon (Lunar Eclipse)**

   This occurs when the earth comes between the sun and the moon which blocks the sun's rays from reaching the moon.

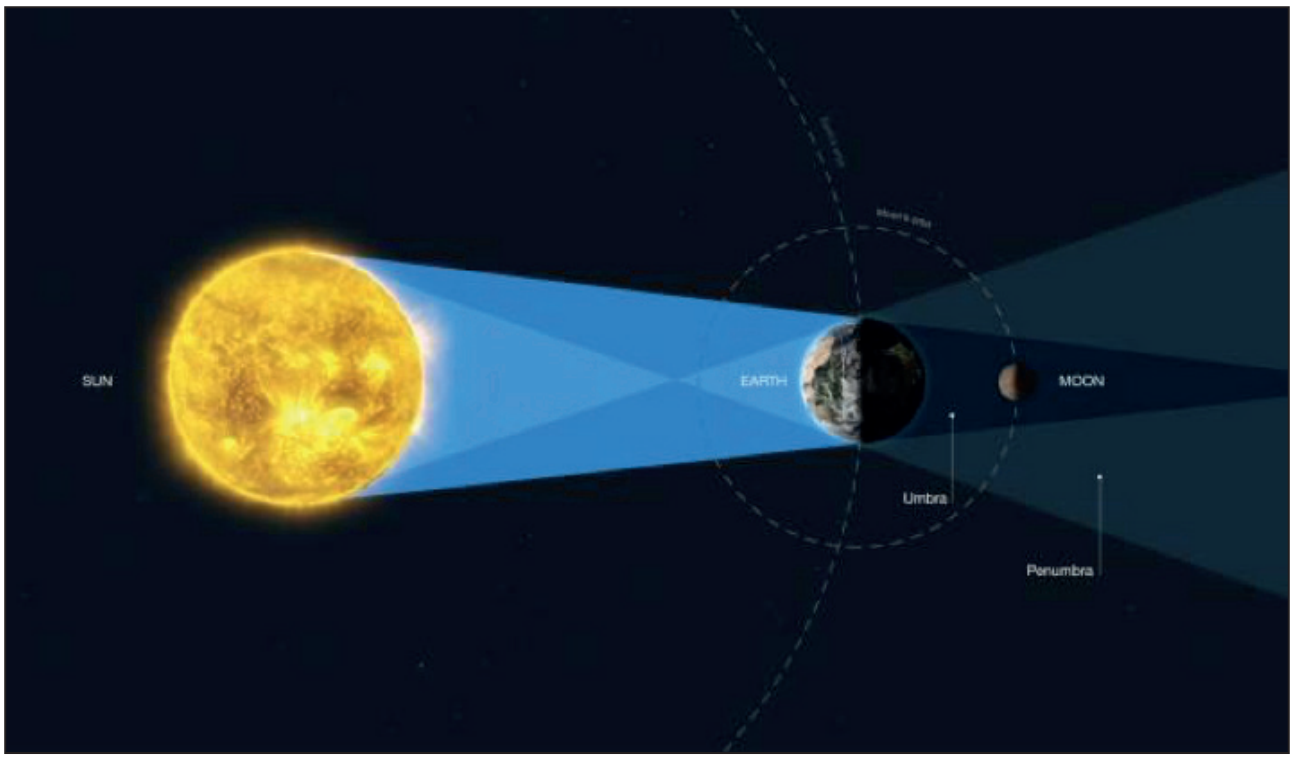

Fig. 4.4: Eclipse of the Moon (ESA Science & Technology - Lunar Eclipse, 2020)

LEARNING TASKS

1. Learners research the effects on the Earth of rotation on its axis and revolution (or orbit) around our Sun.

   The teacher should prepare resources which differentiate between abilities and are mindful of those without access to the Internet. The teacher should prepare prompt sheets for differing abilities which have clear instructions as to the level of detail and number of diagrams required. Consider the expectations for presentation and submission of the work when designing the prompts. For example, a simple prompt might be: 1. Rotation on the axis: day and night 2. Rotation on the axis and orbit: seasons.

2. Learners role play rotation and revolution. Consider how this might be done using cardboard 2D or 3D representations of the Sun and Earth which learners hold. The Earth would have to be held at the correct inclination. Consider how peer feedback might be used to strengthen understanding. Consider how equinoxes would be represented. An alternative would be to show a video before the role play or instead of it to encourage visual interpretation.

PEDAGOGICAL EXEMPLARS

Exploratory Learning:

Before the lesson, learners should research the effects of the rotation of the Earth and its revolution around the Sun from various sources such as books, the internet and the library.

1. Clearly communicate the research objectives and expectations to the learners.
2. Provide specific guidelines on the aspects of rotation and revolution they should focus on, such as duration, effects, or causes.

3. Offer a list of recommended resources, including books, websites, and library references, to help them get started.
4. Familiarise learners with effective research tools and techniques, such as using keywords for online searches or utilising library catalogue systems.
5. Demonstrate how to navigate relevant websites, databases, or library sections to find the most relevant and reliable information.
6. Introduce note-taking strategies to help learners organise their findings and track the sources they use.
7. Establish intermediate checkpoints to monitor learners' progress during the research phase.
8. Encourage learners to work collaboratively in pairs or small groups during the research phase.
9. Facilitate opportunities for peer discussions, where learners can share their findings, exchange ideas, and clarify concepts.
10. Encourage learners to support each other and provide feedback on their research process.
11. Allocate time for learners to reflect on their research and synthesise the information gathered.

Activity-Based Learning:

Role plays the revolution and rotation of the Earth.

1. Begin by explaining the concepts of revolution and rotation clearly to the learners.
2. Use visual aids, diagrams, or animations to demonstrate how the Earth revolves around the Sun and rotates on its axis.
3. Assign specific roles to learners, such as the Sun, Earth, Moon, or different seasons.
4. Allow learners sufficient time to rehearse their roles and practise the movements that represent the revolution and rotation.
5. Encourage them to work collaboratively, providing feedback and support to each other during rehearsals.
6. Offer guidance and clarification on any questions or difficulties they may encounter.
7. Observe the role plays and provide constructive feedback to learners.
8. Highlight accurate demonstrations of revolution and rotation and offer suggestions for improvement if needed.
9. Encourage learners to provide feedback to their peers, fostering a supportive and collaborative learning environment.
10. After the role plays, facilitate a discussion to reflect on the experience and reinforce their understanding of revolution and rotation.
11. Ask open-ended questions to prompt learners to share their observations, insights, and any challenges they faced during the role plays.
12. Address any misconceptions that may have emerged and provide additional explanations or demonstrations, as necessary.

Group work/collaborative learning:

In mixed ability and GESI-responsive groups, discuss the effects of the Earth's rotation and revolution with the aid of pictures, a globe, model, of the solar system. The teacher should provide targeted support for learners who may be struggling to understand the effects of rotation and revolution. Peer

support or prompts in the form of diagrams or models might provide an anchor for understanding. The teachers should offer opportunity to learners who may grasp the understanding of the effects of rotation and revolution more easily to work with others and provide support. The teacher should encourage learners who show high level of understanding of the concepts of rotation and revolution to apply this knowledge to their own personal experiences of daily and seasonal changes they experience in their own locality. Throughout the collaborative learning, teachers should formatively assess individual contributions, provide motivation using praise and reward and guide learners to achieve the highest level in the Key assessments. *Learners should be firm and fair to resist inappropriate views that might override group discussions.*

1. The teacher determines mixed ability groups, ensuring a balance of learners with different skill levels, strengths, and abilities so that others may benefit from peer support and collaboration.
2. The teacher assigns individual roles like leader, spokesperson, researcher, artist, within each group to ensure active participation and equal engagement.
3. The teacher introduces pictures, globe, and other resources available for the discussion.
4. The teacher guides how to use the resources effectively, such as identifying relevant images or using the globe to demonstrate specific concepts.
5. The teacher fosters a supportive and inclusive environment where all learners feel comfortable expressing their thoughts and ideas.
6. The teacher provides a set of scaffolded questions (if required) tailored to individual abilities to guide the group discussion starting with more straightforward questions to activate prior knowledge and gradually progress to more complex inquiries.
7. The teacher fosters a culture of collaborative learning, where higher-ability learners can provide guidance and explanations to their peers.
8. The teacher emphasises the value of teamwork and shared knowledge in achieving a comprehensive understanding.

KEY ASSESSMENT

Level 1: State one effect of the rotation of the Earth in its axis.

Level 1: State two effects of the Earth's revolution around the Sun.

Level 2: Explain how the four seasons are the result of a combination Earth's rotation on its axis and revolution around the Sun.

Level 3: With the aid of diagrams explain the equinoxes and solstices. Learners may choose to present their information digitally using an application of their choosing.

Level 3: Write summary without diagrams to explain how solar and lunar eclipses occur.

Level 4:

1. Design and draw a model that demonstrates the effects of rotation and revolution of the

   Earth around the Sun. Explain how your model shows the concepts of day and night, changing seasons, apparent sunrise and sunset.
2. Discuss the impact of the Earth's rotation and revolution on our daily lives.

Week 5

Learning Indicator(s):

1. *Use latitudes and longitudes to locate places on the Earth's surface*

THEME/FOCAL AREA 1: LATITUDES AND LONGITUDES

Latitudes are imaginary horizontal lines on the Earth's surface *measured in degrees from the centre of the earth to the North and South Poles* starting from a line called the Equator which is the Earth's largest circumference (or 0o). The North pole is 90o from the Equator, (90oN) and the South Pole is 90o from the Equator, (90oS). These imaginary lines on the surface of the Earth run parallel north and south of the Equator. Latitudes divide the Earth into two hemispheres, North and South. Because they are the same distance apart, they are also called Parallels.

Longitudes are imaginary vertical lines on the surface of the Earth *measured in degrees from the centre of the Earth* starting from a line representing 0o called the Greenwich Meridian. Lines of longitude run from the North Pole to the South Pole. Longitudes West and East of the Greenwich Meridian increase in value to a maximum of 180o. This divides the Earth into two hemispheres, West and East. All longitudes have either E or W after their measured angle (20oW, 40oE for example) except at their meeting point at 180o, which is the International Date Line. Lines of longitude are also called Meridians. The Greenwich Meridian is called the Prime Meridian because it is the starting point of longitudes. Unlike latitudes, lines of longitude get closer together as they reach the Poles making the Earth look like the segments of an orange.

Lines of latitude and longitude are used to locate places on the Earth's surface. By using latitudes and longitudes as coordinates, we can determine the precise location of any point on the earth surface.

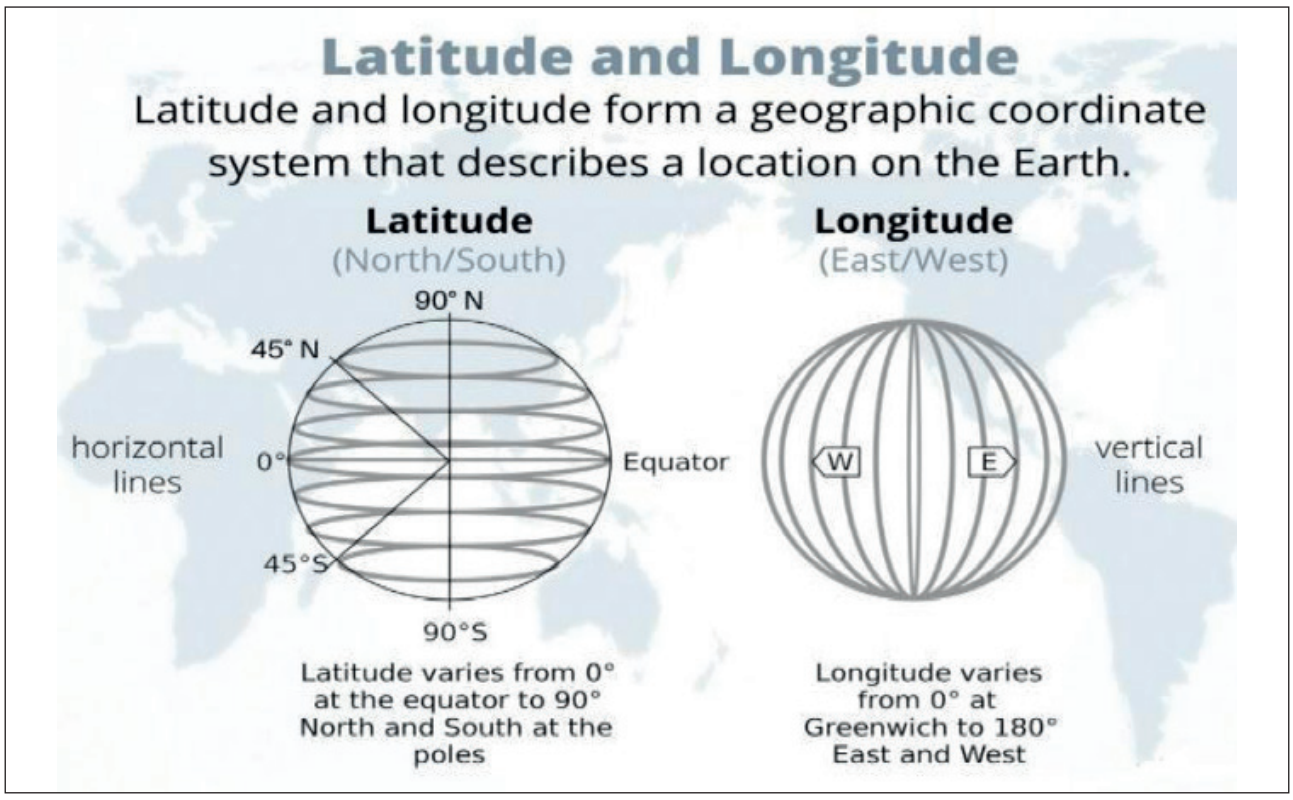

Fig. 5.1: Latitudes and Longitudes (Helmenstine, 2023)

Important Lines of Latitude

1. North Pole (90°N)
2. Arctic Circle (66½°N
3. Tropic of Cancer (23½°N)
4. Equator (0°)
5. Tropic of Capricorn (23½°S)
6. Antarctic Circle (66½°S)
7. South Pole (90°S)

Characteristics of Latitude

1. They are measured in degrees, North or South of the Equator to a maximum of 90o.
2. They are also known as Parallels.
3. They run horizontally from West to East on maps or globes.
4. The circumference of latitudes decreases from the equator towards the poles.
5. They are used in calculating linear distances on the Earth's surface.
6. The equator divides the earth into two equal hemispheres.

Usefulness of latitudes

1. They are used in calculating linear distances on the Earth's surface.
2. They combine with longitudes to give absolute location of place.
3. They demarcate the Earth into climatic zones.
4. It determines the climate and weather patterns.

Characteristics of Longitudes

1. They are measured in degrees, west or east of the Greenwich Meridian to a maximum of 180o.
2. They are also known as meridians or mid-day lines.
3. They run from the north pole to the south pole.
4. They converge at the poles.
5. They are imaginary lines.
6. Two opposite longitudes divide the earth into two equal hemispheres.
7. Each set of lines of longitude forms a semicircle.

Usefulness of longitudes

1. They are used to find local time between two places.
2. They form great circle routes which are used in navigation by air and sea.
3. They combine with latitudes to give absolute location of place.

LEARNING TASKS

1. Using the geographic coordinates provided, identify the location of the point below

   i) Point A: 22°N and 45°E

2. Using the geographic coordinates provided, identify the locations of the following points

   i) Point A: 35°N and 139°E

   ii) Point B: 51°S and 0°

3. Using an atlas map showing the physical features. Find the latitude and longitude of the following features

   i) Lake Bosomtwi

   ii) Cape Three Points

PEDAGOGICAL EXEMPLARS

Exploratory Learning

Using a globe, atlas or other resources, brainstorm the definition and characteristics of latitudes and longitudes in an all-inclusive grouping. *Learners should be able to manage their emotional reactions and behaviours using techniques such as mindfulness strategies, breathing and self-talk.*

1. Begin by introducing the globe, atlas, or other resources as valuable tools for exploring and understanding the Earth's geography.
2. Explain their purpose, features, and how they can be used to learn about latitudes and longitudes.
3. Demonstrate how to use the globe, atlas, or other resources effectively. Show learners how to locate and identify latitudes and longitudes on the globe or maps.
4. Guide learners through a structured exploration of the globe, atlas, or maps.
5. Provide specific tasks or questions that require learners to locate and analyse latitudes and longitudes. For example, ask them to *find the equator, prime meridian, International Date Line or specific coordinates of cities or landmarks*.
6. Introduce and explain key vocabulary related to latitudes and longitudes.
7. Provide definitions, examples, and visual representations to ensure learners understand the terminology used.
8. Encourage learners to ask questions and engage in inquiry while using the resources.
9. Prompt them to think critically about the significance and characteristics of latitudes and longitudes.
10. Provide opportunities for learners to share their findings, exchange ideas, and collaborate on identifying patterns or relationships related to latitudes and longitudes.
11. Offer differentiated support based on individual needs. Provide extra guidance for learners who require it, while allowing more independent exploration for those who are more proficient.
12. Provide graphic organisers or templates that help learners visually organise and compare the characteristics of latitudes and longitudes. Learners can create tables, Venn diagrams, or concept maps to identify similarities and differences between the two.

Exploratory Learning

With the aid of a globe, atlas, Google Earth or other resources, discuss how latitudes and longitudes are used as coordinates ensuring all learners are involved. The teacher should provide targeted support for learners who may be struggling to understand using latitude and longitude as coordinates. Peer support or prompts in the form of diagrams or models might provide an anchor for understanding. The teachers should offer opportunity to learners who may grasp the understanding of using latitude and longitude as coordinate more easily to work with others and provide support or provide extension exercises to identify places in Ghana given the coordinates and find the coordinates of places identified on a map of Ghana. The teacher should encourage learners who show high level of understanding of the using latitude and longitude as coordinates to apply this knowledge to features in their own locality. Throughout the exploratory learning, teachers should formatively assess individual contributions, provide motivation using praise and reward and guide learners to achieve the highest level in the key assessments. Learners should be able to manage their emotional reactions and behaviours. By doing that they learn to be patient and hard working.

1. Teachers familiarise learners with latitudes and longitudes in context (globe, atlas).
2. Teachers use the selected resources (globe or atlas) to visually demonstrate and highlight specific lines of latitude and longitude.
3. Teachers show learners how lines of latitude run parallel to the equator and measure the distance north or south of it, while lines of longitude run from pole to pole and measure the distance east or west of the prime meridian.
4. Teachers show a map of Ghana which has latitudes and longitudes.
5. Teachers explain using visual aids and anecdotes, how to use latitudes and longitudes as coordinates (latitudes flat (always first), longitudes vertical leading to 'you have to go through the door before going upstairs)
6. Teachers encourage them to locate places on their Ghana map using latitudes and longitudes. Ask individual learners to find and give examples, using probing questions and use further examples as a formative assessment opportunity.
7. Facilitate small-group or whole-class discussions where learners can share their findings, ask questions, and engage in peer-to-peer learning.
8. Demonstrate how to use the features of Google Earth to locate and analyse different latitudes and longitudes across the globe.
9. Provide opportunities for learners to summarise their learning and reflect on how to use latitudes and longitudes to locate places on the Earth's surface.
10. Encourage them to articulate their understanding through verbal or written explanations, diagrams, or presentations.

KEY ASSESSMENT

Level 1: Name five key lines of latitude.

Level 1: Name the line of longitude which represents 0o.

Level 1: List all the countries through which the Greenwich Meridian passes.

Level 1: List all the countries through which the Equator passes.

Level 2: Find the Latitude and Longitude coordinates for the cities of Accra, Abuja, Banjul, Dakar, Kinshasa and Luanda.

Level 2: What geographical features can be found at:

1. 0°, 33°E
2. 3°S, 37°E
3. 17°S, 25°E

Level 3: Find the approximate latitude and longitude coordinates for at least 10 capital cities outside of Africa.

The teacher should use more descriptive language and provide basic guidelines for the presentation to be done. Encourage learners to be confident and self-motivated in their presentation delivery.

Week 6

Learning Indicator(s):

1. *Calculate distances using latitudes and time using longitudes*

THEME/FOCAL AREA 2: CALCULATING DISTANCES USING LATITUDES AND TIME USING LONGITUDES

Distances along the same line of longitude can be calculated by working out the approximate distance in kilometres represented by one degree of latitude. Once this distance has been calculated and the difference in latitude is known then the distance can be determined.

Time differences between places can be calculated by working out the approximate time represented by one degree of longitude. Once the time represented by one degree is calculated and the difference in longitude is known then the time difference can be determined.

