

Geography S 5

Teacher's Guide

Kigali, January 2019

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FOREWORD

Dear teacher,

Rwanda Education Board is honoured to present Senior5 Geography teacher's guide which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of the Geography subject. The Rwandan educational philosophy is to ensure that learners achieve full potential at every level of education which will prepare them to be well integrated in society and exploit employment opportunities.

In line with efforts to improve the quality of education, the government of Rwanda emphasizes the importance of aligning teaching and learning materials with the syllabus to facilitate their learning process. Many factors influence what they learn, how well they learn and the competences they acquire. Those factors include the relevance of the specific content, the quality of teachers' pedagogical approaches, the assessment strategies and the instructional materials available. Special attention was paid to the activities that facilitate the learning process in which learners can develop ideas and make new discoveries during concrete activities carried out individually or with peers. With the help of the teachers, learners will gain appropriate skills and be able to apply what they have learnt in real life situations. Hence, they will be able to develop certain values and attitudes allowing them to make a difference not only to their own lives but also to the nation.

This is in contrast to traditional learning theories which view learning mainly as a process of acquiring knowledge from the more knowledgeable who is mostly the teacher. In competence-based curriculum, learning is considered as a process of active building and developing of knowledge and understanding, skills, attitudes and values by the learner, where concepts are mainly introduced by an activity, situation or scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values.

In addition, such active learning engages learners in doing things and thinking about the things they are doing. They are encouraged to bring their own real experiences and knowledge into the learning processes. In view of this, your role is to:

- Plan your lessons and prepare appropriate teaching materials.
- Organize group discussions for learners considering the importance of social constructivism suggesting that learning occurs more effectively when the learner works collaboratively with more knowledgeable and experienced people.
- Engage learners through active learning methods such as inquiry methods, group discussions, research, investigative activities and group and individual work activities.
- Provide supervised opportunities for learners to develop different competences by giving tasks which enhance critical thinking, problem solving, research,

creativity and innovation, communication and cooperation.

- Support and facilitate the learning process by valuing learners' contributions in the class activities.
- Guide learners towards the harmonization of their findings.
- Encourage individual, peer and group evaluation of the work done in the classroom and use appropriate competence-based assessment approaches and methods.

To facilitate you in your teaching activities, the content of this teacher's guide is self-explanatory so that you can easily use it. It is divided into 3 main parts:

The part 1: Starts with general introduction and explains the structure of this book and gives you methodological guidance;

The part 2: Provides the sample lesson plans as reference for your lesson planning process;

The part 3: Provides details on teaching guidance for each concept given in the student book.

Even though this teacher's guide contains the answers for all activities given in the learner's book, you are requested to work through each question and activity before judging learner's findings.

I wish to sincerely appreciate all people who contributed towards the development of this teacher's guide, particularly REB staff who organized the whole process from its inception. Special appreciation goes to University of Rwanda which provided experts in design and layout services, illustrations and images anti- plagiarism, lectures and teachers who diligently worked to successful completion of this book. Any comment or contribution would be welcome to the improvement of this teacher's guide for the next edition.

Dr. NDAYAMBAJE Irénée

Director General of REB

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I wish to express my appreciation to all the people who played a major role in development of this Geography textbook for senior five. It would not have been successful without active participation of different education stakeholders.

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Finally, my word of gratitude goes to the Rwanda Education Board staff particularly those from the curriculum, Teaching and Learning Resources Department (CTLR) who were involved in the whole process of in-house textbook writing.

Joan MURUNGI,

Head of curriculum, Teaching and Learning Resources Department (**CTLR**)

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PART I. GENERAL INTRODUCTION

1.1. The structure of the teacher's guide

This section presents the overall structure, the unit and sub-heading structure of the teacher's guide. This aims at helping teachers to understand the different sections of this guide and what they will find in each section.

Overall structure

The whole guide has three main parts as follows:

Part I: General Introduction.

This part provides general guidance on how to develop the generic competences, how to integrate cross cutting issues, how to cater for learners with special educational needs, active methods and techniques of teaching geography and guidance on assessment.

Part II: Sample lesson plan

This part provides a sample lesson plan, developed and designed to help the teachers develop their own lesson plans.

Part III: Unit development

This is the core part of the guide. Each unit is developed following the structure below. The guide ends with references.

Structure of a unit

Each unit is made of the following sections:

- **Unit title:** From the syllabus
- **Key unit competence:** From the syllabus
- **Prerequisites (knowledge, skills, attitudes and values)**

This section indicates knowledge, skills and attitudes required for the success of the unit. The competence-based approach calls for connections between units/topics within a subject and interconnections related to different subjects. The teacher will find an indication of those prerequisites and guidance on how to establish connections.

- **Cross-cutting issues to be addressed**

This section suggests cross cutting issues that can be integrated depending on the unit content. It provides guidance on how to come up with the integration of the issue. Note that the issue indicated is a suggestion; teachers are free to take another cross-cutting issue taking into consideration the learning environment.

- **Guidance on the introductory activity:**

Each unit starts with an introductory activity in the learner’s book. This section of the teacher’s guide provides guidance on how to conduct this activity and related answers. Note that learners may not be able to find the right solution, but they are invited to predict possible solutions or answers. Solutions are provided by learners gradually through discovery activities organized at the beginning of lessons or during the lesson.

- **List of lessons/sub-heading**

This section which is in a table form presents suggestion on the list of lessons, lesson objectives copied or adapted from the syllabus and duration for each lesson. Each lesson /subheading is then developed.

- **End of each unit**

At the end of each unit the teacher’s guide provides the following sections:

- Summary of the unit: This provides the key points of content developed in the student’s book.
- Additional information: This provides supplementary content compared to the student’s book for the teacher to have a deeper understanding of the topic.
- End unit assessment: This provides the answers to questions of end unit assessment in the textbook and suggests additional questions and related answers to assess the key unit competence.
- Additional activities: These cater for remedial, consolidation and extended activities. The purpose of these activities is to accommodate each learner (slow, average and gifted) based on end unit assessment results.

Structure of each sub heading

Each lesson/sub-heading is made of the following sections:

Lesson /Sub heading title 1.....