A. Calculation of Distances using Latitudes

Principle: Earth's POLAR circumference is approximately = 40,008km

if 360° = 40,008

therefore 1° = 111.13 km (correct to 2dp)

Procedure used in calculating distances between two places at different latitudes on the same line of longitude

Locate the two places involved

1. Find the difference in latitudes in degrees
   - Where it is North-North, subtract (-)
   - Where it is South-South, subtract (-)
   - Where it is North-South or South-North, add (+)
   - Where it is Equator (0°) to Northern Hemisphere/South Hemisphere, add (+)
2. Multiply the answer by 111.13 km to get the distance

Worked Examples

1. Calculate the distance between place 'X' on the equator and 'Y' on latitude 5°N.

   Solution

   Procedure 1: Locate places involved

   Place 'X' = 0°

   Place 'Y' = 5°N

   Procedure 2: Find the difference in latitudes

   Difference in latitudes = 0° + 5°N

   = 5°

   Procedure 3: Multiply the answer by 111km to get the distance

   Distance between Place X and Place Y = 5 × 111.13km

   =555.65 km (2dp)

2. What will be the approximate distance between two countries that span on latitudes 10°N and 8°S on the same longitude?

Solution

Procedure 1: Locate places involved

Country A =10°N

Country B = 8°S

Procedure 2: Find the difference in latitudes

Difference in latitude = 10°N + 8°S

= 18°

Procedure 3: Multiply the answer by 111km to get the distance

Distance between Place X and Place Y = 18 × 111.13km

= 2000.34 km

Note that this method cannot be used to calculate the distance between places on different lines of longitude.

B. Calculation of Time using Longitudes

Local Time/Solar Time

Each Meridian has its local time. Since the Earth completes one rotation in approximately 24 hours, each hour corresponds to 15 degrees of longitude (There are 360 degrees in a full rotation (a circle) so 360 degrees / 24 hours = 15 degrees per hour or 15 degrees per 60 minutes). To work out the time difference for one line of latitude a simple calculation is done; 60 minutes / 15 degrees = 4 minutes per degree. Therefore, each degree of longitude represents a time difference of 4 minutes. The local time of places in the east is ahead of the local time of places in the west. This means that a country with a wider longitudinal extent may have numerous local times. To avoid confusion in the usage of time and date, Standard Time is applied.

Time Zones

The Earth is divided into 24 time zones, each representing 15° longitudinal extent with the Prime Meridian serving as the reference point. The time of places in the east is ahead of the time of places in the west.

Standard Time

This refers to the uniform time within a specific time zone that is commonly used as a reference for a region's clock and schedules. It is the time that is generally adopted by governments and organisations to create consistency and facilitate coordination within a particular geographic region. The chosen meridian is often called the standard meridian for that time zone and the time at this meridian is considered the standard time for the entire zone. Each standard time zone is defined by an offset from the Greenwich Mean Time (GMT) or Coordinated Universal Time (UTC). This offset represents the difference in hours between the Standard Time of the zone and GMT/UTC. For instance, East African Time (EAT) in Kenya is UTC+03:00 which means it is three hours ahead of UTC. Countries such as Russia have 11 standard time zones ranging from UTC+2:00 to UTC+12:00.

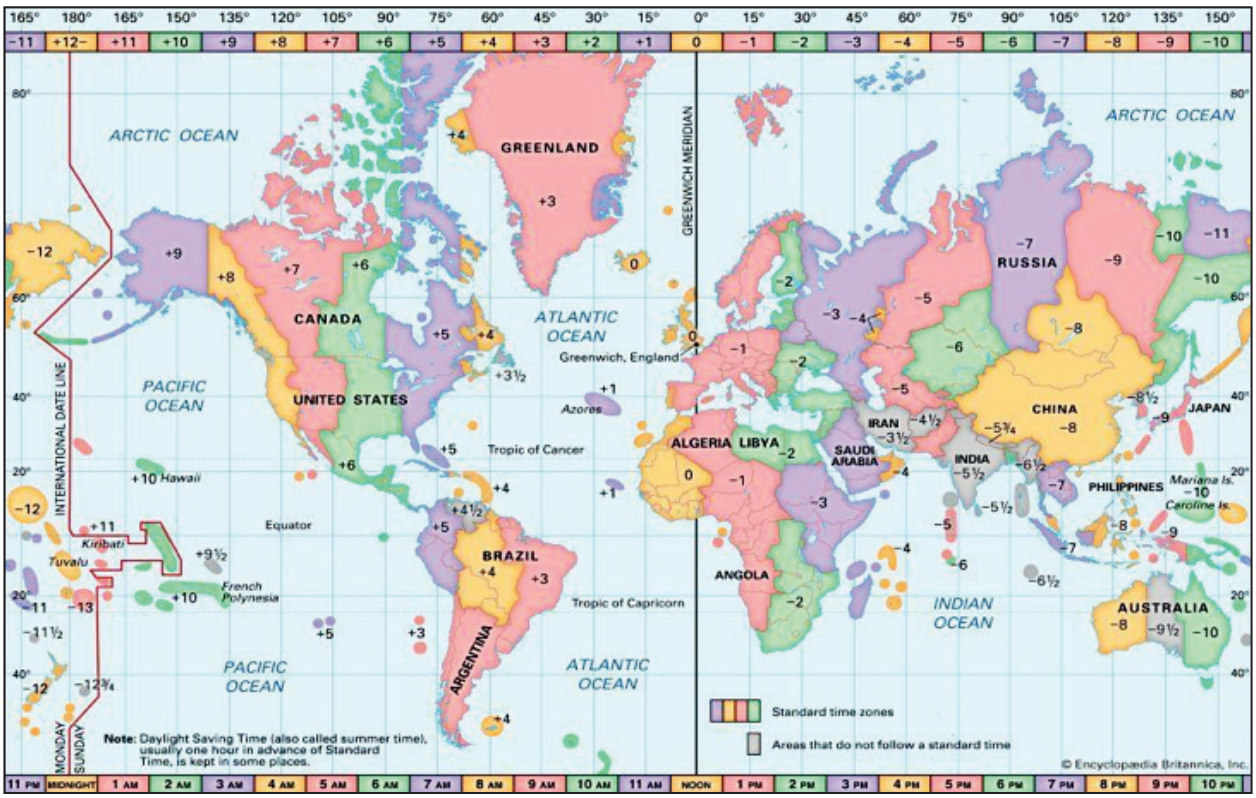

Fig. 6.1: GMT, UTC and Time Zones (Betts, 1998)

Greenwich Mean Time (GMT)

It is a time standard based on the mean solar time at the Prime Meridian, which passes through Greenwich, London. The Prime Meridian (Longitude 0°) is the reference point and the time at this meridian is considered the baseline for GMT. It is important to know that GMT does not observe daylight saving time adjustments. In the UK, GMT is sometimes used to refer to standard time during the non-daylight-saving period while BST (British Summer Time) is used during daylight saving period.

Procedure used in calculating time differences between places

1. **Locate** the two places and their longitudes.
2. Find or calculate the **longitudinal differences** of the places. Note that the rule is, IF:
   I. the two given places are on the lines in **same hemisphere**
   (i.e., both West or both East = Subtract **(–)**
   II. the two given places are the lines in **different/opposite hemispheres**
   (i.e. one east one west) = **Add (+)**
   III. one place is on **Greenwich Meridian (0°)** and the other is on a line in **Eastern Hemisphere or Western Hemisphere** = **Add (+) / Subtract (–)**
3. **Convert or change** the longitudinal differences to time.

   Note: 24 hours = 360°
   1 hour = 15°
   4 minutes = 1°
4. If the time at one place is known then apply the rule above to calculate the time at the second place. Remember movement to the **EAST** from Greenwich **(Gain/Add/Ahead of time)** and movement to the **WEST** from Greenwich **(Loss/Subtract/Behind time)**

Worked Examples

1. The longitude of Station X is 0°and that of Station Y is 45°E.

(i) Is Station Y ahead or behind Station X and by how many hours?

(ii) Calculate the time of Station Y if Station X is 3pm.

Solution:

Longitude of Station X = 0°
Longitude of Station Y = 45°E
Longitudinal Differences = 45° - 0°
= 45°

But 15° = 1 hour
Therefore 45° =
Therefore, time difference = 3 hours

(ii) Time at Station X = 3pm
Time at Station Y = 3pm + 3 hours **(since Station Y is ahead of Station X, add)**
= 6pm

Therefore, the time at Station Y is **6pm**

Calculating Time Using Longitudes (Same Hemisphere):

2. Find the local time in Town X, on longitude 70°E, when the time in Town Y, longitude 15°E is 5pm.

Solution:

Longitude of Town X = 70°E
Longitude of Town Y = 15°E
Longitudinal Differences = 70° - 15°
= 55°

But 15° = 1 hour
Therefore 55° =
= 3 hours and 10°
But 1° = 4 minutes
Therefore 10° = 10 × 4 minutes
= 40 minutes
Therefore, time difference = 3 hours 40 minutes
Time at Town Y = 5pm
Time at Town X = 5pm + 3 hours 40 minutes **(since Town X is ahead of Town Y, add)**
= 8:40pm

The local time at Town X is **8:40 pm.**

Calculating Time Using Longitudes (Different Hemispheres):

3. If John in Thailand, 100°E telephones a friend in Liberia, 10°W on Monday, 11th August 2015 at 5am, calculate the time and date that the friend will receive the call.

Solution:

Longitude of Liberia = 10°W
Longitude of Thailand = 100°E
Longitudinal Differences = 10° + 100°
=110°

But 15° = 1 hour

Therefore 110° =
= 7 hours and 5°
But 1° = 4 minutes
Therefore 5° = 5° × 4 minutes
= 20 minutes
Therefore, time difference = 7 hours 20 minutes
Time at Thailand = 5am
Date in Thailand = Monday, 11th August 2015
Time at Liberia = 5am − 7 hours 20 minutes **(since Liberia is behind Thailand, subtract)**
= 9:40pm
Date in Liberia = Sunday, 10th August 2015
John's friend will receive the call **9:40pm, Sunday, 10th August 2015**

4. A football match is being played at 6:00pm (18:00 GMT) in Town Y, which lies on Longitude 125°E. If this match is being telecast live across the world at what time will people in Town T, which lies on Longitude 120°W watch the match.

Solution:
Longitude of Town Y = 125°E
Longitude of Town T = 120°W
Longitudinal Differences = 125°+ 120° = 245°
But 15° = 1 hour
Therefore 245° =
= 16 hours and 5°.
But 1° = 4 minutes
Therefore, 10° = 10° × 4 minutes
= 20 minutes
Therefore, time difference = 16 hours 20 minutes
Time at Town Y = 6pm (18:00 GMT)
Time at Town T = 18:00 GMT - 16 hours 20 minutes **(since Town T is behind Town Y, subtract)**
= **1:40am**
People in Town T which lies on longitude 120oW will watch the match at **1:40am**.

Calculating Longitudes Using Local Time of Places:

Procedure:

1. Locate the two given places.
2. Find the time differences.
3. Multiply the time differences by 15o or 1o to get the longitude.
4. Adjust the longitude to the West or East as determined by the question. That is, **subtract if it is West** or **Add if East**.

Worked Examples

1. Find the Longitude of Town A whose local time is 9:00am when it is 4:00pm the same day in Town B, 30°E.

Solution:
Note: 4:00pm is ahead of 9:00 am so Town B (30°E) is at the East or right of Town A.
Time at Town A = 9:00am
Time at Town B = 4:00pm

Time Differences = 4:00 pm – 9:00 am (16:00 GMT – 9:00 am)
= 7 hours
But 1 hour = 15o
Therefore 7 hours =
= 105°
Longitude of Town B = 30°E
Longitude of Town A = 105° - 30° (Subtract since Town A is behind Town B)
= 75°W
Since Town A is on the West (Subtract). The Longitude of Town A is **75 o W.**

2. If the local time in London, 0° is 12 noon and the time in Dhaka (Bangladesh) is 6pm, what is the longitude of Dhaka?

Solution:
Note: time in Dhaka (6:00pm) is ahead of London's time (12:00 noon), so Dhaka is at the East of London, 0°.
Time in London = 12:00 noon
Time in Dhaka = 6:00 pm (18:00 GMT)
Time Differences between countries = 18:00 GMT – 12:00 noon
= 6 hours
But 1 hour = 15°
Therefore 6 hours =
= 90°
Longitude of London = 0°
Longitude of Dhaka = 0°+ 90° (Since Dhaka is at the East of London, Add)
= 90°E
The Longitude of Dhaka is **90 o E**

International Date Line (IDL)

IDL is an imaginary line that approximately follows the 180° longitude. It passes through the Pacific Ocean. It serves as the demarcation lines between two consecutive calendar days. IDL is not a straight line but deviates (it is zigzag) to accommodate political and territorial boundaries. This is to ensure that certain countries or island groups remain within the same day. A traveller crossing the dateline from east to west (right to left) loses a day while crossing the dateline from west to east (left to right) he gains a day. For example, when it is midnight, Sunday on the Asiatic side, by crossing the line eastwards, he/she gains a day; it will be midnight Saturday on the American side.

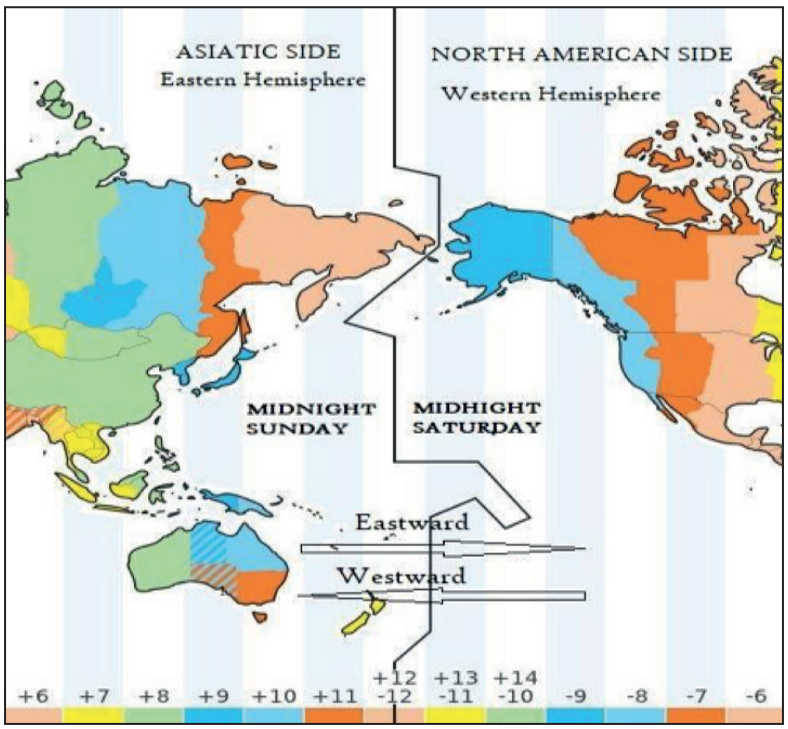

Fig. 6.2: International Date Line (Gonzales, 2015)

Note: *Losing or gaining a day when one crosses the IDL westward or eastward respectively, is paradoxical. For instance, when the traveller crosses the dateline eastward thus from Sunday to Saturday, he/she will have another Sunday to relive.*

LEARNING TASKS

1. What is the distance between Tema on latitude 6°N and Bawku on latitude 11°N?
2. Calculate the distance, in kilometres, between the Tropic of Cancer and the Tropic of Capricorn.
3. A football match between Black Stars and Super Eagles is to be played at Baba Yara Sports Stadium On longitude 0° at 5pm at what time will football fans in Lagos, on longitude 15°E, tune in to watch on the television sets?
4. It is noon at Point X (longitude 35°E, what will be the time at Point Y, on longitude 20°W?
5. If the time at longitude 100° E was 5 a.m. Monday 24th July 2023, what was the:
   - **I.** time at longitude 10° W
   - **II.** day at longitude 10° W
   - **III.** date at longitude 10° W

PEDAGOGICAL EXEMPLARS

Project Based and Collaborative Learning:

Using maps or other resources, and in manageable mixed ability groups, calculate distances using latitudes and time using longitudes. The teacher should provide targeted support for learners who may be struggling to understand the concept of distance and time difference calculations. Peer support or

prompts in the form of diagrams or models might provide an anchor for understanding. The teacher should offer extended opportunities to learners who may grasp the understanding of how distances along the same line of longitude and how global time differences can be calculated. These learners may also be guided to provide peer support to others within the mixed ability groups. The teacher should encourage learners who show high level of understanding of the time and distance calculations to apply this knowledge to more complex activities like calculating distances between two places on different lines of latitude and longitude. Throughout the collaborative learning, teachers should formatively assess individual contributions, provide motivation using praise and reward and guide learners to achieve the highest level in the key assessments.

1. Assess learners' prior knowledge of latitudes, longitudes, distance, and time concepts. Identify any knowledge gaps or misconceptions that may impact their understanding.
2. Break down the process of distance and time calculations using latitudes and longitudes into step-by-step instructions.
3. Provide clear and detailed explanations of each step, emphasising the key mathematical operations or conversions involved.
4. Utilise visual representations, such as maps and diagrams to enhance learners' understanding and demonstrate how to measure distances or calculate time differences using these visual aids.
5. Use real-world examples to illustrate the application of distance and time calculations. Show learners how these calculations are used in scenarios such as flight planning, global communications, or determining time differences for international events.
6. Provide scaffolded practice exercises that gradually increase in complexity. Start with simple calculations and gradually introduce more challenging scenarios.
7. Offer support and guidance as learners work through the exercises, providing feedback and clarification as needed.
8. Encourage learners to analyse and identify potential errors in their calculations. Teach them to double-check their work and consider factors such as rounding, units of measurement, or conversion errors.

KEY ASSESSMENT

Level 1: What is the distance represented by one degree of latitude.

Level 1: What is the time represented by one degree of longitude.

Level 2: Using globes and atlases, determine the latitudinal and longitudinal differences between

Tema (Ghana) and Addis Ababa (Ethiopia).

Level 3: Using globes and atlases

1. Calculate the time difference between two locations, examples Tema (Ghana) and Addis Ababa (Ethiopia).
2. Calculate the distance between two locations, example Tema (Ghana) and London (England).

Level 3: Utilising globes and atlases,

1. Determine the longitudinal difference between two locations across the Greenwich Meridian, example Dakar (Senegal) and Tokyo (Japan).
2. Determine the time difference between two locations across the Greenwich Meridian, example Dakar (Senegal) and Tokyo (Japan).

3. Calculate the time in one location, for example, the time and date in Tokyo (Japan) assuming the time in Dakar (Senegal) which is at the other side of the Greenwich Meridian is 1:00 PM on Monday, 22 March 2024.

Level 4: Research and apply a method to calculate the distance using latitude and longitude between Tema and New York.

Section Review

This section focused on amalgamated weeks lessons, which is Week 3, 4, 5, and 6. Learners delved into the proofs of the earth's shape, the movements of the earth, as well as latitudes and longitudes and their usefulness. It adopts learner-centred pedagogies such as exploratory learning and activity-based learning that ensure active participation of learners, critical thinking and self-confidence. The section includes differentiated content, pedagogies and assessment strategies to meet different learning abilities of learners.

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SECTION 4: MAPPING ESSENTIALS AND RELIEF REPRESENTATION

Strand: Navigating our Environment

Sub-Strand: Maps, their Elements and Analyses

Learning Outcome: *Based on your knowledge on maps, examine the different types of maps, their importance and map scales.*

Content Standard: Demonstrate understanding of maps, their importance and the map scales.

INTRODUCTION AND SECTION SUMMARY

This section dives into the exciting world of maps, your essential tools for navigating the planet. Learners will explore different types of maps, each revealing unique information. Ever wondered how some natural and artificial features are shown on maps? Learners will crack the code and learn about various methods, like contour lines, which bring Earth's diverse landscapes to life on paper. By understanding different map types and how they represent relief, learners become good users of maps, with the ability to understand marginal information of maps, plan adventures, and truly appreciate the amazing variety of our planet's surface.

The week(s) covered by the section is/are:

***Week 7**: Maps and their importance; and Map Scales and their Conversion*

***Week 8**: Methods of Representing Relief on Maps and Using Contours to Represent Relief on Topographic Maps.*

SUMMARY OF PEDAGOGICAL EXEMPLARS

This section employs a range of engaging teaching methods to encourage participation and cater for diverse learning styles. This will promote active learning and ensure everyone benefits from the differentiated instruction provided. These pedagogies include Talk for learning specifically activities like brainstorming, Activity-Based learning and Collaborative learning.

ASSESSMENT SUMMARY

In line with the designated focal areas for discussion, the teacher is anticipated to utilise diverse formative assessment methods, including both individual and group projects. These approaches prioritise the learner's engagement and assess their understanding across different levels of knowledge depth, thus fostering autonomy, independent learning, and collaborative skills among learners. Moreover, they encourage the development of lifelong learning competencies. This section aims to equip learners with critical thinking and reasoning skills. Consequently, the teacher should craft their inquiries based on the appropriate Depth of Knowledge necessary for evaluation. Additionally, the teacher should be mindful of discrepancies in the learners' abilities and provide appropriate support as needed.

Week 7

Learning Indicator(s):

1. *Discuss the types of maps and their importance*
2. *Explain the concept of map scale and convert from one scale type to another*

THEME/FOCAL AREA 1: MAPS AND THEIR IMPORTANCE

- A map is the graphical representation of the entire earth surface or a part of it on a medium-wall, paper, ball, and leather, usually drawn to scale.
- Digital maps are electronic representation of maps and other geographic information on electronic devices such as computers, smart phones and navigation systems.
- Examples include Google maps, Apple maps, Bing maps and OpenStreetMap.

Elements of a Map

1. Title
2. Legend/key
3. Scale
4. Direction
5. Date
6. Margins/frame
7. Authorship

Types of Maps

There are two main types of maps, they are:

1. **General purpose maps:** These are maps that combine two or more themes, signs and symbols to represent both natural and human-made features. Examples include topographical maps, cadastral maps and aeronautical maps.
2. **Thematic maps:** They are maps that focus on specific themes, idea, subjects or topic, such as geological maps, relief maps, vegetation maps, drainage maps, climatic maps and political maps.

Importance of maps include

1. Maps show regional and national boundaries of a place.
2. Maps show water bodies with blue colour.
3. Maps show both natural and human-made features.
4. Maps show the geographic distribution of the monthly or annual average values of climatic variables.
5. Maps show the specific type of economic activity or natural resources.
6. Maps show major and minor highways and roads in detail.
7. Maps are essential tools for navigation, i.e., determining location, plan routes and reach destinations efficiently.

8. Maps help to summarise geographical ideas and findings.

LEARNING TASK

The teacher should help learners engage with the following learning tasks to help reinforce understanding and acquire new knowledge or skills._*The teacher might vary resources and tasks according to learner needs. The tasks can be done as individual, pair or group work but they should be structured in all cases to stretch and challenge all learners. Probing questions and verbal prompts should be used by the teacher while the tasks are being undertaken to formatively assess understanding.*

1. Learners explore different maps and note down what they show. The teacher should provide a range of different maps and structure tasks according to ability and consider any learners with visual impairment, providing a facilitator, peer buddy or partner to explain what each map shows. As this is practical Geography, a range of maps both general purpose and thematic should be provided of different scales from basic maps of the school grounds, local road maps, national maps, to more complex examples. The focus is hands-on experience and maps used should focus on Ghana. Individual learners, pairs or groups present findings. The teacher should moderate discussions and collect key findings using a flip chart or whiteboard, being prepared to add to or explain relevant details or misconceptions. Scales, keys, direction and titles should be present on all maps as a minimum. Key questions might be: Why does a map need a scale?, Why a key?, Why a compass point? The following might be used by the teacher as a source of up to date maps of Ghana:

   https://gisgeography.com/ghana-map/https://www.orangesmile.com/travelguide/ghana/country-maps.htm

2. On their own learners make mental maps of their school/local area/Ghana. This is primarily a short task which focuses on differences in learner perception and leads to answering the question 'why do we need maps?' Teachers should give structured guidelines as to what should be included on the maps. Learners peer assess each other's work following guidance from the teacher on what they are looking for. At a minimum, the teacher should specify places, distances and direction. For example, the school area map might specify: Make a map of your school which shows the main features like buildings, green areas, playgrounds, entrances, pathways. Ask peers to critically assess the usefulness of the map to a visitor or new pupil finding their way around. Similarly local maps might include the learners' home, local landmarks, markets, shops, and streets and ask whether learners could find their way using a local map prepared by someone else. A key question should be 'how long would it take to get to a place using the map? Or what direction would you walk/drive in.

3. Learners explore digital maps using the Internet. The focus of this task is to show how maps have changed with the widespread use of digital technology. The teacher should prepare the structured tasks in order to stretch and challenge the most able students while providing scaffolded support for those who find understanding maps difficult. The teacher should be aware that some learners find interpreting two dimensional images difficult and find the relationship between scale and distance challenging. Teachers might ask students to use Google Maps or some other application to explore their local area. The teacher should be aware that applications vary with the device and the web browser they are using so any tasks should reflect this variation. Using Microsoft Edge and Google maps explorations of the capital city of Ghana might be along the lines of:

   1. Identify key map features (roads, rivers, green and protected areas, named features)
   2. Explore scale by zooming in and out.

3. Explore and add to the buttons which relate to specific places of interest like hotels and restaurants.
4. Explore map details, tools and types like terrain, traffic, satellite
5. Use directions to make journeys by foot and car from and to specific places.

Learners should write a bullet point summary of what digital maps can show and do. The teacher collects the summaries to use as formative assessment for digital skills, returning them to learners at the earliest opportunity with a short constructive written comment relating to the breadth of uses for digital maps learners have listed.

PEDAGOGICAL EXEMPLARS

Talk for learning and Collaborative Learning: Ask learners to brainstorm on the definition of maps, elements, types and importance of maps. This exercise should be based on visual experiences using examples provided by the teacher in hard copy and digital. Paper, book-based and digital maps should be included in the brainstorm and the teacher should ask for and write down responses from learners on a flip chart or whiteboard. The teacher should moderate discussions, being mindful of the different abilities of learners and ask probing questions of increasing difficulty that will stretch and challenge all individuals. *Ensure no biases during the brainstorming and consider the diverse views from learners. Learners should embrace the differences in the responses.*

A. Talk for Learning/Collaborative skills:

1. Create a supportive and non-judgmental environment where learners feel comfortable sharing their thoughts and ideas. Encourage active participation and assure learners that all contributions are valued.
2. Clarify that the goal is to generate a wide range of ideas and perspectives related to maps, their elements, types, and importance. Emphasise that there are no right or wrong answers at this stage.
3. Begin with a warm-up activity to get learners thinking about maps. Ask learners to discuss in pairs and write down in single words their first thoughts about maps. Allow a short period of time before responses are collected. Learner pairs could be asked to share one word or thought either coming forward and writing in a collective area, or a teacher/facilitator might do this. The teacher should be mindful of the different abilities and degree of confidence when asking them to share their answers in this way. The teacher might stimulate learners to provide written thoughts by asking open-ended questions or prompts, such as "*What comes to your mind when you hear the word 'map'*?" or "*What do you think maps are used for*?"
4. Encourage learners to freely share their ideas and thoughts without judgement or criticism. Emphasise that learners can build on one another's ideas and think creatively.
5. Guide the discussion by asking probing questions, summarising ideas and encouraging learners to elaborate on their contributions. Ensure that all learners have an opportunity to participate and that quieter learners are encouraged to share their thoughts.
6. Conclude the brainstorming session by summarising the main ideas generated. Engage learners in a reflective discussion about the process and outcomes of the brainstorming session.
7. Ask learners to write a brief learning summary to describe what they know about the different kinds of maps and their uses which might be used as a formative assessment opportunity.

B. Activity-based Learning:

Small Groups. *What are maps and why are they important? Teachers use a carefully chosen selection of different maps for learners to look at to answer this question.*

Introducing the group work

1. The teacher should set clear learner expectations of conduct during group work on maps, based around respecting equality, inclusivity and diversity.
2. The teacher should set ground rules that make it clear all learners should participate and all contributions to answer the question 'what are maps and why they are important?' should be equally valued.
3. The teacher should outline each stage of the group work. A time limit might be set for completion, up to 5 minutes. The teacher should be mindful of the concentration span of learners in mixed ability groups over periods longer than five minutes.
4. The teacher should make assessment outcomes clear and state how assessment will be undertaken. In this case written feedback from each group member is required to answer the question 'what is a map and why are they important?' The teacher should be clear what needs to be submitted for assessment.
5. The teacher should be mindful of visual or other impairments which need to be taken into consideration to enable active participation of each learner in the pair or group work and provide resources or assistance to mitigate these issues.

During the group work

1. Mixed ability groups of no more than three should be pre-determined by the teacher.
2. The teacher should set a clear period for the task which gives learners enough time to engage. In this case the learners should use the map resources by the teacher.
3. The teacher should supervise during this time by moving between groups, probing progress, checking if direction is leading to a positive outcome, suggesting ideas, and answering any questions.
4. The teacher must hold a short debrief/feedback session at the end of the group work to gauge the level of understanding and address issues. Teachers should be mindful of any impairments, gender inequalities, levels of confidence and such like when asking learners to feedback discoveries or ideas to an open floor. Alternatives to open floor feedback after pair or group work which minimise these issues might be the collection of anonymous written summaries/notes/ bullet points which are read out by teachers and transcribed by facilitators. In more confident groups, teachers might call on several learners to share a summary of their conclusions. The teacher must address any misconceptions or clarify any confusing points.

5 The teacher undertakes post de-brief formative assessment opportunities by directing individual learners to write either a summary of what their discoveries were in a short paragraph or as a list of points.

B. Using ICT for Activity/Inquiry-based learning. Learners use the Internet and a map application to explore the practical use of digital maps.

Inquiry-based learning is a learner-centred approach which starts with an essential question. Learners research and investigate themselves to find answers to the question, developing practical Geographical knowledge and skills throughout their inquiry. The learner plays an active part in both their learning and the decision-making processes they make which lead them to an answer.

At the centre of inquiry-based learning is curiosity and a desire to find out more. This approach is particularly suitable for practical Geography as it motivates learners to find out for themselves new information that they did not have before. Inquiry work is teacher planned, involves individual research and discovery, presenting findings and reflective practice.

Learners complete an ICT based inquiry which introduces them to digital maps. The key question is 'what use are digital maps to practical Geographers?' To answer this question learners will explore a digital map application.

Before the activity

1. The teacher should set clear learner expectations for individual conduct during the inquiry.
2. The teacher should be clear to learners what needs to be submitted for assessment.
3. The teacher should discuss each stage of the inquiry before the start of the activity. Stages might be:
    - Question & Plan – Question: what use are digital maps to practical Geographers? Plan: Use a Google Map of Accra to find features that might be useful to practical Geographers. The teacher should be mindful of access to resources and determine these are present before embarking on the activity. Computers or smartphones with access to the Internet and Google maps are necessary. General features should be listed, and the teacher should demonstrate how to expand some of the screen menus. The plan should include what learners need to prepare for assessment.
    - Research & Discover – Research should be time limited and focused; discoveries should be noted using suitable medium, notebook, word processer document.
    - Organise & Present – Learners should organise their notes and determine the level of success in answering the question. At this stage, the teacher should remind learners what is required for assessment.
    - Reflection - The teacher should encourage learners in a supportive and sensitive way, using positive praise and reward, to reflect on the success of their inquiry. The teacher might ask learners to write two things that went well and one thing that could have been done better. These might be used as feedback for a teacher led class reflection to inform future inquires.

During the activity

4. The teacher should be mindful of different levels of digital skills and visual or other impairments which need to be taken into consideration to enable the active participation of each learner. The teacher should provide additional scaffolded resources, extension work which will stretch and challenge or learning support.
5. The teacher should supervise during their research, visiting individuals one at a time, probing progress, answering any questions.
6. The teacher should allow time for learners to write a summary of their discoveries which answers the inquiry question. The teacher should be mindful of different abilities and accept summaries which range from a list of points following a brief answer to a structured conclusion which outlines the new knowledge discovered in support of their answer.
7. The teacher should lead a reflective class discussion encouraging feedback from learners and making comparisons with other types of maps they have already seen.

KEY ASSESSMENT

Level 1: State five elements of a map.

Level 1: Describe what a key is used for on a map

Level 1 : Describe what a scale is used for on a map

Level 2 : Explain the difference between general purpose maps and thematic maps.

Level 2: Explains the practical importance of maps to people

Level 3: Outlines the features shown by digital maps and critically compares digital maps with printed versions.

THEME/FOCAL AREA 2: MAP SCALES AND THEIR CONVERSIONS

- A map scale is expressed as the relationship between distances on any two points on the map and the corresponding distances on the ground.
- Alternatively, a map scale is the ratio between distances on a map and the actual distances on the ground.

Types of Scales

1. **Statement (Verbal) Scale:** This is the expression of scale in words. E.g., one inch represents one mile, one centimetre represents one kilometre (1 cm represents 1 km).
2. **Representative Fraction/Ratio Scale (R.F):** This is the expression of a scale in the form of a fraction or ratio. The R.F. always has a numerator of one. It shows the ratio of length on the map to distance on the ground; if, for instance, a map has an R.F. of 1/125,000 or 1:125,000, then a length of 1 unit on the map represents 125,000 units on the ground. Representative fractions are not written in any particular unit of measurement.
3. **Linear/Graphic Scale:** This scale is a segmented line that enables distances on the maps to be measured directly. It is a line drawn and accurately graduated to show lengths. Linear scales may be stated in either metric or imperial units. It is divided into primary and secondary divisions.

Reading and conversion of a linear scale from a given Topographical map to Statement and R.F scales.

1. Take note of the primary and secondary divisions and the unit of measurement, usually in metric units on the primary divisions, starting from 0 to the maximum.
2. Place a ruler on the linear scale, ensuring that 0 cm on the ruler corresponds with 0 km on the linear scale of the map.
3. Read the immediate number after 0 km on the linear scale, for example, 1km and its corresponding number on the ruler, for example, 2 cm.
4. This indicates that the number representing distance between two points on the map i.e., 2 cm corresponds with the number representing distance between two points on the ground, i.e., 1km. This can therefore be read as 2 cm on the map represents 1 km on the ground in Statement scale or 1:50,000 as R.F. scale.

Note: *Consider the merits and demerits of each scale*

Conversion from Statement Scale to R.F. Scale

Given the number of centimetres to the kilometre, to find the representative fraction, divide 100,000 by the number of centimetres to the kilometre to get the denominator to the R.F. For example, if the scale is 4 cm to 1 kilometre, the denominator of R.F. is 100,000/4 = 25,000 and R.F. = 1:25,000.

Conversion from R.F. Scale to Statement Scale

1. Given a representative fraction of 1:50,000, to find the number of kilometres to centimetres, divide the denominator of the fraction by 100,000 i.e., 50,000÷100,000 = 2cm to 1km (two centimetres on the map represent one kilometre on the ground)
2. Given a Representative Fraction of 1:50,000, to find the number of kilometres to a centimetre divide the denominator of the fraction by 100,000 i.e., 50,000 ÷ 100,000 = 1/2 km to 1 cm or 0.5km to 1 cm (one centimetre on the map represents half a kilometre on the ground)

Changing from Representative Fraction to Linear Scale

1. First, find the number of kilometres to a centimetre. That is, 50,000/100,000 = 1cm to 1/2 km or 2cm to 1km
2. Rule a horizontal line of any length and divide it accurately into 2 cm segments to represent map distances. Number the divisions with an interval of 1km to represent ground distances.

LEARNING TASKS

The teacher should help learners engage with the following learning tasks to help reinforce understanding and acquire new knowledge and skills. The teacher should prepare extension exercises for learners who grasp the concept of scale quickly ***that reverse the tasks***, writing a statement of scale as and RF for example.

1. In mixed gender and mixed ability groups practice writing a variety of Representative Fractions as statements of scale and vice versa.
2. Working on their own learners practice constructing a variety of linear scales from given statements scale and Representative Fractions.

PEDAGOGICAL EXEMPLARS

Collaborative learning:

In groups, think-ink-share the definitions of a map scale, types and their advantages and disadvantages. *Learners should be conscious of resolving interpersonal conflicts with each other if they arise in group discussions.*

1. Begin by providing a clear and concise explanation of the concept of a map scale. Define what a map scale is and its purpose in representing distances on a map. Use simple language and visual aids to support comprehension.
2. Recognise that learners in the classroom may have different learning styles, abilities, and prior knowledge. Adjust the complexity of the content and tasks to match individual learner readiness levels.
3. Use graphic organisers, such as concept maps or graphic organisers specifically designed for map scales to help learners organise their thoughts, make connections and understand the relationships between different types of map scales.
4. Incorporate think-ink-share activities to encourage learner engagement and collaboration. Give learners time to individually think and write down their ideas about different types of map scales and their advantages and disadvantages.
5. Then, pair learners up to discuss their ideas before sharing them with the whole class. This strategy allows for peer interaction and helps learners build on one another's ideas.

6. Offer step-by-step instructions and support as learners work through sample problems or map-based activities. Adjust the level of guidance based on individual learners' needs.
7. Use maps with different types of scales, to illustrate the advantages and disadvantages of each type by highlighting their characteristics and purposes.
8. Assign tasks or activities that target each learners' specific needs. Provide additional support, enrichment, or modifications as required to ensure all learners are appropriately catered for.

Activity-based learning:

Practise the conversion of one scale to another (e.g. from statement scale to R.F and linear scale and vice versa) and to construct the linear scale.

1. Break down the process into step-by-step instructions, using simple language and visual aids to support comprehension.
2. Differentiate your instruction by providing multiple means of representation, such as visual examples, verbal explanations, and hands on activities and adjust the complexity of the content and tasks to match individual learner readiness levels.
3. Provide manipulatives or hands-on activities that allow learners to physically manipulate scale components and construct linear scales. For example, learners can use rulers to construct linear scales and practice converting between different scale types.
4. Offer guided practice opportunities where learners can apply their understanding of scale conversions and linear scale construction.
5. Provide step-by-step instructions and support as learners work through sample problems or activities and adjust the level of guidance based on individual learners' needs.
6. Break down the process of scale conversions into smaller, manageable steps. Offer prompts, hints, or worked examples to guide learners through the conversions and linear scale construction and gradually reduce the level of assistance as learners become more confident.

KEY ASSESSMENT

Level 1: States the three types of scale found on maps**.**

Level 1: Gives an example of each type of scale found on maps.

Level 2: Explain the Representative Fraction map scale of 1:50,000.

Level 2: Write the representative fraction map scale 1:25,000 as a statement of scale

Level 2: Write the representative fraction map scale 1:25,000 as a statement of scale

Level 2: Write the statement of scale 10 centimetres on the map represents 1 kilometre on the ground as a representative fraction.

Level 3: Work out the RF for the statement of scale 5 centimetres represents 1 kilometre. Show each step of your working. (1:20,000)

Level 3: A taxi driver says the distance between Accra airport and Osu Castle is about 9km. On his map the distance measures 36cm. What is the RF of the map? (1:25000)

Level 4: Write a critical comparison each map scale. Outline the reasons for the advantages and disadvantages of each map scale.

Week 8

Learning Indicator(s):

1. *Examine the methods of representing relief on maps*
2. *Read and interpret contours on maps*

THEME/FOCAL AREA 1: METHODS OF REPRESENTING RELIEF ON MAPS

Relief refers to the variation in height of the Earth's surface, such as mountains, spurs, valleys, plains, ridges and plateaux. Relief features can be represented on maps using methods such as spot heights, trigonometrical stations, hachures, layer tinting and contour lines.

1. Spot heights

Spot heights are used to show the exact height of the land at a particular point. Spot heights are depicted using a dot and a corresponding number, which represents the altitude (height above sea level) at that point.