Prerequisites/Revision/Introduction:

This section gives a clear instruction to teacher on how to start the lesson

Teaching resources

This section suggests the teaching aids or other resources needed in line with the activities that would permit the achievement of the learning objectives. Teachers are encouraged to replace the suggested teaching aids in case it is necessary with the available ones in their respective schools and based on learning environment.

Learning activities

This section provides a short description of the methodology and any important aspect to consider. It provides also answers to learning activities with cross reference to text book.

Exercises/application activities

This provides questions and answers for exercises/ application activities.

1.2. Methodological guidance

1.2.1. Developing competences

Since 2015 Rwanda shifted from a knowledge based to a competence-based curriculum for pre- primary, primary and general secondary education. This called for changing the way of learning by shifting from teacher centered to a learner centered approach. Teachers are not only responsible for knowledge transfer but also for fostering children's learning achievement and creating safe and supportive learning environment. It implies also that a learner has to demonstrate what he/she is able to do using the knowledge, skills, values and attitude acquired in a new or different or given situation.

The competence-based curriculum employs an approach of teaching and learning based on discrete skills rather than dwelling on only knowledge or the cognitive domain of learning. It focuses on what learners can do rather than what learners know. Learners develop basic competences through specific subject unit competences with well-defined learning objectives broken down into knowledge, skills and attitudes. These competences are developed through learning activities disseminated in learner-centered rather than the traditional didactic approach. The student is evaluated against set standards to achieve before moving on.

In addition to specific subject competences, learners also develop generic competences which are transferable throughout a range of learning areas and situations in life. Below is example of how generic competences can be developed in geography:

Critical Thinking

These are activities that require students to think critically about subject content. Groups can be organized to work in different ways e.g. taking turns, listening, taking decisions, allocating tasks, disagreeing constructively etc.

Collect geographical data locally through designing surveys, questionnaires, interview formats then analyse data, draw conclusions and present findings.

Observe, Record, interpret – e.g. Mark out areas in the school and get different groups to record physical and human features and then try to explain why these features are found in such environment.

Research and discuss on causes and effects of different geographical phenomena.

Compare and contrast physical and human features in different regions.

Debate on different problems associated with different physical environment.

Suggest ways of overcoming the above problems.

Research and problem solving

Use the Internet and the library to make research on the phenomena associated with the physical environment.

Collect geographical data through observation and Recording.

Collect geographical data through surveys, questionnaires and various kinds of interviews.

Develop sampling rules for data collection.

Creativity and Innovation

Design a sketch map.

Create an experiment to prove a Point.

Develop graphs and diagrams to illustrate information.

Create a flow chart to show the main stages in a process.

Design geographical data collection survey/questionnaire.

Identify a problem which requires data collection to solve.

Conduct experiments with objectives, methodology, observations, results and conclusions.

Make hypotheses and identify ways to test them.

Identify local problems and devise ways to resolve them.

Communication Skills

Describe physical and human geographical features.

Present geographical phenomena verbally, in writing, graphically and digitally.

Argue a geographical case verbally, in writing, graphically (compare and contrast) and

digitally.

Observe, record, interpret geographical phenomena.

Teamwork, Cooperation, Personal and Interpersonal management and life skills

Work in Pairs – particularly useful for higher grades for planning research, problem solving, etc.

Small group work.

Large Group Work.

Data Collection from the Community.

Collect community photographs and interview residents to make a class / school geography of the local Community.

Note: The teachers' Guide should improve support in the organisation and management of groups.

Lifelong Learning

Take initiative to update knowledge and skills in geography with minimum external support.

Cope with the evolution of knowledge and technology advances for personal fulfilment.

Seek out acquaintances for more knowledgeable opportunities in relation to areas that need

personal improvement and development.

Exploit all opportunities available to improve on knowledge and skills.

1.2.2 Addressing cross cutting issues

Among the changes in the competence-based curriculum is the integration of cross cutting issues. These should be an integral part of the teaching learning process as they relate to and must be considered and appropriately addressed within all subjects. The eight cross cutting issues identified in the national curriculum framework are: Peace and Values Education, Financial Education, Standardisation Culture, Genocide Studies, Gender, Environment and sustainability, Inclusive Education and Comprehensive sexuality education.

Some cross-cutting issues may seem specific to learning areas/subjects, but the teacher needs to address all of them whenever an opportunity arises. In addition, learners should always be given an opportunity during the learning process to address these cross-cutting issues both within and out of the classroom.

Below are examples on how crosscutting issues can be addressed in your subject:

Environment and sustainability: It can be integrated in geography as stand-alone unit for many topics e.g. when the learners study Environmental conservation. Environment and sustainability can also be integrated through all learning activities where the problems related to the environment such as pollution, erosion, are addressed.

Financial education: It can be integrated in learning activities when studying the relationship between different landforms and human activities.

Inclusive education: It can be integrated in geography for example if they have to make a field Study, they should consider the learners with physical disabilities and react accordingly by choosing an appropriate methodology. The use of a video is recommended for those who will not be able to reach the place. For learners with visual impairment, tactile materials such as tactile maps can be used.

1.2.3. Attention to special needs education and inclusive education

In the classroom, students learn in different ways depending on their learning pace, needs or any other special problem they might have. However, the teacher has the responsibility to know how to adopt his/her methodologies and approaches in order to meet the learning needs of each student in the classroom. Also teachers need to understand that students with special needs, have to be taught differently or need some special attention and consideration in order to enhance the learning environment.

This will be done depending to the topic and the nature of the lesson.

In order to create a well-rounded learning atmosphere, teachers need to:

- Remember that learners learn in different ways so they have to offer a variety of activities through varying ways (e.g. role-play, music and singing, word games and quizzes, and outdoor activities).
- Maintain an organized classroom and limits distraction. This will help learners with special needs to stay on track during lesson and follow instruction easily.
- Vary the pace of teaching to meet the needs of each learner. Some learners process information and learn more slowly than others.
- Break down instructions into smaller and manageable tasks. Learners with special needs often have difficulty in understanding long-winded or several instructions at once. It is better to use simple, concrete sentences in order to facilitate them understand what you are asking.
- Use clear consistent language to explain the meaning (and demonstrate or show pictures) if you introduce new words or concepts.
- Make full use of facial expressions, gestures and body language.
- Pair a learner who has a disability with a friend. Let them do things together and learn
- from each other. Make sure the friend is not over protective. Both learners will benefit from this strategy.
- Use multi-sensory strategies. As all learners learn in different ways, it is important to make every lesson as multi-sensory as possible. Learners with learning disabilities might have difficulty in one area, while they might excel in another. For example, use both visual and auditory signals.