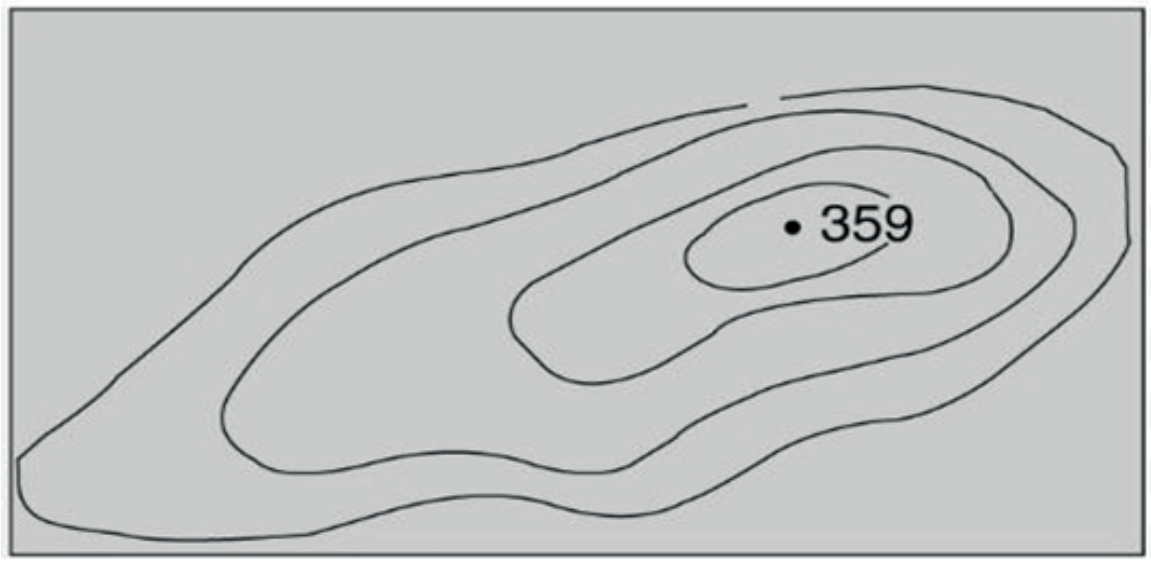

Fig. 8.1: Spot height with contours (Mishra, 2015)

2. Trigonometrical Points/stations

These are indicated on maps by the writing of figures against a triangle with a dot in the centre. They show the height of that point above sea level.

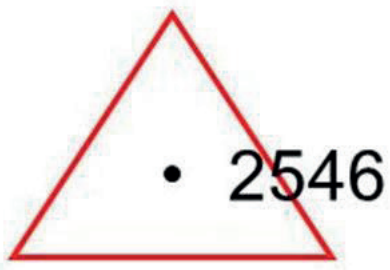

Fig.8.2: Trigonometrical station

3. Layer tinting (colouring)

Layer tinting is a method of showing relief by colour. A different colour is used for each band of elevation. Each shade of colour, or band, represents a definite elevation range.

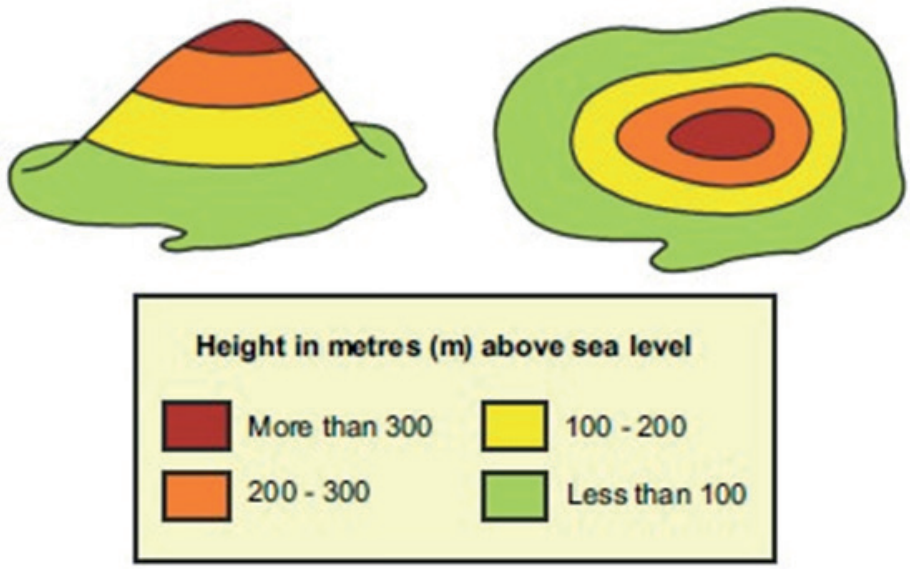

Fig.8.3: Layer colouring (Mishra, 2015)

4. Form Lines

These are lines drawn on maps to link places of approximately the same height. Thus, they are not as accurate as contour and may be used where contours are absent. In other words, form lines are approximate contours, drawn to show the form of the land. The method is less expensive than contouring.

Fig.8.4: Form Lines (Mishra, 2015)

5. Hill shading

Relief shading indicates relief by a shadow effect achieved by tone and colours that result in the darkening of one side of terrain features, such as hills and ridges. The darker the shading, the steeper the slope.

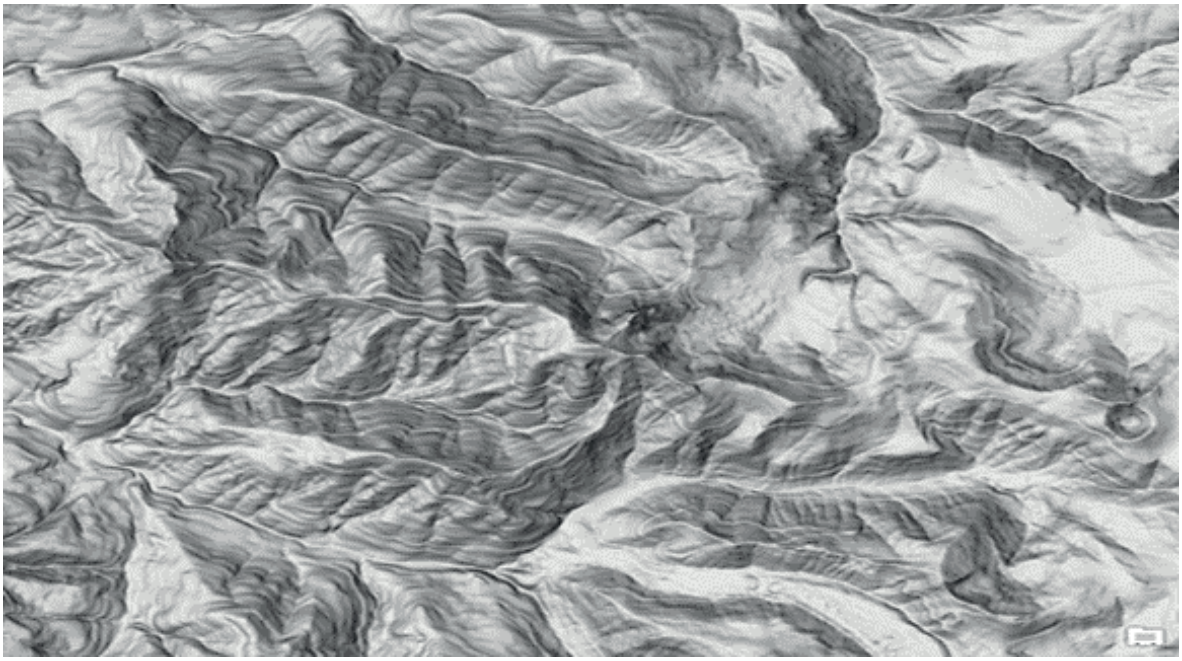

Fig.8.5: Hill shading (Mishra, 2015)

6. Hachures

Hachures are short, broken lines used to show relief. Hachures are sometimes used with contour lines. They do not represent exact elevations, but are mainly used to show large, rocky outcrop areas.

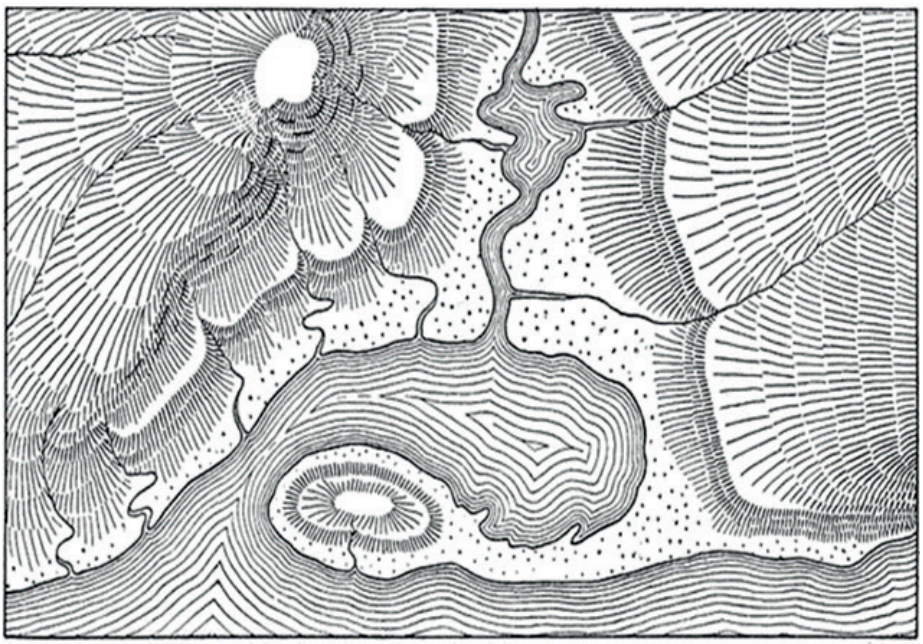

Fig.8.6a: Hachures (Mishra, 2015)

7. Contour Lines

Contour lines are the most common method of showing relief and elevation on a standard topographic map. A contour line represents an imaginary line on the ground, above or below sea level. All points on the contour line are at the same elevation. The elevation represented by contour lines is the vertical distance above or below sea level.

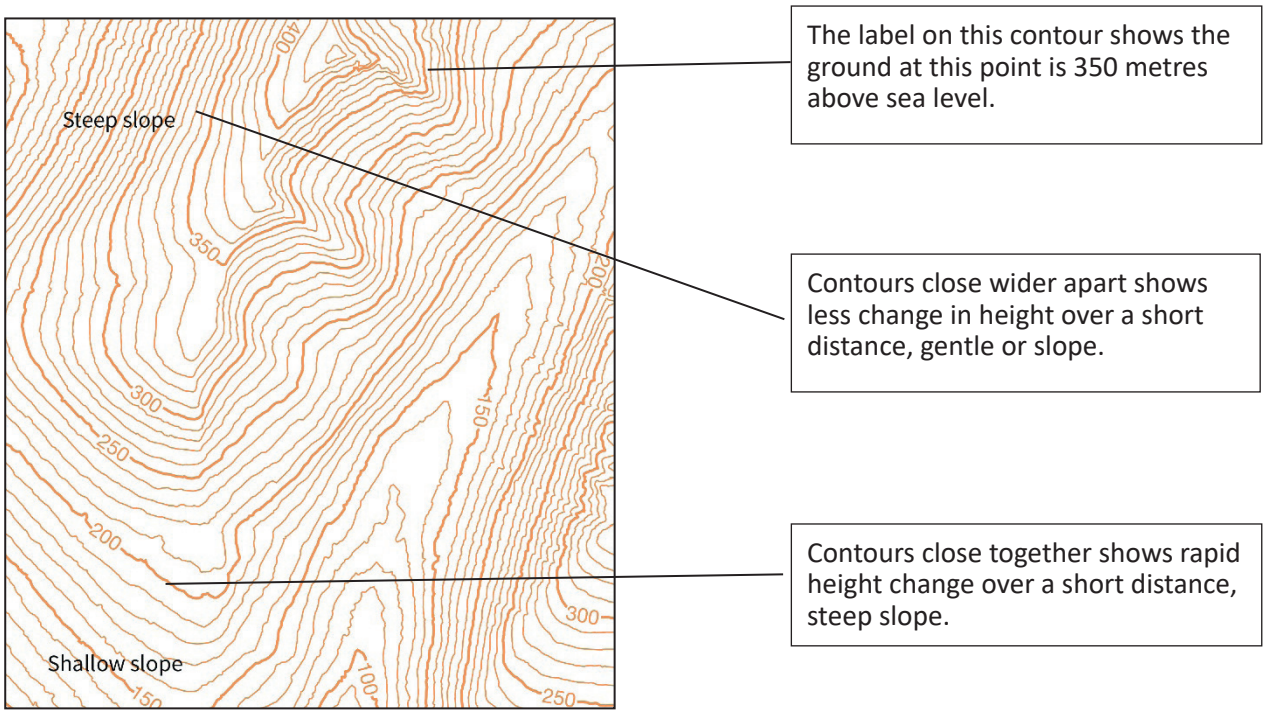

Figure 8.6b Contours on a map

LEARNING TASKS

The teacher should use one or more of the following tasks to help reinforce understanding and acquire new knowledge and skills. The teacher should prepare extension exercises for learners who grasp the concept of relief to show features on maps quickly or use them as peer partners to help promote understanding in other learners. The teacher should be aware of the difficulties that interpreting relief features on maps presents to learners with visual impairment and provide appropriate support. The teacher should also be mindful of the difficulties that viewing a map in three dimensions presents (length, breadth and height) to selected learners.

1. Discuss the various methods used to show relief features on a map using slides. Teachers should reinforce the meaning of relief.
2. Use the contour map (figure 8.6b) to explain the concept of using three dimensional maps to represent relief. At this stage, the teacher should visually demonstrate how contours show slopes, explain what an index contour is, explain what an intermediate contour is, what the vertical interval (VI) represents and demonstrate how it is calculated.

PEDAGOGICAL EXEMPLARS

Collaborative learning

In small mixed ability groups, discuss the various methods used to show relief features on a map. During the discussions, learners should listen to their peers' opinions and express disagreements in constructive ways. *Learners develop skills in teamwork, through discussions in groups of different relief backgrounds.*

1. Assign learners to groups based on their strengths and areas for growth, ensuring that each group has a range of abilities represented.
2. Encourage peer support within the groups. Learners with higher abilities can provide explanations, examples, or guidance to their peers who may require additional support.
3. Provide clear instructions to the groups about the task and the specific methods of showing relief features on a map that they need to discuss. The outcome of the task should be clear before the group discussions start. In this case, following group discussions, individual learners might each write a summary of the groups findings to be used as a formative assessment opportunity. The teacher should provide a range of resources around which group discussions take place which might be based those in this section of the teaching manual.
4. Consider using discussion protocols, such as *Think-Pair-Share* or *Round Robin*, to guide the conversation and encourage participation from all group members.
5. Supervise by moving around the groups to monitor their progress and providing guidance and clarifications as needed. Ask probing questions, encourage deeper thinking, and redirect the discussion if necessary.
6. Follow up the group discussions with individual or small group reflective activities. This can include writing reflections, creating concept maps, or completing worksheets that reinforce the understanding of the different methods used to show relief features on a map.
7. As a follow up the teacher at this point should explain that contours are the most common way relief is represented on printed maps. The teacher should talk through and use visual experiences to show how contours represent the third dimension of a map, explain index and intermediate contours, vertical interval and how to calculate it. The teacher might revisit earlier mapwork using the Google maps to verify how relief is shown on digital maps.

KEY ASSESSMENT

In mixed-gender groups and including learners from different locations.

The teacher should provide a printed map resource for the last key assessment at L3.

Level 1: Communicate in words what relief shows on a map.

Level 1: State three different ways relief is shown on a map.

Level 2: Draw one labelled two dimensional diagram to explain spot heights and contours.

Level 3: Draw a labelled three dimensional diagram to explain contours.

Level 3: Use a contour map to identify and shade areas of steeps slope in contrast to areas where the slope is less steep. Label an index contour, an intermediate contour and calculate the vertical interval for the map.

Level 4: Critically assess colour layering, form lines, hill shading, hachures and contours as methods of showing relief on maps. Use a table to present your assessment as a list of pros and cons.

THEME/FOCAL AREA 2: USING CONTOURS TO REPRESENT RELIEF ON TOPOGRAPHIC MAPS.

This focal area expands on the learning from a section of the last theme/focal area by analysing in detail how contours are used to represent relief and specific relief features on maps.

What are Contours?

- They are lines drawn on maps to show places of equal height above sea level. They are measured in feet or metres.
- Contours are used to determine the nature or topography (natural and human-caused features) of the land including their relative positions and elevation.
- On topographical maps, contours are shown with the colour brown and the heights may be written on them at pre-determined intervals.
- A *contour interval, also* known as *vertical interval* (VI) represents the difference in height between two adjacent contours.
- Contours which are thicker than the adjacent ones are called *index contours*.
- The thinner contour lines are known as *intermediate contours*.

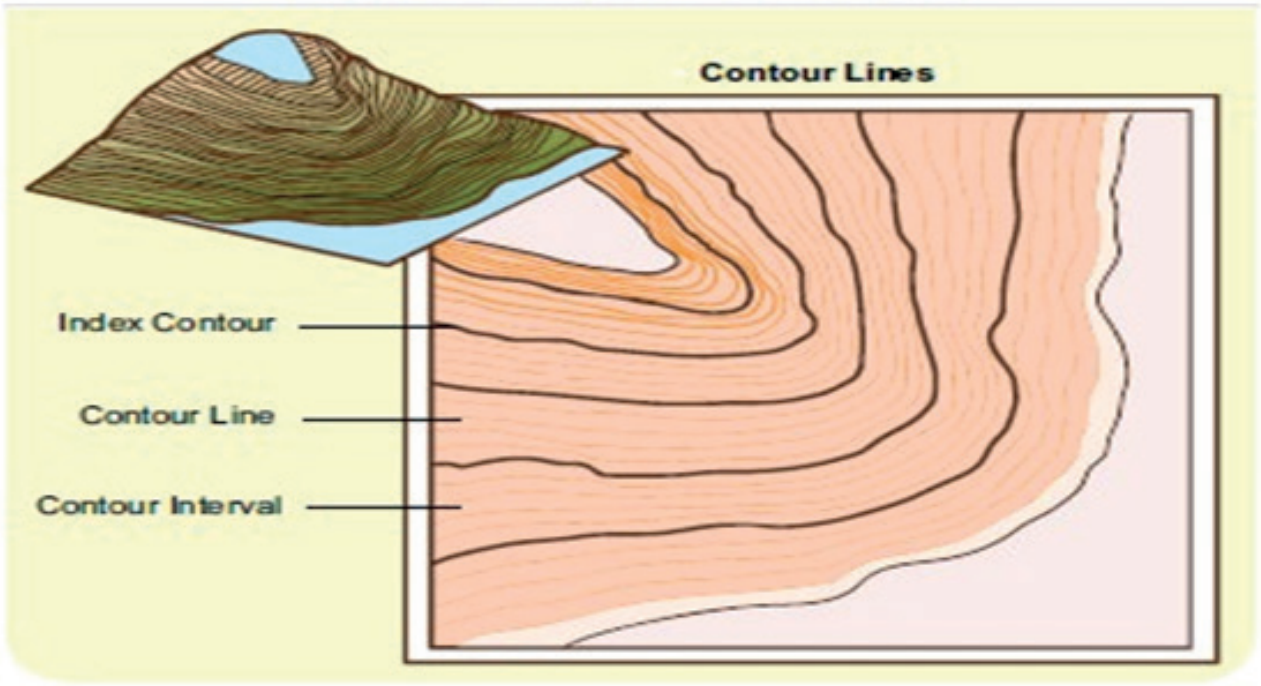

Fig. 8.7: Contour Line, Contour Interval and Index Contour (Mishra, 2015)

Types of Slopes

1. **Steep Slope:** On topographical maps, contours represent steep slopes when the lines are closely spaced showing a rapid change in elevation.
2. **Gentle Slope:** On topographical maps, contours represent gentle slopes when the lines are spaced farther apart, indicating a gradual change in elevation over a longer distance.

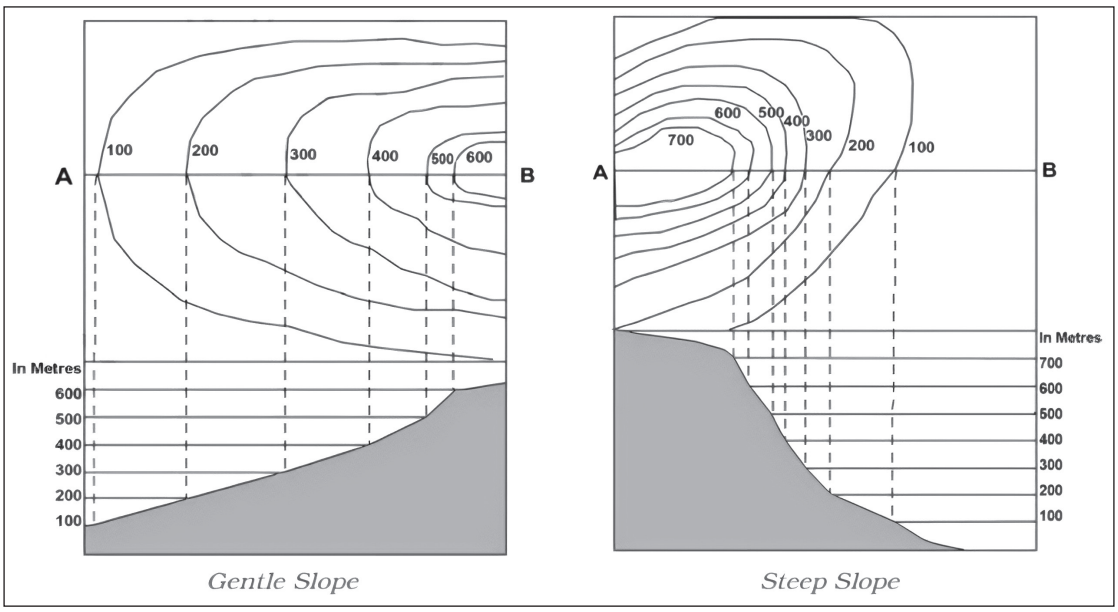

Fig. 8.8: Gentle and Steep slopes (Mishra, 2015)

3. **Concave Slope:** A slope with a gentle gradient in the lower parts of a relief feature and steepness in its upper parts is called a concave slope. Contours in this type of slope are widely spaced in the lower parts and closely spaced in the upper parts.
4. **Convex Slope:** A slope with a gentle gradient in the upper parts of a relief feature and steepness in its lower parts is called a convex slope. Contours in this type of slope are closely spaced in the lower parts and widely spaced in the upper parts.