Below are general strategies related to each main category of disabilities and how to deal with every situation that may arise in the classroom. However, the list is not exhaustive because each learner is unique with different needs and that should be handled differently.

Strategy to help a learner with developmental impairment:

- Use simple words and sentences when giving instructions.
- Use real objects that learners can feel and handle. Rather than just working abstractly with pen and paper.
- Break a task down into small steps or learning objectives. The learner should start with an activity that he or she can do before moving on to something that is more difficult.
- Gradually give the learner less help.
- Let the learner work in the same group with those without disability.

For example, in geography subject, learners with developmental disabilities can be helped by giving them remedial activities according to the level of their needs.

Strategy to help a learner with visual impairment:

- Help learners to use their other senses (hearing, touch, smell and taste) to play and carry out activities that will promote their learning and development.
- Use simple, clear and consistent language.
- Use tactile objects to help explain a concept.
- If the learner has some sight, ask them what they can see.
- Make sure the learner has a group of friends who are helpful and who allow him/her to be as independent as possible.
- Plan activities so that learners work in pairs or groups whenever possible.

Strategies to help a learner with hearing disabilities or communication difficulties:

- Always get the learners' attention before you begin to speak.
- Encourage the learner to look at your face.
- Use gestures, body language and facial expressions.
- Use pictures and objects as much as possible.
- Keep background noise to a minimum.

For example learners with hearing disabilities or communication difficulties will be helped by using enough maps, illustrations, diagrams and sign languages.

Strategies to help a learner with physical disabilities or mobility difficulties:

- Adapt activities that can enable learners who use wheelchairs or other mobility aids, to participate in lesson activities.
- Ask parents/care-givers to assist with adapting furniture e.g. The height of a table may need to be changed to make it easier for a learner to reach it or fit their legs or wheelchair under.
- Get advice from parents or a health professional about assistive devices.

For example: Learners with physical disabilities can have problem to reach the field study. So teachers should think about that before planning the field visit and make sure that some accommodation are provided for those with mobility impairment.

Adaptation of assessment strategies

Each unit in the teacher's guide provides additional activities to help learners achieve the key unit competence. Results from assessment inform the teacher the learner who needs remedial, consolidation or extension activities. These activities are designed to cater for the needs of all categories of learners; slow, average and gifted learners respectively.

1.2.4. Guidance on assessment

Assessment is an integral part of teaching and learning process. The main purpose of assessment is for improvement. Assessment for learning/ **Continuous/ formative assessment** intends to improve learners' learning and teacher's teaching. Whereas assessment of learning/summative assessment intends to improve the entire school's performance and educational system in general.

Continuous/ formative assessment

It is an ongoing process that arises out of interaction during teaching and learning. It includes lesson evaluation and end of sub unit assessment. This formative assessment should play a big role in teaching and learning process. The teacher should encourage individual, peer and group evaluation of the work done in the classroom and use appropriate competence-based assessment approaches and methods.

Formative assessment will be applied in geography before, during and after the lesson by using learning activities and application activities.

Summative assessment:

The assessment can serve as summative and formative depending on its purpose. The end unit assessment will be considered summative when it is done at the end of unit and the teacher wants to start a new one.

It will be formative assessment, when it is done to give information on the progress of students and from there decide what adjustments should be implemented or conducted. The assessment done at the end of the term or end of year, is considered as summative assessment so that the teacher, school and parents are informed of the achievement of educational objective and think of improvement strategies. There is also end of level/ cycle assessment in form of national examinations.

Summative evaluation will be applied in this subject at the end of each unit.

1.2.5. Students' learning styles and strategies to conduct teaching and learn learning

There are different teaching styles and techniques that should be catered for. The selection of teaching method should be done with the greatest care and some of the factors to be considered are: the uniqueness of subjects; the type of lessons; the learning objectives to be achieved; the allocated time to achieve the objective; instructional available materials; the physical/sitting arrangement of the classroom, individual students' needs, abilities and learning styles.

There are mainly four **different learning** styles as explained below:

a) Active and reflective learners

Active learners tend to retain and understand information best by doing something active with it—discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.

b) Sensing and intuitive learners

Sensing learners tend to like learning facts; **intuitive learners** often prefer discovering possibilities and relationships. Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitive learners like innovation and dislike repetition.

c) Visual and verbal learners

Visual learners remember best what they see—pictures, diagrams, flow charts, time lines, films, demonstrations, etc.; verbal learners get more out of words—written and spoken explanations.

d) Sequential and global learners

Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly “getting it.”

The diversity of learners has been catered for in elaborating the learner’s textbook and the teacher’s guide through suggesting a variety of activities such as:

- Learning and application activities.
- Consolidation activities which improve a deep development of competences.
- Remedial activities which help slow learners to develop some competences.
- Extended activities which are meant for gifted and talented learners.

1.2.6. Teaching methods and techniques that promote the active learning

The different student learning styles mentioned above can be catered for, if the teacher uses active learning whereby learners are really engaged in the learning process.

What is Active learning?

Active learning is a pedagogical approach that engages students in doing things and thinking about the things they are doing. In active learning, learners are encouraged to bring their own experience and knowledge into the learning process.

The role of the teacher in active learning

The teacher engages learners through active learning methods such as inquiry methods, group discussions, research, investigative activities and group and individual work activities.

He/she encourages individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.

He/she provides supervised opportunities for learners to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.

The teacher supports and facilitates the learning process by valuing learners' contributions in the class activities.

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The role of learners in active learning

Learners are key in the active learning process. They are not empty vessels to fill but people with ideas, capacity and skills to build on for effective learning. A learner engaged in active learning displays the following:

Communicates and shares relevant information with other learners through presentations, discussions, group work and other learner-centred activities (role play, case studies, project work, research and investigation).