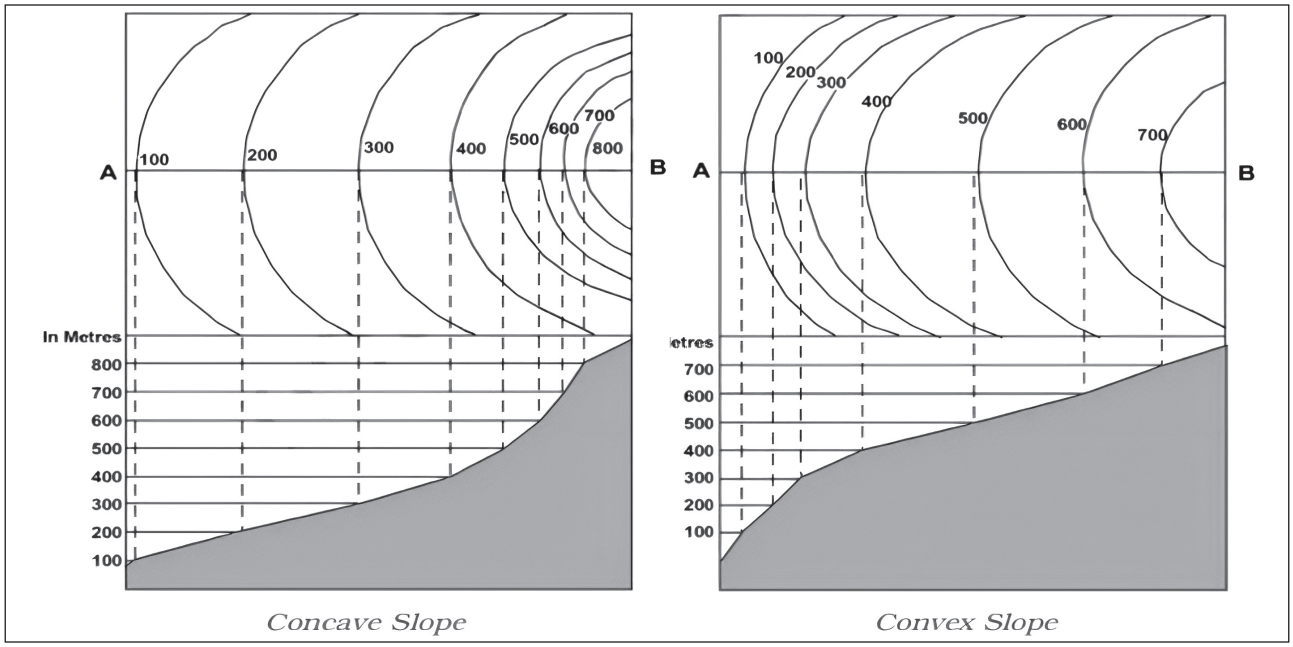

Fig. 8.9: Concave and Convex slopes (Mishra, 2015)

5. **Valley:** A valley is an elongated, low area often running between two hills or mountains. They are represented on topographic maps with closely packed V-shaped or U-shaped contour lines. The innermost contour line has the lowest value (height) while the outermost contour line has the highest value (height).

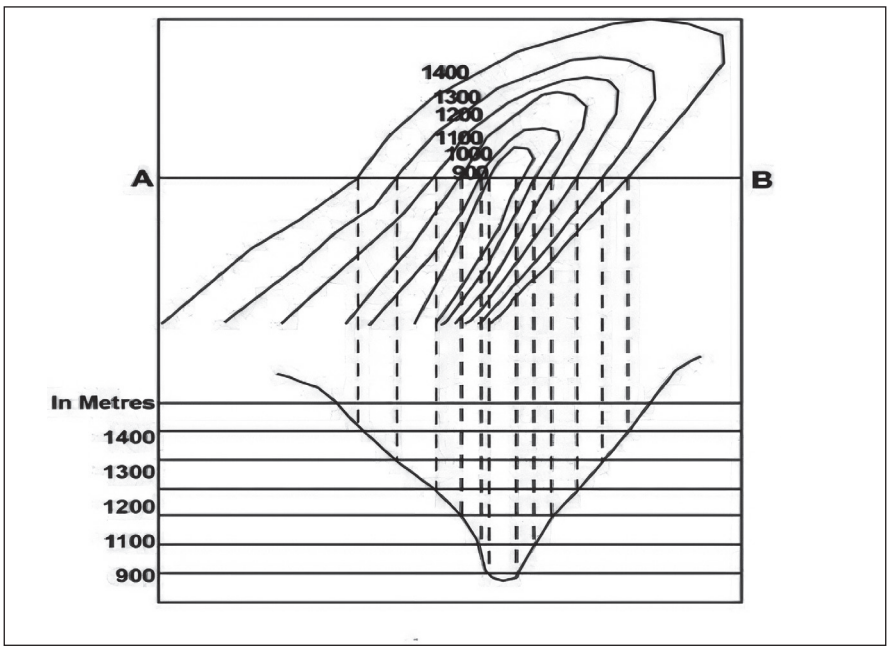

Fig. 8.10: V-shaped valley (Mishra, 2015)

6. **Spur:** A spur is explained as a projection of a highland into a lowland. It is referred to as a highland in-between two lowlands. On topographical maps, spurs have contour patterns that are opposite of valleys. They are also represented with V-shape contours, but the inner contour has the highest value (height).

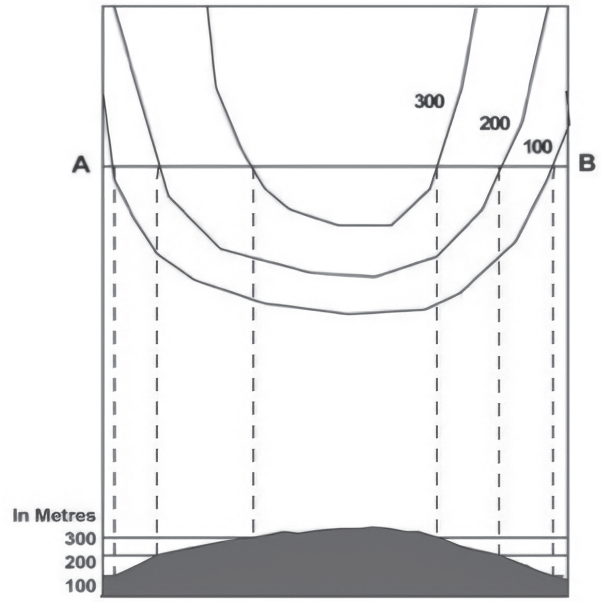

Fig. 8.11: Spur (Mishra, 2015)

7. **Plateau:** A plateau is usually described as a high mountain with steep sides and a flat top. It is sometimes referred to as a table-top mountain. On a map, the contours appear very close at the sides with a vast space in the middle to indicate the flat surface.

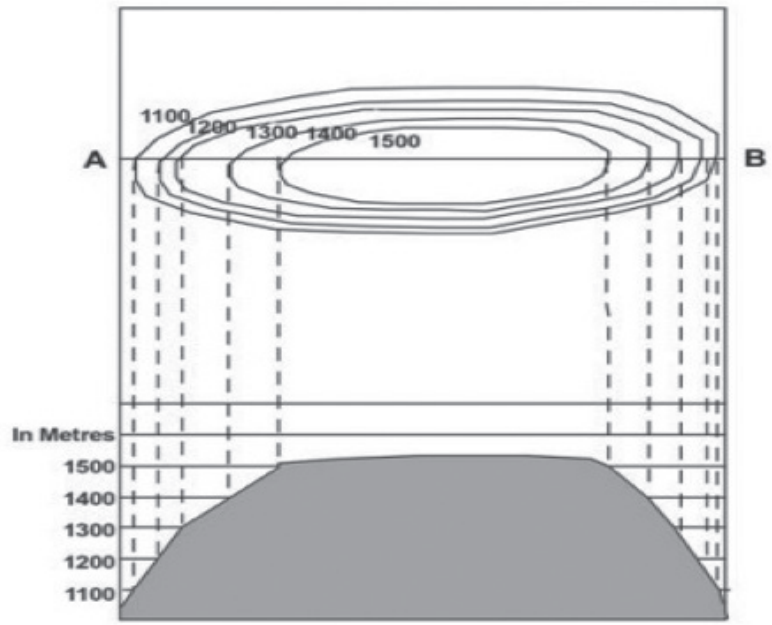

Fig. 8.12: Plateau (Mishra, 2015)

8. **Conical Hill:** A conical hill is a landform or relief feature that is shaped like a cone. It usually stands out from relatively low ground. It is usually represented with few concentric rings of contours which are regularly spaced.

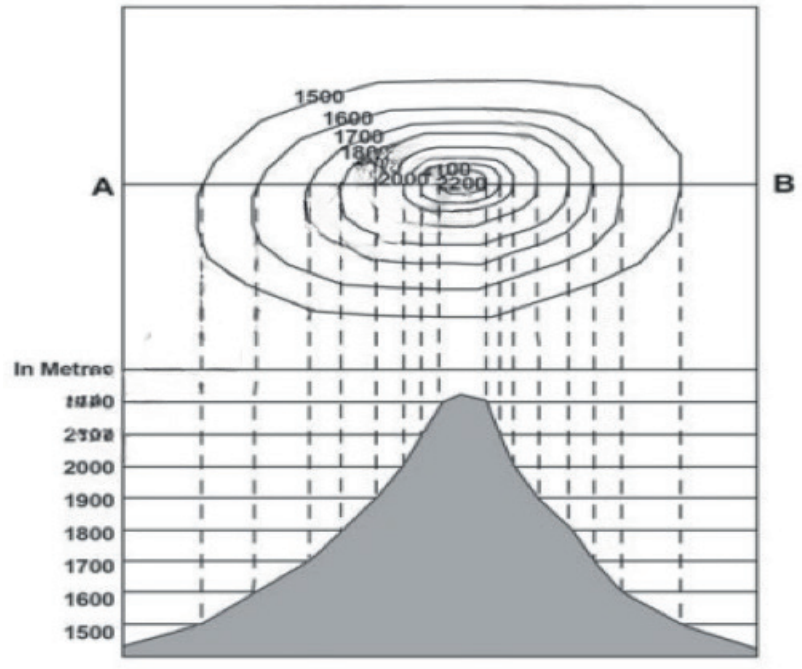

Fig. 8.13: Conical Hill (Mishra, 2015)

9. **Cliff**: A cliff is a vertical or near vertical feature; it is an abrupt change of the land. When a slope is so steep that the contour lines converge into one "carrying" contour of contours, this

last contour line has tick marks pointing toward low ground. Cliffs are also shown by contour lines very close together and, in some instances, touching each other.

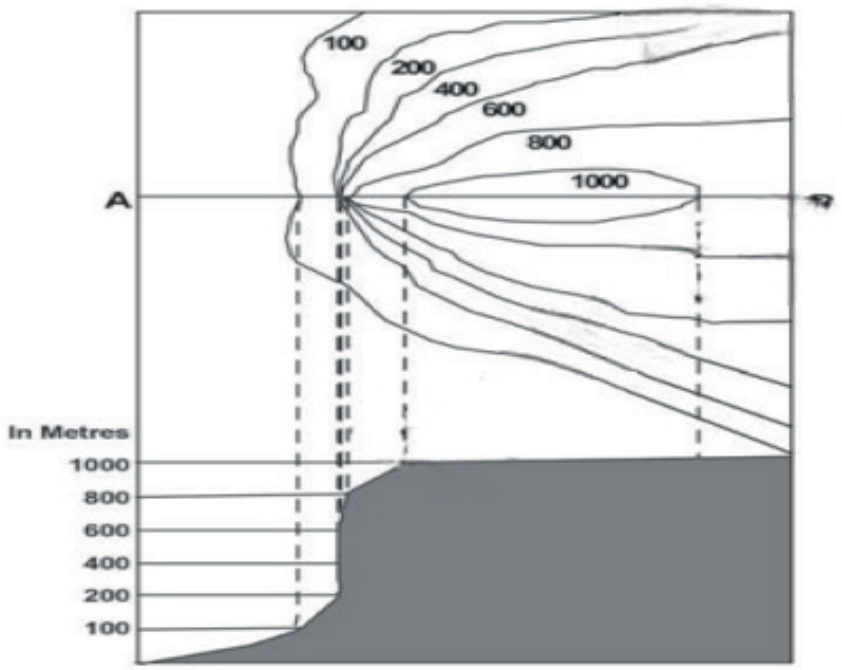

Fig. 8.14: Cliff (Mishra, 2015)

10. **Escarpment**: An **escarpment** usually refers to a long mountain with one side steep and another side gentle. The steep side is referred to as the scarp while the gentle side is referred to as the dip. The contour representations on the scarp are closely packed while that of the dip are widely spaced.

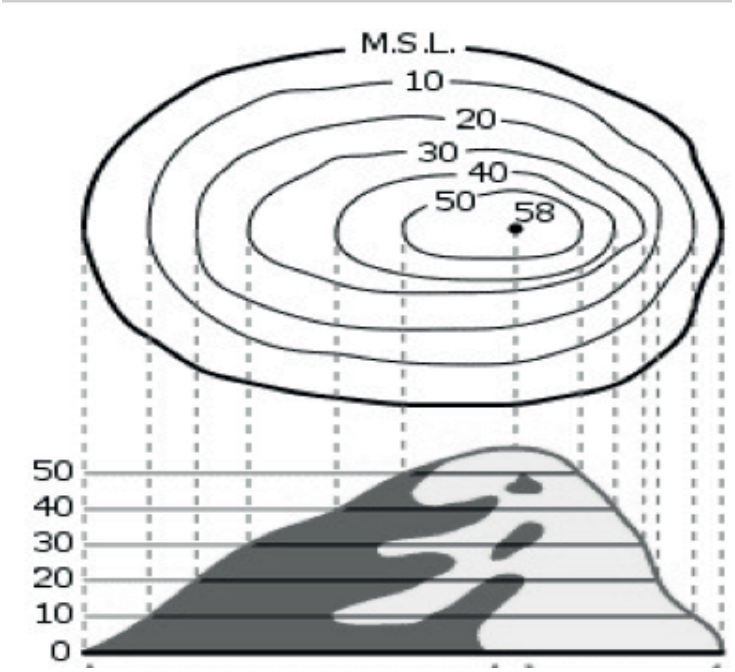

Fig. 8.15: Escarpment (Mishra, 2015)

Other landforms reprinted with contours include, ridge, gorge, col/saddle, gap, pass and knoll.

LEARNING TASK

1. Describe relief characteristics using contours found on sample topographical maps.

PEDAGOGICAL EXEMPLARS

Activity-based learning

In small mixed-ability groups, learners use sample topographic maps to identify some relief features. In the group, all learners should be aware of the emotions of all members, especially the vulnerable ones. Analytical and graphical skills are developed as learners read and interpret relief maps. Learners become tolerant, friendly and open minded during the group work.

- Introduce and clarify key vocabulary related to relief features and topographic maps before starting the activity.
- Ensure that learners understand terms such as *contour lines, contour interval, index contour, elevation, hills, valleys, and slopes*. Provide visual aids or examples to aid comprehension.
- Use sample topographic maps with clear relief features as visual prompts during the activity. Highlight specific relief features and explain how they are represented on the map.
- Offer guided practice opportunities where learners work collaboratively to identify relief features on sample topographic maps. Provide step-by-step instructions and support as learners analyse the map.
- Differentiate the tasks within the small groups based on individual abilities and readiness levels by providing varying levels of complexity or challenge to meet the needs of different learners. For example, some learners may identify basic relief features, while others may analyse more complex features or patterns.
- Incorporate think-pair-share activities within the small groups to encourage collaboration and discussion. Allow learners to individually study the map, pair up to discuss their findings, and then share their observations with the rest of the group.
- Use observation, questioning, or brief quizzes to check for comprehension and provide timely feedback. Adjust instruction based on learners' progress and address any misconceptions or difficulties.
- Offer individualised support to learners who require additional assistance. Provide one-on-one explanations, modelling, or extra practice opportunities tailored to their specific needs.
- Conclude the activity by having learners summarise their findings and reflections on identifying relief features on topographic maps.

KEY ASSESSMENT

Level 1:

With given topographical map, mark and name the following relief features with the letters in the brackets

- One valley (V)
- One steep slope (S)
- One gentle slope.

Level 2:

With given topographical maps, mark and name the following relief features with the letters in the brackets (Ensure accuracy in your labelling and description of each feature). Explain how contours are used to show two of these relief features

- One escarpment (E)
- One valley between two spurs (V)
- One area where the slope is uniform (U)
- One area where the steepness of the slope varies (VS)

Level 3:

Using the given topographical maps, analyse and identify various relief features represented with contours. Mark and label the following specific landforms with the letters in the brackets and justify the answer.

- Interlocking spurs (IS)
- One cliff (CF)
- One concave slope (CE)
- One convex slope (CX)

Section Review

Section 4 concentrated on 4 focal areas for week 7 and 8. The section provided learners with an understanding of different maps including printed and digital forms. Learners explored the information that maps showed and the way in which this was explained using keys, legends, direction, and colour. They developed expertise in how to read, interpret and record information from maps and worked with printed versions and digital applications, using their new skills to compare and contrast the usefulness of each. They developed an understanding of how the features of physical and human environments were represented by maps. They explored ways of representing relief on maps and developed the skill of reading and using contours to recognise different relief features on topographical maps.

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1. Mishra, R. K. (2015). Mapping the knowledge topography: a critical appraisal of geography textbook questions. *International Research in Geographical and Environmental Education*, *24*(2), 118-130.
2. Tsibu, B. (2022). *Physical Geography for Senior High Schools*, Abundance of Grace Ent: Kumasi

SECTION 5: GHANA'S PHYSICAL ENVIRONMENT

Strand: **Human and Environment**

Sub-Strand: Physical Settings and People

Learning Outcome: *Examine the physical environment of Ghana (relief, drainage, climate, vegetation and soils) and their socio-economic importance.*

Content Standard: Demonstrate understanding of the physical environment of Ghana and its socio-economic importance and challenges.

INTRODUCTION AND SECTION SUMMARY

This lesson provides an introductory overview of Ghana's physical setting, focusing on its location, size, administrative regions, relief, and drainage. Ghana is a West African country with a unique geographical position, sharing borders with Cote d'Ivoire, Burkina Faso, and Togo. It is located on the Gulf of Guinea, offering a coastline of over 500 kilometres along the Atlantic Ocean. With an area of approximately 238,539 square kilometres, Ghana encompasses diverse ecosystems, including rainforests, savannas, and coastal plains. The country is divided into 16 administrative regions, each with its own distinct characteristics and local governance. In terms of relief, Ghana exhibits a varied landscape, featuring low-lying plains, rolling hills, and mountainous regions. The southern part is dominated by the Ashanti and Akwapim-Togo Ranges, while the northern region is home to the Bole – Wa – Lawra Hills. The central and eastern parts of Ghana are occupied by the Volta Basin, a sprawling low-lying area. Ghana's major rivers, such as the Volta, Pra, Ankobra, and Tano, play a crucial role in agriculture, transportation, and hydroelectric power generation. Understanding these aspects of Ghana's physical setting is essential for comprehending its cultural, economic, and environmental dynamics.