Actively participates and takes responsibility for their own learning.

Develops knowledge and skills in active ways.

Carries out research/investigation by consulting print/online documents and resourceful people, and presents their findings.

Ensures the effective contribution of each group member in assigned tasks through

clear explanation and arguments, critical thinking, responsibility and confidence in public speaking.

Draws conclusions based on the findings from the learning activities.

Main steps for a lesson in active learning approach

All the principles and characteristics of the active learning process highlighted above are reflected in steps of a lesson as displayed below. Generally, the lesson is divided into three main parts whereby, each one is divided into smaller steps to make sure that learners are involved in the learning process. Below are those main part and their small steps:

1) Introduction

Introduction is a part where the teacher makes connection between the current and previous lesson through appropriate technique. The teacher opens short discussions to encourage learners to think about the previous learning experience and connect it with the current instructional objective. The teacher reviews the prior knowledge, skills and attitudes which have a link with the new concepts to create good foundation and logical sequence.

2) Development of the new lesson

The development of a lesson that introduces a new concept will go through the following small steps: discovery activities, presentation of learners' findings, exploitation, synthesis/summary and exercises/application activities, explained below:

Discovery activity

Step 1

The teacher discusses convincingly with students to take responsibility of their learning.

He/she distributes the task/activity and gives instructions related to the tasks (working in groups, pairs, or individual to instigate collaborative learning, to discover knowledge to be learned).

Step 2

The teacher allows the students work collaboratively on the task.

During this period the teacher refrains to intervene directly on the knowledge.

He/she then monitors how the students are progressing towards the knowledge to be learned and boost those who are still behind (but without communicating to them the knowledge).

Presentation of learners' productions

- In this episode, the teacher invites representatives of groups to present the students' productions/findings.

- After three/four or an acceptable number of presentations, the teacher decides to engage the class into exploitation of the students' productions.

Exploitation of learner's productions

The teacher asks the students to evaluate the productions: which ones are correct, incomplete or false.

Then the teacher judges the logic of the students' products, corrects those which are false, completes those which are incomplete, and confirms those which are correct.

Institutionalization (summary/conclusion/ and examples)

- The teacher summarises the learned knowledge and gives examples which illustrate

the learned content.

Exercises/Application activities

Exercises of applying processes and products/objects related to learned unit/sub-unit.

Exercises in real life contexts.

Teacher guides learners to make the connection of what they learnt to real life situations. At this level, the role of teacher is to monitor the learner's application of knowledge, skills, values and attitudes fixing the product/object being learned.

3) Assessment

In this step the teacher asks some questions to assess achievement of instructional objective. During assessment activity, learners work individually on the task/activity. The teacher avoids intervening directly. In fact, results from this assessment inform the teacher of next steps for the whole class and individuals. In some cases, the teacher can end with a homework assignment.

PART II: SAMPLE LESSON PLAN

SAMPLE LESSON PLAN 1 ON PRACTICAL GEOGRAPHY

School Name: GS Nyamata Catholic

Teacher's name: Dukundane Jane

Term	Date	Subject	Class	Unit No	Lesson No	Duration	Class size
I	24/02/2018	Geography	S5	3	3/12	40 minutes	40 learners
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				2 slow learners. 1 learner highly gifted learner.			
Unit title		Map work interpretation					
Key Unit Competence		The learners should be able to explain the relationship between the physical aspects and human activities on maps.					
Title of the lesson		Interpretation of the physical aspects from the maps.					
Instructional objective		Using topographic maps and text books learners identify and describe the physical aspects appropriately.					
Plan for this Class (location: in / outside)		The lesson will take place in the classroom.					
Learning Materials (for ALL learners)		Base maps, topographic maps, photographs of physical features, charts and flip charts.					
References		<p>Safari Sibo, Silvester Musisi and Godfrey Ssekandi (2012), Mk Senior Secondary Geography students' book 6, Kigali, Mk. Publishers.</p> <p>John whitton (1984). Dictionary of Physical Geography, New York, USA. Compound physical Geography by K. Kansime.</p> <p>Muhire, Mugabe, L, Nyirishema, M. (2012). Rwandan Geography Students' Book 6. Jomo Kenyata Foundation publisher.</p> <p>Ajaegbu, H.I., (1991). New approach to practical work in geography, Ibadan,</p> <p>Henry M. Kichodo (2009) Practical Geography for Advanced level map work, photographic interpretation, statistics, and field work Kampala, Compsolutions.</p>					
Timing step for each step		Description of teaching and learning activity				Generic competences and cross cutting issues to be addressed + a short explanation.	
		The learners using text books, topographic maps and the physical environment, identify and interpret the various physical aspects from maps.					

	Teacher's activities	Learner's activities	
Introduction (10min)	Learners are organized in pairs and given the print out for the introductory activity	Learners discuss and share the ideas in relation to the introductory activity.	<p>Cooperation:</p> <p>Cooperation and communication skills are addressed through working in groups.</p> <p>Critical thinking through identifying the factors influencing weathering.</p> <p>Inclusive education:</p> <p>Make the gifted learner the leader of the group so that he/she got busy helping the rest of the group.</p>

Development of the lesson: 25 min			
a) Discovery activity	<p>The teacher introduces the lesson of the day regarding interpretation of the physical aspects from the maps.</p> <p>Each pair/group, is given samples of topographic maps and photographs of expected physical aspects, by the teacher.</p> <p>Assigns the entire class the task of discussing at class level.</p>	<p>Listening.</p> <p>The learners in their pairs discuss the ways of identifying and interpreting the physical aspects from the map.</p> <p>Note down the findings of their research and share with the rest of the class.</p>	<p>Critical thinking:</p> <p>This will be achieved through finding how the physical aspects are identified and interpreted.</p> <p>skills: Cooperation and communication skills are enhanced through working in groups and pairs</p>
b) Presentations of learners' productions	<p>The teacher guides the class to share the latest ideas generated from the various presentations/discussions in relation to the interpretation of physical aspects from maps.</p>	<p>Asking</p> <p>Writing down the main points from the class discussion.</p> <p>Answering questions</p>	<p>Communication skills: These are addressed through presentations.</p> <p>Environment and sustainability:</p> <p>This is through realizing the need to conserve and protect the physical aspects that make up our environment.</p> <p>Inclusive education:</p>
c) Exploitations of learner's productions	<p>The teacher tasks the class/learners to contribute and comment on each other's' content/discussion presented.</p>	<p>Learners assess the validity of the content presented by the fellow students.</p> <p>Class contributes to the presentations made by each pair/group.</p>	<p>Group slow learners with those who you think are going to help them.</p>