The weeks covered by the section is/are:

***Week 9**: Ghana's Location, Size and Administrative Regions*

***Week 10**: Relief and Drainage in Ghana*

SUMMARY OF PEDAGOGICAL EXEMPLARS

This section employs a range of engaging teaching methods to promote active learning and cater for diverse learning styles. It includes talk for learning through activities like brainstorming and group discussions, activity-based learning through hands-on experiences and interactive tasks, and project-based learning through extended tasks or projects. These pedagogies encourage learner participation, critical thinking, problem-solving, and collaboration. By incorporating these approaches, the section creates an inclusive learning environment where learners actively engage in their learning process and benefit from differentiated instruction.

ASSESSMENT SUMMARY

The assessment strategy for this section focuses on evaluating learners' learning outcomes at levels 1, 2, 3 and 4. Group projects provide an opportunity for learners to collaborate, apply their knowledge, analyse information and generate innovative solutions. This assessment method allows learners to demonstrate critical thinking, synthesis and teamwork skills. On the other hand, the individual class exercises challenge learners to engage in higher-order thinking, evaluate their learning processes and make connections between concepts. By completing these exercises, learners demonstrate their ability to analyse complex problems, provide evidence-based arguments and reflect on their learning. The

use of both group projects and individual exercises ensures a comprehensive assessment of learners' abilities, encompassing critical thinking, problem-solving and collaboration.

Week 9

Learning Indicator(s):

1. *Draw the outline map of Ghana and describe the location and size and indicate the administrative regions.*

THEME/FOCAL AREA(S) 1: GHANA'S LOCATION, SIZE AND ADMINISTRATIVE REGIONS

Relative location (Position):

Relative location describes where something is in relation to familiar features or landmarks.

Ghana is a country in the African continent. It is situated in West Africa, on the coast of the Gulf of Guinea, a large inlet of the Atlantic Ocean. Ghana is bounded by the countries of Burkina Faso in the north, Ivory Coast in the west, and Togo in the east. The shape of Ghana is roughly rectangular with Cape Three Points located at the furthest point south in the Western Region. The distance across the widest part of Ghana, the coastal area, is approximately 560 kilometres. The distance from the southern coastline to the Savanna High Plains at the northern border with Burkina Faso is approximately 670 kilometres.

Absolute location refers to a precise point on Earth or any other defined space. It is identified by specific coordinates, such as latitude and longitude.

Absolute Location: Ghana is found in West Africa and lies between latitudes 4°44'N and 11°10'N. Its western and eastern extremities lie at longitudes 3°15'W and 1°11'E absolutely, respectively. The Greenwich Meridian passes through Tema, a town on the coast close to the capital City of Accra.

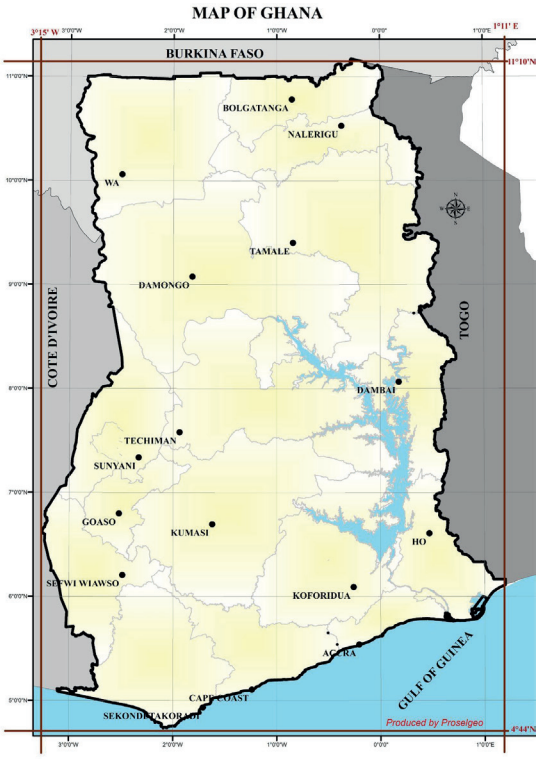

Fig. 9.1: Location and Size of Ghana (Proselgeo.com, 2024)

Size of Ghana

Ghana is the eighth largest country in West Africa by landmass. It is about one-fourth the size of Nigeria. It occupies a total land area of about 238,539 km2. The distance from the north to the south is about 672 km and from east to west it stretches for about 534 km. The country's population is 30.8 million people (GSS, 2021).

Ghana is a former British colony. She attained independence on the 6th of March 1957. Before independence, Ghana's name, the Gold Coast (given by the Portuguese Traders), was changed to Ghana. Ghana became a republic on 1st July 1960.

Administratively, the country is divided into sixteen (16) regions, 170 districts and 275 electoral constituencies. As at March 2012, the number of Metropolitan, Municipal and District Assemblies (MMDAs) have been increased to 170.

Fig. 9.2: Political Map of Ghana (ghanamissionun.org, n. d.)

LEARNING TASKS

The teacher should help learners engage with the following learning tasks to help reinforce understanding and acquire new knowledge or skills.

1. In mixed ability and mixed gender groups, learners use an atlas or the Internet to describe the relative and absolute location and size of Ghana. Outcomes for this task might be verbal, written and visual. Groups might elect a spokesperson to give verbal descriptions of relative and absolute location. Peer assessment of these outcomes might be undertaken based on their detail, accuracy and presentation skills. Outcomes for the size of Ghana would depend on the task instructions which should be developed being mindful of the groupings selected by the teacher. Teachers should discuss at length the difficulties that the irregular shape of the countries bring to measuring length, breadth and calculations of area. This discussion might be amplified if the data learners have prepared on length, breadth and area is collected and shared at a classroom level. Groups might elect a scribe to share their information on a flip chart or whiteboard and the teacher could raise questions from the point the data has been collected.
2. In mixed ability and mixed gender groups, learners identify the administrative regions and main towns,

PEDAGOGICAL EXEMPLARS

Collaborative Learning

In mixed ability and mixed gender groups, discuss the size of Ghana, using an atlas map. Learners should create an environment where others believe their thoughts and opinions are valued. The group discussions and individual contributions promote tolerance of opinions, oral communication and self-confidence.

1. Ensure that learners understand terms related to map reading and measurement, such as scale, legend, latitude, and longitude and are proficient with the skills of calculating areas and using coordinates. Their relevance to understanding the size of Ghana on the map should be explained by the teacher. A review of the work already completed in weeks 5 (latitude and longitude) and 7 (maps) might be undertaken as an introduction.
2. The teacher should clearly state the expected outcomes of the group work. Learners should be aware of these outcomes and assign roles to members of their group in preparation such as scribe, spokesperson, researcher.
3. Use an atlas map that clearly shows the location of Ghana in the African continent, the bordering countries and other boundaries of Ghana. Visual representation helps learners visualise the country and its relative size compared to neighbouring countries or regions. The map should show lines of latitude and longitude and have a scale.
4. Provide alternative means of representing the size of Ghana, such as digital maps, visual aids, verbal explanations, or tactile resources, to accommodate different learning styles. Adjust the complexity of the discussion and tasks to match learners' readiness levels.
5. Ask guided questions to prompt learner discussion about the size of Ghana. For example, "*Where is Ghana?*" or "*How would you describe the shape of Ghana?*" or "*How would you work out the land area of Ghana'* or '*How does Ghana's size compare to its neighbouring countries?*
6. Encourage learners to actively engage in discussions, sharing their perspectives on the size of Ghana. Provide opportunities for learners to explain their reasoning, listen to others' viewpoints, and build on each other's ideas.

7. Offer individualised support to learners who require extra assistance. Provide one-on-one explanations, additional resources, or alternative explanations tailored to their specific needs. Monitor their progress closely and adjust your instruction accordingly.
8. Bring together and review the information learners have collected and use reflective techniques to draw together facts relating to size and explain why calculating the exact area of a country is difficult. The teacher might ask learners to write a summary of the class findings and a spokesperson from each group read this out.

Initiate talk for learning

Give learners a definition of absolute and relative location. Brainstorm on what things should be included when describing the absolute and relative location of Ghana. The teacher should either collect the information on a flip chart or whiteboard or ask learners to produce a mind map. Let learners share their thoughts in a controlled discussion. Learners become curious and critical of things they see and hear and be optimistic on their expectations as they brainstorm.

1. Begin by providing a clear explanation of the concepts of absolute and relative locations. Use simple language and provide examples and visual aids to enhance understanding.
2. Use visual prompts such as maps, globes, or images to help learners visualise and understand the concepts of absolute and relative locations. Display these visuals and point out examples to facilitate discussion and make the concepts more concrete.
3. Ask learners to individually think about and jot down their initial understanding of absolute and relative locations. Then, pair them up to discuss their ideas and share their thoughts with the rest of the class or contribute to a central resource like a flip chart.
4. Tailor the prompts given to learners based on their learning abilities. Provide simpler prompts or sentence starters for learners who may need more guidance or struggle with generating ideas independently. Alternatively, offer open-ended and challenging prompts for learners who are ready for a higher level of thinking.
5. Ask scaffolding questions that guide learners' thinking and prompt them to consider different aspects of absolute and relative locations. For example, *"What would you include in a summary of the absolute location of a country? How are absolute locations determined?" or "How can relative location be described using features or landmarks?"* These questions help learners develop a deeper understanding of the concepts.
6. Encourage learners to support one another during the brainstorming process. Pair learners with different abilities or learning styles to create opportunities for peer learning. Learners can share their ideas, provide explanations, or ask clarifying questions.
7. Bring together and review the information learners have collected and use reflective techniques to draw together facts relating why calculating the exact area of a country is difficult. The teacher might ask learners to write a summary of the class findings and a spokesperson from each pair read this out. This is a formative assessment opportunity.

Collaborative learning

In mixed gender and ability groups of no more than three learners:

(i) Use administrative maps of Ghana to identify and locate the administrative regions and towns. The teacher can at this point limit the towns to be included to regional capitals and other towns by population size.

(ii) Challenge groups to sketch their own outline map of Ghana and the administrative regions and accurately locate the capital of each.

Provide a blank outline of Ghana divided into administrative regions which is large enough to easily include the locations and names of capitals for groups/learners who might find sketching difficult.

1. Introduce and clarify key vocabulary related to administrative maps, such as administrative regions, regional capitals, other main towns including the capital city. Ensure that learners understand these terms and their relevance to the task at hand. Provide visual examples and explanations to aid comprehension.
2. Use visual aids, such as large, clear administrative maps of Ghana, to support learners' understanding. Display the maps prominently and point out the different regions and towns. Highlight the legends and symbols used on the map to represent different features.
3. In the mixed ability group, provide varying levels of complexity or challenge to meet the needs of different learners. For example, some learners may focus on identifying and locating the regions, while others may also work on locating specific towns within those regions.
4. Encourage learners to verbalise their thinking and explanations while locating and identifying the administrative regions and towns. Verbal explanations support verbal learners and enhance understanding.
5. Provide flexible ways of drawing the administrative maps of Ghana. Learners can adopt Overlay Tracing, Observe and Draw, Grid Drawing or Sketch from Memory methods or through Digital Map creation.
6. Offer individualised support to learners who require additional assistance. Provide one-on-one explanations, modelling, or extra practice opportunities tailored to their specific needs.
7. Make learners aware that the goal is not to create a perfectly detailed map, but to help learners understand the spatial relationships and key features of a country. Encourage creativity and exploration through these map-making activities to make learning geography engaging and memorable.
8. Conclude the activity by having learners summarise their findings and reflections. Ask them to share their completed maps with the inserted administrative regions and towns.

KEY ASSESSMENT

Level 1: Describes the relative location of Ghana with accurate reference to at least four features.

Level 1: Describes the absolute location of Ghana with accurate reference to lines of latitude and longitude in degrees.

Level 1: Can you verbally name the capital of Ghana, at least 5 administrative regions and their capital cities.

Level 2: Describes the relative location of Ghana with reference to its position in Africa, all neighbouring countries, Gulf of Guinea, and at least four other features.

Level 2: Describes the absolute location of Ghana with reference to the lines of latitude and longitude, the Greenwich Meridian and the Equator.

Level 2: Sketch an outline map of Ghana which shows unnamed administrative regions and their capital cities and name all sixteen regions and their capital cities.

Level 3: Sketch an outline map of Ghana and insert the country capital, regional capitals, indicate and name the latitudinal and longitudinal limits of Ghana and the relative position of the Equator and Greenwich Meridian.

Level 4: Analyse the size, relative and absolute position of Ghana from a global perspective.

Week 10

Learning Indicator(s):

2. *Discuss the major relief and drainage features of Ghana and their importance and challenges to development*

THEME/FOCAL AREA 1: RELIEF AND DRAINAGE IN GHANA

A. RELIEF

In Geography relief is a term used to describe the variations in the height of land over a defined area.

Ghana can be divided into two areas which have different relief, highlands and lowlands.

Highlands

The highlands cover approximately 50% of the total land area of Ghana. The highlands usually range between 450m and 900 m above sea level. The highlands are groups into the following

1. The central highlands lie between Koforidua and Wenchi forming the Kwahu – Mampong-Koforidua Ridge. Two prominent highlands on this ridge include the Kintampo ridge and the Kwahu – Mampong highlands.
2. The North – Eastern highlands are called Gambaga escarpment.
3. The North – Western highlands are also called the Bole – Wa' – Lawra Hills. The Wa escarpment or scarp is located on these highlands.
4. Akuapem – Togo ranges have a height up to about 800 metre above sea level. Afadjato (885 metres) is located on this range.

Lowlands

The lowlands have a height ranging between 150 – 300 metres above sea level. It is grouped into two.

1. **The coastal lowlands**

   The coastal lowlands stretch from Half Assini in the Western Region to Denu in the Volta region rising to a height of about 100 – 150 metres above sea level.

2. **The interior lowlands (Volta basin)**

   This is made up of gently sloping or flat – bedded sandstones, shale and mudstone. It concedes with the Voltaian sandstone basin rising to about 300 metres, known as the Tamale Hills.

Physiographic Regions in Ghana

A physiographic region refers to a geographic area with almost uniform relief characteristics such as landforms, vegetation, and other natural features.

According to Wikipedia, a physiographic region is a geographic area that is defined by its distinct physical and natural features, such as landforms, climate, vegetation, and other natural features, which are shaped by the geological history and processes of the area.

https://en.wikipedia.org/wiki/Physiographic_region

Ghana is divided into the following physiographic regions:

1. The Coastal Plains
2. The Forest Dissected plateau
3. The Savannah High Plains
4. The Voltaian sandstone basin
5. Akuapem – Togo Ranges
6. The Gambaga Escarpment
7. Southern Voltaian Plateau

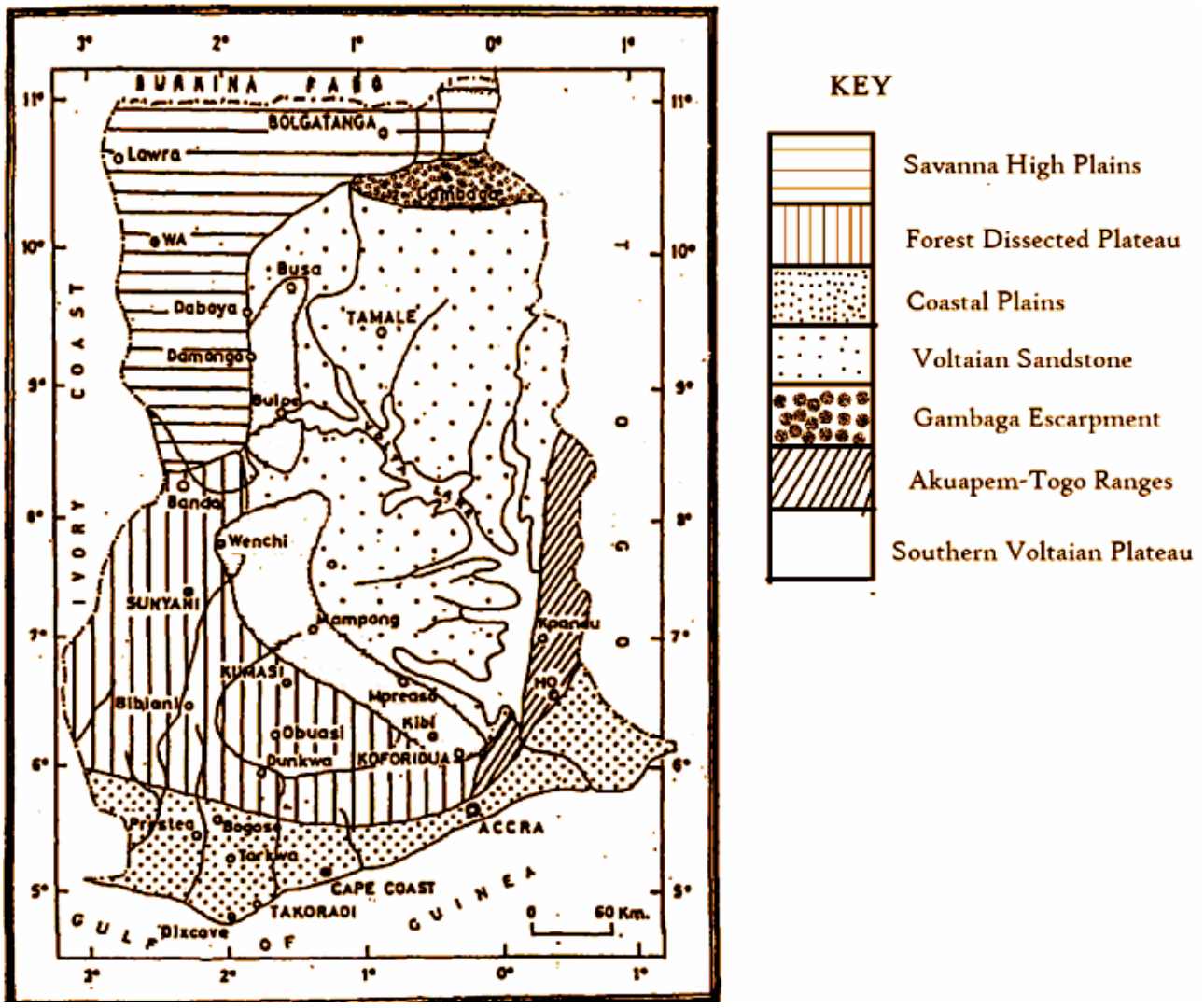

Fig. 10.1: Physiographic Regions in Ghana

1. Coastal Plains

Location: The coastal plains stretch from Half – Assini (Western Region) to Denu (Volta region). It is divided into two, that is, the South-East Coastal plains and South-West Coastal plains.

Characteristics of the Coastal Plains

1. Average height below 100m above sea level.
2. Presence of bays, cliffs and headlands.
3. Volta delta has spits and bars.

4. East coastal plains are dominated by isolated rounded hills called inselbergs. e.gs Shai Hills, Ningo and Osudoku.
5. It is full of lagoons and swamps.
6. The land is relatively flat and undulating.
7. It is broad at the east and narrow at the west.
8. The south-east coastal plains are flat and gently sloping.

2. Forest Dissected Plateau

Location: The Forest Dissected Plateau is found in the forest zone stretching along areas like Eastern, Western, Central, Ashanti and parts of Brong-Ahafo Regions. The underlying rocks are Tarkwaian and Birimian rocks (named after Tarkwa and River Birim).

Characteristics of the Forest Dissected Plateau

1. Average height between 240m and 300m above sea level.
2. The region is drained by rivers such as Tano, Ankobra, Birim, Pra and others.
3. The underlying rocks are Tarkwaian and Birimian rocks.
4. The Tarkwaian rock area is hilly and rugged, but the Birimian rock area is gentle.
5. The dense forest protects the land against excessive erosion.

3. Savannah High Plains

Location: The savannah high plain is a gentle sloping stretch of land located in the four northern regions (i.e., Northern, North-East, Upper East and Upper West Regions).

Characteristics of the savannah High Plains

1. The land rises to about 180 – 300m above sea level.
2. It is dominated by small, rounded hills or inselbergs especially near Upper west (e.g., Tumu) and Upper East.
3. It has a gentle rolling surface.
4. The small round hills are made up of granite rocks.

4. The Voltaian Sandstone Basin

The Voltaian sandstone basin occupies about 47.3% of the total land area of Ghana covering areas like Volta, Ashanti, Brong Ahafo, and parts of Northern as well as upper East Region. It is the largest of all the regions.

Characteristics of the Voltaian Sandstone Basin

1. The Voltaian sandstone basin is an extensive area 60 – 150m above sea level.
2. It is composed of sandstone, shale, limestone and mudstone.
3. It is drained by the Volta River with its tributaries like Afram, Oti, Sene, Daka, Black and White Voltas.