<p>Institutionalization (summary, conclusions and examples 3 minutes)</p> <p>Application activities : 2 min</p>	<p>The teacher sums up the lesson by providing a summary of content that harmonizes the work the students discussed.</p> <p>The teacher asks one of the students to voluntarily summarize the content of the lesson.</p> <p>The teacher distributes the print out of the Application activity to the students and guides them on how to go about it.</p>	<p>Listening</p> <p>Answering</p> <p>Noting down the main points</p> <p>Giving comments</p>	<p>Communication skills:</p> <p>Communication skills are addressed through presentation</p> <p>Inclusive education:</p> <p>Give extra time to slow learners to finish their work. If possible take this time to give extra explanations where they still struggling.</p>
<p>Assessment</p>	<p>The teacher challenging the learners with the task, of using the topographic map to identify the physical aspects from it.</p>		
<p>Teacher-self evaluation</p>	<p>The learners' active participation and enthusiastic involvement in the lesson and the positive responses provided, prove that the pre-stated instructional objectives were achieved.</p>		

LESSON PLAN 2 ON HUMAN AND ECONOMIC GEOGRAPHY

School Name: ----- Teacher's name: -----

Term	Date	Subject	Class	Unit No	Lesson No	Duration	Class size
II	27/06/2018	Geography	S5	10	4/5	40 minutes	40 learners
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				1 learner with visual impairment, 1 learner with hearing difficulty.			
Unit title		Population distribution in the world					
Key Unit Competence		The learner should be able to discuss the problem of the population growth and the ways of controlling the population growth in the world. Explain the impacts of early sex, HIV/ Aids, health risks and STD _s on the world's population.					
Title of the lesson		Population growth and its effects.					
Instructional objective		Using the passage provided by the teacher, learners identify the factors influencing the birth and death rate; describe the causes and the effects of a rapid growth correctly.					
Plan for this Class (location: in / outside)		The lesson shall be conducted in the classroom.					
Learning Materials (for ALL learners)		Internet, text books, photographs, video, maps, etc.					
References		Safari.S & at el (2012) MK Senior Geography student's book 6; Byamugisha B.c (2010) Focus on World Geography: selected Topics in World Problems and development, A'level Geography paper 2, Kabs Published Ltd.					
Timing step for each step		Description of teaching and learning activity			Generic competences and cross cutting issues to be addressed + a short explanation.		
		The learners using internet, geographical documents, passage, identify the factors influencing the birth and death rate; describe the causes and the effects of a rapid growth.					
		Teacher's activities		Learner's activities			

<p>Introduction (5min)</p>	<p>Form groups for discussion</p> <p>Learners are given passage to read critically and analyze it.</p>	<p>Group formation</p> <p>Learners read the passage critically and internalize it.</p>	<p>Critical thinking: This is achieved through analysing and interpretation of the passage.</p> <p>Inclusive education:</p> <p>A learner with visual impairment is provided a large print text.</p>
<p>Development of the lesson</p> <p>30 minutes</p> <p>Development of the lesson: 25 min</p> <p>a) Discovery activity</p> <p>b) Presentations of learners' productions</p> <p>c) Exploitations of learner's productions</p>	<p>Guide learners to answer the questions related to the passage.</p> <p>Guide learners to present arguments from group discussion.</p> <p>Guide class discussion for sharing more ideas.</p> <p>Gather all arguments, ideas presented by the learners and harmonize them.</p> <p>Ask questions in relation to what the learners are presenting.</p>	<p>Answering questions related to the passage.</p> <p>Presenting their arguments.</p> <p>Discuss and asking questions.</p> <p>Noting down important points.</p>	<p>Critical thinking: This will be achieved when learners are identifying the factors leading to population growth.</p> <p>Cooperation and communication competences are developed through working in groups and presentation.</p> <p>Inclusive education:</p> <p>Encourage other learners to speak loudly so that the one with hearing impairment can partipate in classroom discussion.</p> <p>Environment and sustainability:</p> <p>This through realizing impact of population growth rate on the environment.</p>

Institutionalization (summary, conclusions and examples 3 minutes)	Guide class representation from any group asked to make a wrap-up of what has been learnt.		Communication and cooperation skills: These are developed through group presentation and discussion.
Conclusion (5 min) Summary (3min)	Harmonize the presentation findings of the learners and add on the points not discussed by the learners.	Write down the important points learnt from the lesson.	
Application activities: 2 min	Students are assigned the assignment on the next topic for next day.	Write the assignment in their revision books.	
	Provide the print out of the application activity 10.6 in the learner's book and provides the guideline.	Note down the application activity.	
Assessment	Distribute the print out of the assignment to be done at home. Examine the implication of high population on the socio-economic development for any country of your choice.		
Teacher-self evaluation	The lesson was successfully taught as evidenced by the learners' feedback as reflected by their scores. This proves that the pre-stated instructional objective were achieved.		

Lesson Plan: 3 on Physical geography

School Name: GS Rilima

Teacher's name: Mahoro Grace

Term	Date	Subject	Class	Unit No	Lesson No	Duration	Class size
I	24/02/2018	Geography	S5	4	1/7	40 minutes	40 learners
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				2 students who are visually impaired. 1 student with communication challenges.			
Unit title		The origin of the earth					
Key Unit Competence		The learner should be able to discuss the theories for the origin of Earth.					
Title of the lesson		Theories which explain the origin of the earth					
Instructional objective		Using the text books and internet, learners should describe the theories advanced to account for the origin of the earth.					
Plan for this Class (location: in / outside)		The lesson will take place in the classroom.					
Learning Materials (for ALL learners)		Globe, atlases, text books, photographs, illustrations, charts and flip charts, markers, pencils.					
References		<p>Safari Sibo, Silvester Musisi and Godfrey Ssekandi (2012), Mk Senior Secondary Geography students' book 5, Kigali, Mk. Publishers.</p> <p>John whitton (1984). Dictionary of Physical Geography, New York, USA. Compound physical Geography by K. Kansime.</p> <p>Muhire, I., Mugabe, L, Nyirishema.</p> <p>Ajaegbu, H.I., (1991). New approach to practical work in geography, Ibadan,</p> <p>Henry M. Kichodo (2009) Practical Geography for Advanced level map work, photographic interpretation, statistics, and field work Kampala, Compsolutions.</p>					
Timing step for each step		Description of teaching and learning activity				Generic competences and cross cutting issues to be addressed + a short explanation.	
		Teacher's activities		Learner's activities			

<p>Introduction (10min)</p>	<p>Organize the learners in groups.</p> <p>Give learners the reviewing activities:</p> <p>E.g.</p> <ol style="list-style-type: none"> 1. In your groups, take three minutes to discuss how the earth originated. 2. Could you have ever been told on how the earth was formed in your previous studies? Share your answers. 	<p>Discuss and share the ideas in relation to question 1 and 2 asked by the teacher.</p> <p>Expected answers:</p> <p>God created the world (The creation theory)</p> <p>Big bang theory</p>	<p>Cooperation:</p> <p>Cooperation and communication skills are addressed through working in groups.</p> <p>Critical thinking through identifying the factors influencing weathering.</p> <p>Inclusive education:</p> <p>The student with communication problem can share his/her point of view by writing it on a piece of paper. Also the teacher should encourage peers to give him/her a chance to express his/her opinion by valuing paying more attention to what he/she is saying or writing.</p>
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<p>Development of the lesson: 25 min</p> <p>a) Discovery activity</p> <p>b) Presentations of learners' productions</p> <p>c) Exploitations of learner's productions</p>	<p>Introduce the lesson of the day regarding the theories of the origin of the earth.</p> <p>Distribute to the learners the print out of the learning Activity 5.1 in the learner's book page 151.</p> <p>Guide and monitor the learners' discussion progress, organizational, participatory of each learner in the group.</p> <p>Attend to individual needs of the SEN. (<i>Special Education needs</i>)</p> <p>Assist the learners on how they must present their work.</p> <p>e.g. Providing flip charts, PowerPoint, use of chalk board division columns, or use the stick notes which are pinned in one part of the class and two learners are asked to read the answers to the rest of students.</p> <p>Ask questions in order to check the mastery of the research findings or discussion results in relation to the learners' presentation work.</p> <p>Ask some questions such as :</p> <p>How did you relate the Activity 5.1 in learner's book page 151, to the theory of big bang theory?</p> <p>Explain briefly the biblical theory and any other theory that you have researched on.</p> <p>Harmonize the main points presented by the students.</p>	<p>Listening and receiving the issued print out.</p> <p>Discuss and share ideas about the Activity 5.1 indicated in the learner's book.</p> <p>Note down their findings/ answers generated from the discussions.</p> <p>Expected answers:</p> <p>Refer to the teacher's guide book under answers for the learning Activity 5.1.</p> <p>Asking</p> <p>Writing down the main points from the class discussion.</p> <p>Answering questions.</p> <p>Assess the validity of the content presented by the fellow students.</p> <p>Contributes to the presentations made by each pair/group.</p> <p>Provide answers for the questions that the teacher has asked them.</p> <p>Expected answers:</p> <p>Refer to the answers for learning activity 5.1 in the Teacher's guide book.</p> <p>Refer to the learner's book under 5.1: The theories of the origin of the earth.</p>	<p>Critical thinking:</p> <p>This will be achieved through finding how the physical aspects are identified and interpreted.</p> <p>skills: Cooperation and communication skills are enhanced through working in groups and pairs.</p> <p>Communication skills:</p> <p>Communication skills are addressed through presentations.</p> <p>Environment and sustainability:</p> <p>This is through realizing the need to conserve and protect the physical aspects that make up our environment.</p> <p>Inclusive education:</p> <p>The learner with communication problem should write his/her opinion on the blackboard.</p>
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<p>Institutionalization (summary, conclusions and examples 3 minutes)</p> <p>Application activities: 2 min</p>	<p>Sums up the lesson by providing a summary of content that harmonizes the work the students discussed.</p> <p>Gives the additional content which is very important that learners may have not mentioned or discussed.</p> <p>Compliments the learners' findings and makes appropriate conclusive summary of the lesson.</p> <p>Distributes the print out of/write down the Application activity number 5.1 (To be copied by the learners)</p> <p>The possible answers refer to the teacher's guide under lesson 5.1: The theories of the origin of the earth.</p>	<p>Listening.</p> <p>Answering.</p> <p>Noting down the main points.</p> <p>Giving comments.</p>	<p>Communication skills:</p> <p>Communication skills are addressed through presentation and debating.</p> <p>Inclusive education:</p> <p>Write in large character so that it makes easier to read for those with visual impairment.</p>
<p>Assessment</p>	<p>Gives out the print out or write down the questions to be done as home work. This to be done out side the normal time table.</p> <p>The sample examples include the following:</p> <p>In reference to two theories, explain the origin of the earth.</p>		
<p>Teacher-self evaluation</p>	<p>The responses of the learners during the lesson and the positive answers that they provided, revealed that they achieved the pre-stated instructional objective.</p>		



UNIT 1: STATISTICAL GRAPHS, DIAGRAMS AND MAPS

1

1. Key unit competence:

To be able to interpret statistical data, Construct statistical graphs, diagrams and maps.

2. Prerequisite (knowledge, skills, attitudes and values)

The teacher should guide the learners towards application of various knowledge, skills, attitudes and values, acquired and developed right way from senior one to senior five. It is vital to note that, learners already have a handful of skills that can enable them to understand and master this unit.