5. The Akuapem -Togo Ranges

The Akuapem – Togo ranges are a narrow belt of ridges and hills which stretch from the mouth of river Densu (West of Accra), follow a north – easterly direction, across the Volta region, through Togo. It is also called the Togo – Atakora Mountains.

Characteristics of the Akuapem-Togo Ranges.

1. The ranges are broken by the Volta gorge at Ajena.
2. The average height of the land is about 450 m above sea level.
3. The height rises to between 600 and 900 m above sea level.
4. The highest mountain in Ghana (mt. Afadjato) is located within this range.
5. It is drained by many tributaries of the Volta River such as Asukawkaw, Alabo and others.

6. The Gambaga Escarpment

Location: This scarp lies between the Savannah High Plains and the Voltaian Sandstone Basin at the north-eastern part of the country.

Characteristics of the Gambaga Scarp

1. The average height is about 450 m above sea level.
2. The Gambaga scarp is made up of a horizontal layer of sandstone which extends from East to West.
3. The north facing slope is steeper with undulating edges, but the south – facing slope descends into the Voltaian basin.

7. Southern Voltaian Plateau

The Southern Voltaian Plateau consists of horizontal layers of sandstone. It has many escarpments. It runs south –east to north – west. It has an average height of not less than 450 metres above sea level. The escarpment has steep slopes to the south and gentle slopes to the north.

Importance of mountains

1. Help in the formation of orographic rainfall.
2. Sources of minerals.
3. Tourist attractions. Example, Mt. Afadjato and Gambaga Escarpment
4. Source of some rivers.
5. Serve as windbreaks.
6. Serve as political boundaries.
7. Site for settlement e.g., Kwahu, Akuapem areas.
8. Site for telecommunication masts
9. Site for agricultural activities e.g., Kwahu and Akuapem areas.

Socio-economic Problems posed by highlands

1. Limited land for the development of human settlement.
2. Increased soil erosion.
3. Unsuitable for mechanised agriculture.

4. Limited transportation network.
5. Prone to various natural hazards, including landslides, avalanches, and earthquakes.

Importance of lowlands

1. They favour communication due to accessible transportation routes.
2. Good grounds for grazing.
3. Source of minerals. E.g., alluvial gold, rock salt and crude oil.
4. Suitable for sand winning.
5. Good site for human settlement.
6. Suitable site for agricultural activities.

Socio-economic Problems posed by lowlands

1. Easily inundated by rains.
2. Inaccessibility to transport routes during flooding.
3. Poorly drained areas can be unsuitable for some farming practices.
4. They harbour insects such as mosquitoes that can cause diseases.

B. DRAINAGE OF GHANA

Drainage refers to all kinds of water bodies that occupy an area. The water bodies found in the country are rivers, lakes, seas and lagoons, streams.

Fig. 10.2: Principal Rivers in Ghana Source: Boateng, 2021

1. **River Volta**: It is the largest and longest river in Ghana. It takes its source from Sikasso Plateau or Moshi Highlands in Burkina Faso. Its mouth is at Ada, Greater Accra region. It is drained by tributaries such as White Volta, Mawli, Daka, Oti, Dayi to the right bank and Black Volta, Tain, Pru, Sene, and Afram to the left bank. Dams such as Akosombo, Kpong, and Bui are constructed on the Volta River.
2. **River Pra**: It takes its source from Kwahu-Mampong Ridge and flows into the Gulf of Guinea. Its tributaries include River Offin, Birim and Anum.
3. **Bia, Tano and Ankobra Rivers**: Located at the south-western part of Ghana, Bia and Ankobra Rivers take their source from the Forest Dissected Plateau. River Tano takes its source from Wenchi Plateau near Techiman, flows through parts of Brong Ahafo, Western region and enters the sea through the Aby lagoon in the Republic of Côte d'Ivoire. River Ankobra flows into the sea at a place near Axim. River Bia's mouth is at Lake Ayame in the Republic of Côte d'Ivoire.
4. **Densu, Ayensu, Narkwa and Amissah Rivers:** These rivers take their source from Atiwa-Atwiredu Range in the Eastern Region.
5. **Kulpawn, Sisili, Kornin, Red Volta, White Volta, Morago**: These rivers drain the northern part of Ghana and serve as tributaries to the White Volta

Lakes in Ghana

A lake is a large body of water surrounded by land. Ghana has artificial lakes such as Lake Volta, Weija and Tadane, and Lake Bosomtwi as the only natural lake.

1. **Lake Volta:** The Volta Lake is the largest human-caused lake in Ghana and one of the largest reservoirs in the world. It is located in the south-eastern part of the country and spans across the regions of Volta, Eastern, and Greater Accra. The lake was created as a result of the construction of the Akosombo Dam on the Volta River in the 1960s. The Volta Lake covers an area of about 8,502 square kilometres (3,283 square miles) and stretches approximately 400 kilometres (250 miles) from the Akosombo Dam in the north to the Atlantic Ocean in the south. It is a significant water body, providing hydroelectric power, irrigation, and transportation for the country.
2. **Lake Bosumtwi:** Lake Bosumtwi is a natural lake located in the Ashanti region of Ghana. It is situated about 30 kilometres southeast of Kumasi. The lake is one of the few meteorite impact craters in the world and is believed to have been created by a meteorite strike about 1.07 million years ago. Lake Bosomtwi is surrounded by lush greenery, hills, and picturesque landscapes, making it a popular tourist destination and a serene getaway for visitors. The lake itself is approximately 8 kilometres in diameter and reaches depths of up to 78 metres, making it one of the largest natural lakes in Ghana.

Lagoons in Ghana

A lagoon is a shallow body of water that is separated from a larger body of water, such as a sea or an ocean, by a barrier such as a sandbar, coral reef, or barrier island. It is usually found along coastal areas and is characterised by its calm and relatively stagnant waters. Examples of lagoons in Ghana are Keta Lagoon, the largest, Songor, Sakumono, Amisa, Muni and Avu

Characteristics of Rivers in Ghana

1. Seasonal variations in volume.
2. Seasonal colour changes.
3. Presence of debris.
4. Muddy in appearance in rainy seasons.

5. Shallowness of rivers.
6. Presence of rapids and waterfalls.
7. North to south direction of flow.
8. Presence of irregularities.
9. Presence of sandbars and spits.
10. Evidence of river capture.

Economic importance of rivers/lakes in Ghana

1. For hydro – electric power production.
2. For irrigation.
3. For transportation purposes.
4. Source of minerals.
5. Source of water for domestic purposes.
6. Source of water for industrial Purposes.
7. Serve as a tourist attraction.
8. Source of employment.
9. Rivers provide food for the populace.

Problems/Factors that limit the use of rivers/lakes in Ghana

1. Inadequate skilled river management personnel.
2. Presence of rapids and waterfalls.
3. Seasonal flow of rivers.
4. Presence of pests and diseases.
5. Shallow depth of rivers.
6. Presence of tree stumps and floating vegetation.

Solutions to the problems that limit the use of rivers/ lakes in Ghana

1. Training and retraining of river management personnel.
2. Clearing of floating vegetation.
3. Construction of canals.
4. Removal of tree stumps.
5. The use of narrow boats.
6. Dredging of river channels.

LEARNING TASK

1. In small manageable all-inclusive groupings, use books, maps, atlases and digital resources to identify and describe:

a. The relief features of Ghana.

b. The challenges of relief to socio-economic development in Ghana.

c. The drainage features of Ghana.

d. The challenges of drainage to socio-economic development in Ghana.

PEDAGOGICAL EXEMPLARS

Talk for learning

Use a map or any other appropriate resource to identify and describe the relief regions of Ghana, in small manageable all-inclusive groupings emphasising on learners from different regions of Ghana. The group discussions and individual contributions promote tolerance of opinions, oral communication and self-confidence.

1. Provide multiple entry points to accommodate different learning abilities by offering varying levels of complexity in tasks and assignments, ensuring each learner is appropriately challenged and engaged. For example, learners with lower abilities can focus on basic identification and labelling, while learners with higher abilities can engage in more in-depth analysis and description of relief regions. Use the Internet, photographs, topographical maps, satellite photographs, relief maps to facilitate learner progression from identification of basic areas of lowland and highland to more detailed naming of specific areas then a description of the relief. Stretch and challenge learners to use geographical terms for landforms found in specific areas. For example: Highland area– The Akuapem -Togo Ranges – average height 450 metres – span border with Togo – south-eastern Ghana – ridges, valleys, hills - – Volta gorge – Ghana's highest mountain Afadjato (885m/2904ft) is located here.
2. Encourage collaboration among learners from different regions to foster a supportive and inclusive environment. Pair learners with different abilities and regional backgrounds to ensure peer learning and the exchange of knowledge and perspectives.
3. Provide scaffolded support through guiding questions, graphic organisers, and step-by-step instructions. This helps learners break down complex tasks into manageable steps, allowing them to build their understanding gradually.
4. Recognising that learners have varying needs, The teacher can provide individualised support and assistance based on each learner's abilities. This can include one-on-one guidance, additional resources, or modified tasks to ensure equitable opportunities for success.
5. Make outcomes of group work clear, state what evidence groups must present and how must they present it; verbal, written, sketch, share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

Discuss the importance and challenges of relief to socio-economic development through think-pair-share.

1. Begin by providing learners with a prompt or a guiding question on importance and challenges of relief to socio-economic development.
2. Allow learners to take a moment to think individually about their ideas and perspectives.

3. Pair up learners to share their ideas and thoughts with a partner. This pairing can be done strategically, considering diverse perspectives or mixing learners with different strengths and abilities.
4. After the pair discussion, facilitate a whole-class discussion where learners share the key points and insights from their discussions with the larger group.
5. Provide support by actively monitoring the discussions, asking probing questions to stimulate critical thinking, and encouraging respectful and inclusive participation.
6. Make outcomes of paired work clear, state what evidence must each pair present, verbal, written, sketch, share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

Activity-Based Learning

Use maps to identify and discuss the drainage features of Ghana through a pair activity.

1. Pair learners strategically, considering their different learning abilities and strengths. Match higher-ability learners with lower-ability learners to promote peer learning and support.
2. Provide a set of guiding questions or prompts related to the drainage features of Ghana. These questions can be differentiated based on complexity and depth. Lower-ability learners can have more straightforward questions focusing on identification, while higher-ability learners can have more challenging questions that require analysis and evaluation of the significance of drainage features.
3. Give learners special sheets to help them write down their observations and discussions. These sheets can be simple or fancy, depending on how good the learner is at learning. The easier ones will have boxes to fill in, while the harder ones will be more open-ended to encourage deeper thinking.
4. Provide maps with clear markings of the drainage features of Ghana. Use visual cues such as colour-coding or labels to assist learners in identifying and understanding the different drainage systems.
5. Facilitate the pair activity by providing scaffolds, such as sentence starters or key vocabulary lists, to support learners' discussions to help lower-ability learners express their ideas more confidently and prompt higher-ability learners to delve into more complex discussions.
6. Circulate among pairs to provide support, clarify concepts, and offer feedback on learners' discussions
7. Make outcomes of activity work clear, state what evidence pairs must present and how must they present it; verbal, written, sketch, share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

Collaborative Learning:

In mixed ability, mixed gender groups and a focus on learners living closer to different drainage systems, discuss the importance and challenges of drainage features to socio-economic development. Learners become tolerant of people from different ethnic groups as they learn their culture.

1. Form mixed gender and ability groups by strategically pairing learners with diverse abilities and backgrounds.
2. Assign different roles or tasks within the group to cater for different learning abilities. For example, lower-ability learners can focus on identifying and describing basic concepts, while higher-ability learners can delve into more complex analysis or research.

3. Provide scaffolding materials such as worksheets, vocabulary lists, or guiding questions to support learners at different levels.
4. Guide the mixed ability groups through the discussion by asking probing questions, encouraging active participation, and ensuring that all voices are heard.
5. Make outcomes of group work clear, state what evidence must groups present and how must they present it; verbal, written, sketch, share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

Project-based learning:

Using different task-based or small mixed ability groups, draw an outline map of Ghana showing the relief and drainage features.

1. Provide flexible ways of drawing the relief and drainage maps of Ghana. Learners can employ Overlay Tracing, Observe and Draw, Grid Drawing or Sketch from Memory methods or through Digital Map creation.
2. Offer individualised support to learners who require additional assistance. Provide one-on-one explanations, modelling, or extra practice opportunities tailored to their specific needs.
3. Make learners aware that the goal is not to create a perfectly detailed map, but to help learners understand the spatial relationships and key features of a country. Encourage creativity and exploration through these map-making activities to make learning geography engaging and memorable.

KEY ASSESSMENT

Level 1: Verbally names and locates two lowland areas in Ghana.

Level 1: Verbally names and locates two highland areas in Ghana.

Level 1: Verbally names and locates four major rivers in Ghana.

Level 2: Contrasts the relief features of any lowland and any highland area in Ghana

Level 2: Outline the physical and economic benefits of Ghana's rivers.

Level 2: Sketch an outline map of Ghana to show the location of her main areas of lowland areas of highland and rivers with their respective names.

Level 3: Analyse the socio-economic problems that can arise due to relief features in Ghana's highlands and lowlands.

Level 3: Compare and contrast the socio-economic problems and benefits of Ghana's rivers.

Level 4: Critically analyse the ways Ghana optimises its lowlands, highlands and river systems to maximise the socio-economic benefits derived from these diverse geographical features?

Section Review

This section focused on two focal areas for Week 9 and 10. The section on relief and drainage in Ghana provides learners with a comprehensive understanding of the country's physical geography. Learners should acquire knowledge about Ghana's varied relief features, including mountains, plateaus, and coastal plains, and their significance in shaping the landscape. They will also explore the drainage patterns, including rivers and lakes, and their impact on the country's ecosystems and human activities. Through this section, learners will develop skills in map reading, spatial analysis, and interpreting geographic features. They will also gain

competencies in understanding the interplay between relief, drainage, and the socio-economic development of Ghana.

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SECTION 6: PRIMARY ECONOMIC ACTIVITIES

Strand: **Human and Environment**

Sub-Strand: Economic Activities

Learning Outcome: *Examine the methods, importance and problems of agriculture, lumbering and mining in Ghana*

Content Standard: Demonstrate an understanding of the various primary economic activities in Ghana and beyond

INTRODUCTION AND SECTION SUMMARY

In this section we explore two important aspects of economic activity: farming and lumbering. Subsistence agriculture involves farming practices where individuals or families produce food primarily for their own consumption. This lesson delves into the various techniques and methods employed in subsistence farming and highlights its significance in providing sustenance for rural communities. On the other hand, commercial agriculture focuses on large-scale production for the purpose of selling crops and generating profit. The lesson examines the differences in farming practices between subsistence and commercial agriculture, considering factors such as scale, technology, labour, and market orientation. Additionally, the lesson explores the economic activity of lumbering, which involves the extraction and processing of timber for commercial purposes. Through these lessons, learners gain a comprehensive understanding of the diverse economic activities that contribute to livelihoods, food security, and economic development in different regions. This section has a link with Agricultural science at the senior High School level as well as Social Studies at both the Junior and Senior High school levels.

The week(s) covered by the section is/are:

***Week 11**: Subsistence and Commercial Agriculture*

***Week 12**: Lumbering as an economic activity*

SUMMARY OF PEDAGOGICAL EXEMPLARS

In this section, a variety of pedagogical approaches are utilised to create an engaging and interactive learning experience for learners. Collaborative learning strategies, such as think-pair-share and brainstorming, encourage active participation and discussion among learners. Mixed ability grouping allows learners with different skill levels to work together, promoting inclusivity and knowledge sharing. Furthermore, talk for learning is facilitated through the use of video presentations and resource persons, providing learners with visual and auditory stimulation and real-world insights. These pedagogical examples aim to foster critical thinking, collaboration, exploration, and meaningful engagement with the subject matter. By incorporating these strategies, educators can create a dynamic learning environment that enhances learner learning outcomes and promotes a deeper understanding of the topics at hand.

ASSESSMENT SUMMARY

In line with focal areas in this section, the teacher is encouraged to use formative assessment strategies like oral responses, short answers, and mini essays to assess learners' understanding of foundational Geography concepts. These strategies elicit individual responses and allow the teacher to gauge the

depth of learners' comprehension. By aligning assessments with Depth of Knowledge (DoK) levels 1, 2, and 3, the teacher can cater for different cognitive demands. It is important to consider the diverse abilities of learners and provide appropriate support. Additionally, the teacher should be mindful of gender dynamics in their assessment approaches to ensure fairness and inclusivity. By implementing these strategies, the teacher can effectively assess learners' understanding, create an inclusive learning environment, and provide tailored support where needed.

Week 11

Learning Indicator(s):

3. *Discuss the characteristics of subsistence and commercial agriculture and their importance and challenges in Ghana*

THEME/FOCAL AREA 1: SUBSISTENCE AND COMMERCIAL AGRICULTURE

Agriculture is the practice of cultivating plants and rearing animals for food, fibre, medicinal plants, and other products used to sustain human life. In Ghana, agriculture can be broadly grouped into two categories, namely, subsistence and commercial agriculture.

Subsistence Agriculture: This is a system of agriculture that involves cultivating crops and rearing animals purposely for domestic use. The surplus may be sent to the market for sale.

Fig. 11.1: Family working together on their small farm using simple farm tools

Characteristics/Features of subsistence agriculture

1. The use of simple farm tools. E.g., cutlass, hoe, axe and others.
2. It is a small-scale farming.
3. Cultivation is mainly for consumption.
4. Labour intensive.
5. The use of manual labour mostly by family members.
6. Less capital intensive.
7. It is seasonal and rain-fed.
8. Usually characterised by free range farming.
9. Natural ways of controlling pests and diseases.
10. Little attention is given to cash crops.
11. Practised in areas with low population.
12. Notable farming systems include mixed cropping, mixed farming, bush fallowing, free range farming, shifting cultivation, nomadic pastoralism, transhumance and others.

Benefits/Advantages of subsistence agriculture

1. It ensures food security.
2. It is cost effective.
3. Cheap farm labour.
4. It does not require special skills and technology.
5. It is ecologically friendly due to non-application of weedicides/pesticides.
6. Land regains fertility during the fallow period.
7. Farm produce is normally natural and non-genetically modified.

Problems/Disadvantages of subsistence agriculture

1. Low farm yield.
2. Limited food production.
3. Vulnerable to environmental impacts like weather conditions.
4. Limited access to the market.
5. Less income generation.
6. Limited access to essential farm inputs.
7. Poverty.
8. Rural depopulation.

Solutions to problems of subsistence agriculture

1. Access to modern farming techniques and technology.
2. Diversification of crops and income sources.
3. Access to road networks.
4. Adequate storage facilities.
5. Access to credit and financial services.
6. Construction of small-scale irrigation systems.
7. Providing farmers with access to training programs, workshops, and extension services.
8. Implementing supportive policies, such as subsidies, and land tenure reforms.
9. Education and empowerment of rural communities.

Commercial Agriculture: It is a system of agriculture which involves large-scale cultivation of crops and rearing of animals purposely for sale rather than for personal consumption.

Fig. 11.2: Farmer working with disc plough mounted on a tractor

Characteristics/Features of commercial agriculture

1. It operates on a large scale.
2. Commercial farmers often specialise in the production of specific crops or livestock.
3. It is capital intensive.
4. It employs technologies and machinery.
5. Limited access to modern farming technologies, improved seeds, and mechanised equipment.
6. Utilises weedicides, fertilisers and pesticides.
7. It is market-oriented.
8. It is export-oriented.
9. Low accessibility to international markets.
10. Farmers often engage in supply chain integration by working closely with food processors, distributors, and retailers.
11. Crops grown are mostly cash crops. These crops include cocoa, cotton, oil palm, rubber, cashew, and various fruits and vegetables.
12. Environmental concerns, including deforestation, soil degradation, and water pollution.
13. Notable farming systems include plantation farming, irrigation farming, ranching, market gardening and many more.

Benefits/Advantages of Commercial Agriculture

1. Enables large-scale production of food and cash crops.
2. Ensuring food security by increasing the availability and accessibility of food.

3. It creates numerous employment opportunities.
4. It generates income for farmers and rural communities and contributes to the overall Gross Domestic Product (GDP).
5. It involves value-added processing activities such as food processing, packaging, and agro-industrial manufacturing.
6. Infrastructure Development such as irrigation systems, roads, storage facilities, and processing plants.
7. Lead to capacity building among farmers, promote agricultural education and training
8. Generates foreign exchange

Problems/disadvantages of Commercial Agriculture

1. Land tenure issues.
2. Insufficient infrastructure, including roads, irrigation systems, storage facilities, and processing plants.
3. Limited access to finance.
4. Climate change and environmental degradation.
5. Pest and disease.
6. Market access and trade Barriers.
7. Limited access to modern farming technologies, improved seeds, and mechanised equipment.
8. Limited access to agricultural training, extension services, and information.
9. Fluctuations in global prices. e.g., Cocoa.

Solutions to Problems of Commercial Agriculture

1. Governments can establish clear and secure land tenure systems that protect the rights of commercial agriculture investors.
2. Improving transportation networks and providing reliable access to water resources
3. Efforts should be made to improve access to finance for smallholder farmers and emerging commercial agriculture enterprises.
4. Promoting climate-smart agricultural practices, such as conservation agriculture, agroforestry, and water management techniques, can help farmers adapt to climate change and reduce environmental impacts.
5. Governments, research institutions, and extension services should prioritise the development and dissemination of effective pest and disease management strategies.
6. Governments can negotiate favourable trade agreements, reduce trade barriers, and streamline customs procedures to improve market access for agricultural products.
7. Promoting the adoption of modern farming technologies, such as improved seeds, precision agriculture tools, and efficient irrigation systems, can increase productivity and efficiency.
8. Investing in agricultural research and development, extension services, and farmer training programs can facilitate knowledge and skill transfer, encouraging innovation in the sector.

LEARNING TASKS

1. Compare and contrast the farming practices between subsistence and commercial farming. 'Compare and contrast' is a higher order skill which involves the consideration and sorting of often complex information. The teacher should define the expected outcomes for this task mindful of learners with differing abilities as some might be challenged with the concept of compare and contrast. A simple table might be used to good advantage as a prompt. This might have two columns, one headed up 'differences' the other 'similarities'. Both farming practices need seeds and water – a similarity. One uses machines – a difference. These may be placed in the columns as a prompt. For those learners who grasp the concept of 'compare and contrast' a Venn diagram might be used to highlight common needs of each farming practice, seed and water would be in the circle overlap for example. The Venn diagram could be written in two short paragraphs with a concluding section. The teacher could allocate differentiated resources based on their assessment of individual learners' abilities or use paired groupings to encourage peer learning.
2. Describe the advantages and disadvantages of subsistence agriculture in Ghana. The teacher might make use of a visiting speaker/video/case study documentation. The teacher should be clear about the learning outcomes, written summary or table form, notes, mini essay, digital presentation. Exemplars might be provided to show what learners need to work towards to provide a detailed response to this task.
3. Describe the advantages and disadvantages of commercial agriculture in Ghana. The teacher might make use of a visiting speaker/video/case study documentation. The teacher should be clear about the learning outcomes, written summary or table form, notes, mini essay, digital presentation. Exemplars might be provided to show what learners need to work towards to provide a detailed response to this task.
4. Outline the improvements that could be made to subsistence farming to help solve some of its problems. The teacher might use this as a research opportunity, clearly defining the resources, pairing learners of differing abilities, and providing sections for them to work through: 1. Better seeds and cultivation techniques, 2. Education, 3. Crop diversification, 4. Finance, 5. Access to markets. The teacher might determine in what form the findings can be presented; verbal presentation to whole class, summary of points, evaluation depending on ability and stretch and challenge.
5. Outline the improvements that could be made to commercial farming to help solve some of its problems. The teacher might use this as a research opportunity, clearly defining the resources, pairing learners of differing abilities, and providing sections for them to work through: 1. Modern mechanised techniques, 2. Scale of Production 3. Use of fertilisers and pesticides, 4. Finance, 5. Access to international markets. The teacher might determine in what form the findings can be presented; verbal presentation to whole class, summary of points, evaluation depending on ability and stretch and challenge.

PEDAGOGICAL EXEMPLARS

Collaborative learning

In mixed groups from different localities, think-pair-share on the meaning of agricultural activities with emphasis on subsistence and commercial farming and identify some of these activities in their various localities.

1. The teacher should provide a clear definition of agriculture (farming) including crops and animals and explain how farming can be either for personal consumption or for commercial sale. The fact that subsistence farmers may sell some of their surplus at local market must be

discussed to explain that this is not commercial farming and the reasons why it is not. Create mixed groups that consist of learners from different localities to allow for diverse perspectives and experiences to be shared during the activity.

2. Provide differentiated prompts or questions that cater for different learning abilities. Lower-ability learners can focus on understanding the meaning of agricultural activities, while higher-ability learners can delve deeper into analysing the impact and challenges of different farming activities in their specific localities – challenge learners to contrast the production of maize in local farms with that of Cocoa in the south-eastern hills.
3. Encourage learners to pair up within their groups to discuss the prompts and share their insights. This collaboration fosters peer learning and allows learners to exchange knowledge about primary economic activities in their respective localities.
4. Offer different supports, such as simple worksheets, vocabulary lists, or visual aids, to assist learners in organising their thoughts and identifying primary economic activities in their localities. These supports can be adjusted based on individual learning needs.
5. Make outcomes of group work clear, state what evidence groups must present and how they might present it; share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

Learners brainstorm on the crops grown in their local area. *Learners should help to expand others' emotional vocabulary and their abilities to identify physical sensations related to particular feelings.*

1. Begin the brainstorming session by providing multiple entry points or prompts of varying complexity. Encourage learners to use their own experiences and that of others in their family group to build a picture of what 'agriculture' is in Ghana.
2. Allow learners to form small groups based on their interests or abilities.
3. Provide worksheets or templates to support learners in organising their ideas during the brainstorming activity.
4. Offer scaffolding and prompts to guide learners through the brainstorming process.
5. Create a supportive and inclusive environment where all learners feel comfortable sharing their ideas. Encourage active participation by valuing and respecting each contribution, regardless of its complexity or level of detail.
6. Make outcomes of group work clear, state what evidence groups must present and how they might present it; share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

Exploratory Learning:

In mixed ability groupings, visit local farms that practises subsistence and commercial farming or watch a video on subsistence and commercial farming and discuss the characteristics, importance, problems and remedies of the various forms of agriculture (subsistence and commercial) in Ghana. *Individuals should accept the views of others and embrace diversities.*

1. Provide learners with specific observation or viewing tasks to focus their attention during the farm visit or video. Differentiate these tasks based on learners' abilities, allowing for different levels of analysis and reflection.
2. Form mixed-ability groups for discussion after the farm visit or video viewing. Encourage learners to share their observations, insights, and questions related to the characteristics, importance, problems, and potential remedies of subsistence and commercial farming in Ghana.

3. Support learners' discussions with scaffolding materials, such as sentence starters, graphic organisers, or key questions. These resources can be tailored to different learning abilities and provide support for organising thoughts and contributing to the discussion.
4. Actively facilitate the group discussions, providing clarifications, guiding questions, and encouraging respectful and inclusive participation. Offer differentiated support and feedback to each learner, addressing their specific needs and encouraging critical thinking.
5. Make outcomes of group work clear, state what evidence groups must present and how they should present it; share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

KEY ASSESSMENT

Level 1: Verbally describes the meaning of agriculture.

Level 1: Can verbally name two common subsistence crops and two crops grown on a commercial scale.

Level 1: Outline their experiences growing produce for use in their own home.

Level 2: Outline the differences and similarities between subsistence and commercial farming.

Level 2: Describe the problems of subsistence farming and how these might be solved.

Level 2: Research the commercial production of Cocoa in Ghana providing details on where it is produced, methods of production, problems and the importance of this crop to Ghana's economy.

Level 3: Outline the actions that could be taken to improve either subsistence or commercial agriculture in Ghana.

Level 3: As a Minister of Agriculture, how would you formulate comprehensive policies that foster the shift from subsistence farming to commercial agriculture in rural communities? Consider economic, social and environmental considerations while devising your strategy.

Week 12

Learning Indicator(s):

4. *Examine the methods, importance and problems of lumbering and mining in Ghana (Lumbering)*

THEME/FOCAL AREA 1: LUMBERING AS AN ECONOMIC ACTIVITY

Meaning of Lumbering and Timber

Lumbering, also called timber logging, is defined as a primary economic activity which involves the felling, processing and transportation of economic trees for commercial, domestic and industrial purposes.

Timber, commonly, refers to wood that has been cut and prepared for use in building houses, bridges, furniture, and other projects. This includes processing the wood into beams, planks, or other usable shapes.

Areas of lumbering activities/ timber logging in Ghana

Lumbering is undertaken in forested areas. They include Western, Western North, Bono, Ashanti, Eastern, and Central regions. Notable lumbering areas are Sefwi-Wiawso, Goaso, Manso-Nkwanta, Kade, Dunkwa and others.

Common types of trees that are cut down for timber include Odum, Mahogany, Wawa (Obeche), Sapele, Emire, Dahoma, African walnut, Makore, Utile, Teak and Kokrodua.

Methods of Lumbering/Timber Extraction in Ghana

1. The lumberjacks (people who cut down trees) initially search the forest for tree species, which may include Wawa, African Walnut, Odum, or Sapele.
2. Secondly, platforms of approximately 3m in height are constructed around the roots of the buttress.
3. The lumberjack is then employed to fell the tree using a chain saw in a manner that minimises the risk of injury.
4. After felling the tree branches are removed followed by the cutting of the tree into logs.
5. The logs are then dragged along the floor of the forest to a loading point.
6. Finally, the logs are transported by timber trucks to a sawmill for processing or to a port for export.

Factors that Favour Lumbering in Ghana

1. The presence of tropical rainforest
2. Presence of economic trees
3. Favourable equatorial climate
4. Availability of transport facilities
5. Availability of labour
6. High demand for wood in the local market

7. The external market for hardwood
8. Presence of saw milling industries

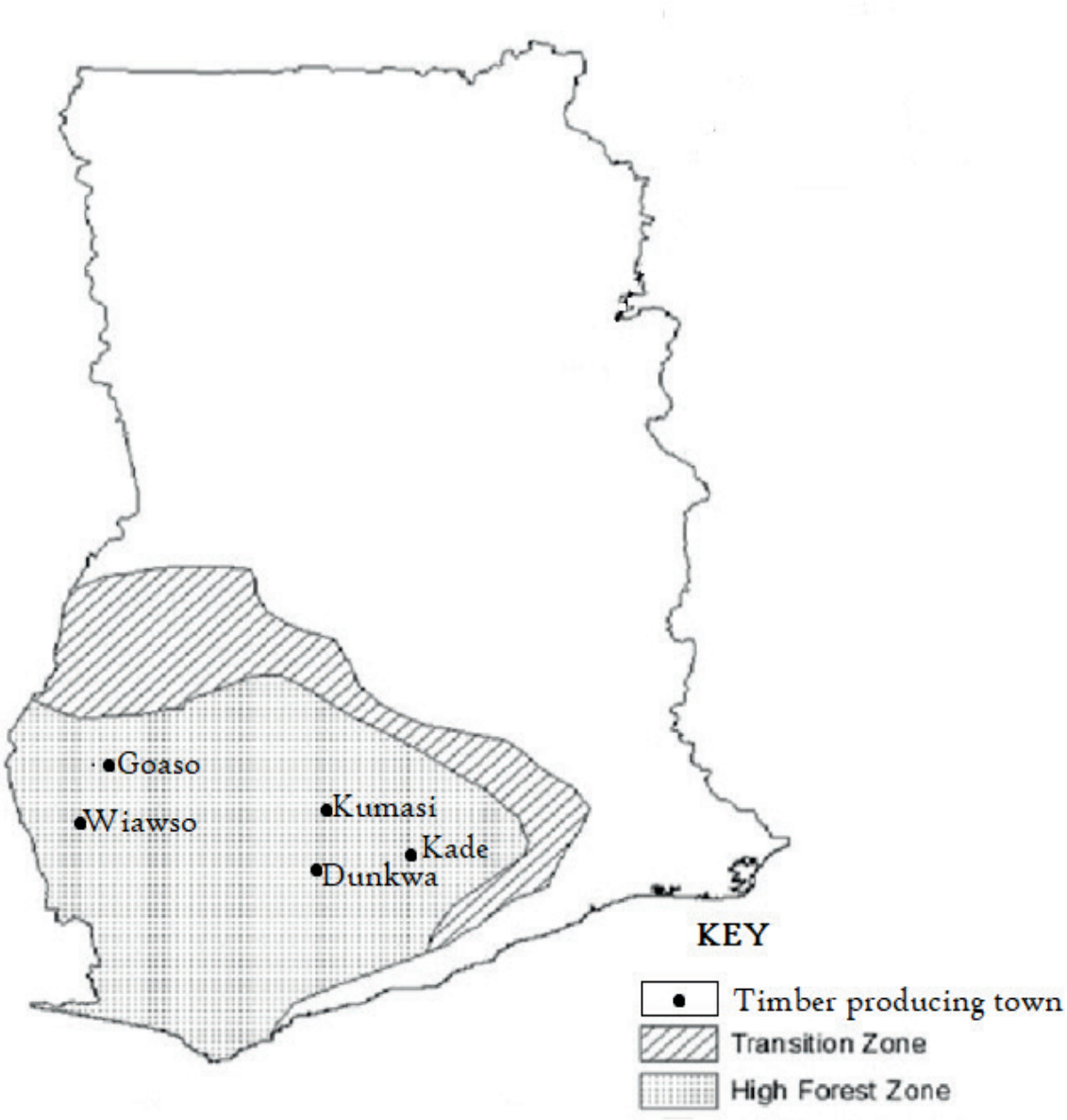

Fig. 12.1: Lumbering areas in Ghana

Economic Importance of Lumbering in Ghana

1. It provides job opportunities for both skilled and unskilled workers, including loggers, sawmill operators, truck drivers, and workers in related industries.
2. It generates income to workers which contributes to poverty reduction and improves livelihoods.
3. The timber industry plays a crucial role in earning foreign exchange through exports.
4. The exports as well as taxes from timber companies generate revenue for the country, contributing to its balance of trade and overall economic growth.
5. It serves as a source of industrial raw materials.
6. Lumbering supplies fuel wood such as firewood, coal, sawdust, and timber chips for use in the home and industry.

7. It also encourages the development of ancillary industries and opens up new doors for related businesses, like sawing, furniture, woodworking, carpentering, shipping, and logistics
8. It provides wood products for building and construction of houses, bridges and railway sleepers
9. The timber companies, as a way of compensation, provide infrastructure and social amenities such as roads, electricity, pipe-born water, clinics and more in the towns in which they operate.
10. Hardwood such as Wawa is used for boat/canoe building which promotes fishing activities.

Problems Affecting Lumbering in Ghana

- Illegal logging which contributes to deforestation, habitat destruction, and loss of biodiversity.
- Deforestation and forest degradation, primarily driven by agricultural expansion, including the cultivation of cash crops like cocoa.
- Attack by pest and diseases.
- Poor transport systems.
- Low level of technology
- Inadequate capital.
- The trees are not in a pure stand, and this makes the felling challenging and expensive.
- Inadequate enforcement of forestry regulations and weak governance systems contribute to the challenges in the lumbering sector.

Solutions to Address the Problems of Lumbering in Ghana

- Adoption of forest certification programs that make sure timber products come from forests that are managed in a way that is good for the environment, the society, and the economy.
- Legislation to combat illegal logging. This includes increased patrol, surveillance, and monitoring of forest areas to identify and arrest illegal loggers.
- The government should initiate extensive afforestation programmes to restore and preserve forests, in partnership with local people and international organisations.
- Farmers and unlawful chainsaw operators need to be taught about sustainable tree felling and the dangers of deforestation on radio and television.
- Railways should be modernised and designed for the primary purpose of carrying heavy goods such as timber. Road maintenance should also be carried out regularly.
- Disease control measures and pesticides should be used to address the attack of pests and diseases.
- Leading financial institutions such as the Agricultural Development Bank (ADB) and the National Investment Bank (NIB) should be able to easily offer low-interest loans to timber companies.
- Workers should receive in-service training with foreign specialists to enhance their understanding and proficiency in lumbering.

LEARNING TASKS

The teacher may select one or more of these tasks depending on the time and resources available. Task 4 might be used as a stretch and challenge extension for those learners who master the knowledge and understanding of lumbering and its economic importance in a relatively short space of time.

1. Describe the types of trees, methods and main areas of lumbering in Ghana. The teacher might use a variety of methods to accomplish this task. Videos/visiting speakers might be used to provide visual first hand evidence, although teachers should be mindful of those with visual impairment when using these methods. Teachers might have samples of the types of wood from trees that are targeted for commercial lumbering activities. The idea of sustainability with respect to commercial lumbering should be introduced for this task so learners are aware of trees being finite resources and their vital contribution to global climate. The need for conservation should also be an important part of discussions around this task. The teacher should prepare resources which reflect the ability of all learners and stretch and challenge all groups
2. Discuss the major problems and their remedies for lumbering and activities in Ghana. The assessment outcome of this task could be in the form of a verbal or written summary or digital presentation depending on the resources available. Challenge learners to identify a problem and verbally explain the solution to their peers. Use flash cards to present problems and ask learners in pairs to explain their random choice.
3. On an outline of Ghana, or using a freehand sketch, locate the main areas of commercial lumbering.
4. Research the contribution international exports of timber make to the economy of Ghana. Use the data you discover to draw graphs.

PEDAGOGICAL EXEMPLARS

Talk for Learning

Watch a video presentation or listen to a resource person give a presentation on:

1. Meaning of lumbering and timber.
2. Factors influencing lumbering and methods of extraction.
3. Importance and challenges facing lumbering activities and their solutions in Ghana.

Learners should accurately assess their own capabilities as they watch videos or listen to the resource person.

1. Provide differentiated materials and resources to learners, based on their abilities and prior knowledge. This can include simplified readings, vocabulary lists, or visual aids to help them understand the concepts and context of lumbering and timber.
2. Offer differentiated note-taking supports, such as graphic organisers or structured note-taking templates for learners to organise their thoughts and capture key information from the video or presentation by resource person.
3. Provide learners with specific focus questions or tasks to guide their viewing or listening experience.
4. Form mixed-ability groups for discussions after watching the video or listening to the presentation. Encourage learners to share their observations, insights, and questions related to the meaning of lumbering, factors influencing lumbering, methods of extraction, and the importance and challenges facing lumbering activities in Ghana.
5. Support learners' discussions with scaffolding materials, such as sentence starters, discussion prompts, or guiding questions. These resources can be adjusted to cater for different learning abilities and help learners engage in meaningful conversations.

6. Actively facilitate the group discussions, providing clarifications, guiding questions, and encouraging respectful and inclusive participation. Offer differentiated support and feedback to each learner, addressing their specific needs and encouraging critical thinking.
7. Make outcomes of individual work clear, state what evidence an individual must present and how they must present it: Mini essay, digital presentation. The teacher might ask learners to share findings in a review/reflective class discussion. Learners must know the goal they are working towards to engage with the task within the time limits specified.

KEY ASSESSMENT

Level 1: Verbally states at least three trees that are important to commercial lumbering.

Level 1: Describe the method used by lumberjacks to cut down trees.

Level 1: List 5 factors that favour lumbering in Ghana.

Level 1: Identify four major problems associated with lumbering activities in Ghana.

Level 2: Sketch an outline map of Ghana and locate and name the main area of lumbering.

Level 2: As a member of a local environmental club in Ghana you have been asked to plan a presentation to raise awareness about the environmental impact of lumbering activities.

Research the local and global environmental problems of lumbering in Ghana and use your findings to build a digital or scripted presentation for your group to highlight the impacts.

Level 3: Write a letter to a National Government Representative, highlighting the major issues associated with lumbering and propose strategies to address them. Consider the perspectives of various stakeholders, including local communities, environmental organisations, and industry representatives.

Section Review

This section focused on two focal areas for Week 11 and 12. In this section on subsistence and commercial agriculture as economic activities equips learners with a solid understanding of these two distinct forms of agricultural practices. Learners should acquire knowledge about subsistence agriculture, including its purpose of producing crops and livestock for personal consumption. They should also gain insights into the methods, challenges, and prevalence of subsistence farming in developing countries. Furthermore, learners will explore commercial agriculture, focusing on large-scale production for sale in the market, and gain an understanding of different forms such as plantation farming and agribusiness. The focus on lumbering as a commercial enterprise gives learners a perspective of how natural resources like timber contribute to the economy in Ghana. By studying both subsistence and commercial agriculture, learners will develop a comprehensive grasp of how societies meet their economic needs through agricultural activities.

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