Throughout the subject of geography, there are units that learners studied that included statistical approach.

for example:

- In Senior S1 unit 8, students studied the curve graph as they dealt with the structure of the atmosphere,
- unit 9 of senior 2 discussed the presentation of rainfall and temperatures, where a line and bar graph was used.
- In unit 16 of transport, communication and trade several tables were used. On a special note, students in ordinary level studied Venn Diagrams (divided circles) and other forms of graphs in units: Unit 8 S1, Unit 10 S2 and unit 11 S3.

All these form a basis upon which a teacher can build to take through the learners up to the end in this Unit 1.

The learners should be helped to remember the primary elements of a good geographical diagram or graph or any illustration used. As a teacher, it would be good to always draw examples from the previous classes to mark a clear connectivity displayed between what the learners already know and what is yet to be studied. It is good to always remember that; there is a direct link between statistics and all the socio-economic activities. This does not rule out the science subjects. This means that learners can draw and interpret the statistical methods and data especially those that fall under the simple methods category.

3. Cross-cutting issues to be addressed:

There is a wide range of the cross-cutting issues that can be integrated into the teaching of Unit 1 senior five. This implies that the data which is the focal point in statistics can be collected from a given situation related to a specific cross-cutting issue.

Furthermore, the activities used in class enable the teacher to fittingly integrate the cross-cutting issue. There are cross-cutting issues that fit in this unit and are hereunder: **Peace and values education Financial education, environment and sustainability.** There are cross-cutting issues (like gender education) that can be integrated while dealing with the construction of population pyramids commonly known as age-sex graphs. Inclusive education as a point of emphasis applies in every aspect of the teacher's instructional techniques used.

In the writing of this Unit, the writer has used some activities to include and integrate the cross-cutting issues. In Activity 1.1, there is **environment and sustainability**, in Activity 1.2, there is **peace and values education**, where names that can remind the learners the values of society are used. For example; Micomyiza, Habinshuti and Twubahane villages are used. These intend to start a spark of thought on the peace and values cherished in the society. The teacher therefore, can use such an activity or create similar activities to have more emphasis on the cross-cutting issue of peace and values education. When you take an example of end unit Assessment, there is emphasis put on the environment and sustainability cross-cutting issue.

Even though in student's book there are examples and activities indicated, the teacher can improvise and use data that may be related to a given cross-cutting issue that he or she needs to integrate. For example, in financial education, one can get the data and rephrase the questions that can evoke the learners' thought on how to save money and why we should spend money wisely.

4. Guidance on the introductory activity:

The introductory activity 1.1 in the pupils' book is cardinal tool used as orientation activity that enables students to connect the knowledge, skills, attitudes and values already acquired in previous classes or levels that involved statistics and the new unit title or concept to be studied. In this case, it tests the level of learners in understanding the diagrams and statistical, analytical skills and data presentation competences. Therefore, the news print obtained from the New times report is used. The report has data that are scattered and intermingled.

It challenges the student to identify from among several categories of data in the report, the suitable and required information. This calls for each learner to construct the table for the raw data. Thereafter, use it to construct any appropriate statistical method that applies.

Guidance on expected statistical methods:

- i. Pie charts or divided circles.
- ii. Simple bar graphs.
- iii. Simple line graphs.
- iv. Grouped graphs (Line or bar).

5. List of lessons and End Unit assessment

#	Lesson title	Learning objectives (knowledge, skills and attitudes).	Number of periods
1	1.1: Definition of statistics and importance of statistical graphs and diagrams in geography.	<p>Define the term statistics.</p> <p>Identify the importance of statistics in geography.</p> <p>Appreciate the importance of statistics in geography and daily living activities.</p>	1
2	1.2: Line and curve graphs (simple, group, compound, divergence). Advantages and disadvantages of each type	<p>State the advantages and disadvantages of statistical graphs and diagrams.</p> <p>Create statistical line graphs and diagrams to present various geographical data.</p>	5
3	1.3: Bar graphs (simple, group, compound, divergence, age and sex graphs, dispersion graphs, circular graphs). (Advantages and disadvantages)	<p>Outline different statistical bar graphs (methods).</p> <p>Explain the advantages and disadvantages of each statistical method.</p>	7

4	1.4: Statistical charts: Divided circles/ Pie charts (simple, proportional), Divided rectangles (simple, compound) and their advantages and disadvantages.	Draw different statistical charts and diagrams. Examine the advantages and disadvantages of statistical charts.	3
5	1.5: Repeated symbols (proportional circles, squares, cubes and spheres).	Draw different statistical Repeated symbols State the advantages and disadvantages of repeated symbols.	3
6	1.6: Statistical diagrams: Statistical maps (dot maps, isoline, Map shading, flow maps). Wind rose (simple, compound). (Advantages and disadvantages of each type).	Create different statistical diagrams. Explain the advantages and disadvantages of various statistical graphs and diagrams.	4
	Assessment		1

6. Guidance on different lessons

This section provides a guidance on the lessons outlined in the table above. It further, looks at each activity included in the Pupils' book. The application Activities which are six in number are also catered for. All in all, there are 6 lessons that are to be looked at hereunder. However, the teacher should be aware that, lesson is bigger than a period.

Lesson 1: Definition of statistics and importance of statistical graphs and diagrams in geography

This lesson is allocated one period. The teacher must be aware of time management.

a). Prerequisite/Revision/introduction

The teacher should use the skills acquired while dealing with the climatic data presentation with line and bar graphs. The teacher should guide the students to find the meaning of statistics and its importance.

b). Teaching resources

- Charts of statistical graphs.
- Print out of Activity 1.1.
- Print out of application.

c). Learning activities

Activity 1.1

- refer to the learner's book on importance of statistical graphs and diagrams in geography.
- Yes. Because it has data that can be used to construct various statistical diagrams or graphs.
- Refer to the learners' book on 1.1.2 Importance of statistical graphs, and diagrams in Geography.

Application Activity 1.1

The answers for this application Activity are embedded in the notes of importance of statistics in a learners' book under the sub heading: 1.1.2: Importance of statistical graphs and diagrams.

Lesson 2: Line and curve graphs

The teacher should respect the order of the kinds of line and curve graphs. Each of the statistical line and curve graph creates the foundation upon which the next type is constructed. They are related in nature.

a). Prerequisite/Revision/introduction

The teacher should use the climatic data studied in ordinary level or senior four, so that the learners are tasked to draw or describe how such data is statistically presented. This intends to give the learners to recall the line/curve graph.

Teaching resources

- Samples of already drawn or constructed line and curve graphs.
- Print out for Activity 1.2.2 indicated under 1.2: line and curve graphs in the learners' book.

b). Teaching resources:

- Print out for Activities
- Flip charts
- Manila papers
- Coloured pencils or markers of varying colours.
- Etc.

c). Learning activities

Activity 1.2.1

- a). Refers to the steps involved in the construction of a simple line graph, in pupils' book (1.2.1).
- b). Refers to pupils' book (Steps followed in drawing a curve graph (1.2.1). The teacher should understand that students already know how to construct these graphs. They have at least experienced it while dealing with climatic graphs, and the data in human and economic geography in ordinary level and senior four.
- c). The trend of land use in country X from 2015 to 2017 is that there was a steady increase in land use. From 2015 the hectares measured by 100,000 hectares, to 2016, and continued to increase by 300,000 hectares between 2016.
- d). Refers to pupils' book under the Advantages and disadvantages of line and curve graphs.

Activity 1.2.2

- a). The difference between the two graphs are:
 - The first graph has one line which makes it a simple line graph. While the second graph has several lines (two) which makes it to be a comparative graph.
- b). The features include: Two lines are drawn, it has several variables represented.
- c). Refer to the learners' book under the advantages and disadvantages of line and curve graphs.

Activity 1.2.3

- a) The teacher should guide learners on calculation of the cumulative totals as shown below:

The table below shows cumulative totals for the crop production from 2005 to 2010 in '000 tons in country Y:

Years	2005	2006	2007	2008	2009	2010
Crops						
Sorghum	1158	1100	1027	1008	1192	1198
Maize	2046	1953	1752	2159	3133	3685
Beans	2683	2776	2676	3075	4077	4712

- b). Refer to the learners' book under the construction of a compound line graphs 1.2.2.
- c). Refer to the learners' book under advantages and disadvantages of compound line graph.

Activity 1.2.4

Possible answers:

- a). The first graph showing production of selected food crops is a comparative line graph with more lines representing specific values for the variables in question. While the second graph showing abnormalities in mean rainfall at Kigali weather station, is primarily representing the standardized mean rainfall about the calculated average that is marked zero line.
- b). Refer to the learners' book under: advantages and disadvantages of divergence line graph.

Application Activity 1.2

- a). This part of the application Activity needs the teacher to guide the students on how they will collect the data using the techniques of field work study learnt in senior four. This implies that each learner will or may have different or similar data if the source and techniques used are the same. Therefore, the expected answers should reflect any kind of line/curve graphs constructed.
- b). The trend of performance will depend on data collected, and the curve constructed. This means that the teacher should expect a wide range of answers.

Lesson 3: Bar graphs

a). Prerequisite/revision/introduction

The teacher should use the activity 1.3.1 for introductory purpose. This is intended to introduce the lesson title to the learners.

b). Teaching resources

- Samples of already drawn or constructed simple bar graphs.
- Print out for Activities.
- Flip charts.
- Manila papers.
- Coloured pencils or markers of varying colours.

c). Learning activities

Activity 1.3.1

- a). The learners are given a chance of constructing any graph of their choice. It is well-known however, that learners are aware that rainfall is represented using bar graph.
- b). Refer to the learners' book under: the advantages and disadvantages of bar graphs.

Activity 1.3.2

- a). Refer to the learner's book under the construction of a simple bar graph.
- b). China has the highest levels of population totals. It is followed by India. Then, Euro area, United States and Indonesia have high population. Japan, Russia, Brazil have low population as few data shown in the table.
- c). Effects of high population on the physical environment:
 - Deforestation.
 - Over utilization of resources.
 - Encroachment on protected and gazette lands.
 - Shortage and over using of water resources.
 - Destruction of eco-system.
 - Reduction of bio-diversity.
 - Swamp reclamation hence affecting wet lands.
 - Pollution, etc.
- d). Refer to the learner's book under Advantages and Disadvantages of a simple bar graph.

Activity 1.3.3

- a). Graph A displays single bars and it falls under a simple bar graph B shows the grouped bars where each group represents a specific independent variable.
- b). Refer to the learners' book under the advantages and disadvantages of group bar graph.

Activity 1.3.4

- a). They are all bar graphs, both represent a single variable, However, the difference

is that in the second graph of cultivated areas of selected food crops in Rwanda, the bars are further divided into the segments.

- b). Refer to the learners' book under the advantages and disadvantages of compound bar graphs.

Activity 1.3.5

- a). Refer to the learners' book under Construction of the divergence bar group.
- b). The answers for this question refer to the learner's book under the Construction of divergence bar graph.

Activity 1.3.6

- a). The diagrams are Age-sex pyramid/Population pyramid.
- b). Graph A represents the population structure of a developed country while graph B is representing a population structure of a developing country.
- c). Refer to the learners' book under Advantages and disadvantages of population pyramid.

Activity 1.3.7

- a). The first graph shows a simple line graph while the second one is a dispersion graph. For further details refer to the learners' book under Dispersion graph.
- b). Refer to the learner's book under Advantages and disadvantages of dispersion graph.

Activity 1.3.8

- a). The first diagram or graph shows the plotted points in relation to the trend line. That describes the relationship between Rainfall and altitude. While the second graph shows a circular graph showing or representing both rainfall and temperature. The curve that represents temperature is also drawn in a circular form.
- b). Refer to the learners' book under the advantages and disadvantages of circular graph/polar graphs.

Application Activity:

- a). Deforestation.
- b). Tree planting, agro-forestry, better methods of farming, mulching, crop rotation, intercropping, mass education, fertilization of farms using organic manure etc.
- c). The learners will have varying responses since the question is open-ended.

Lesson 4: Statistical charts

This is the 4th lesson. It is composed of all kinds of divided circles and divided rectangles. These require the learners to apply the knowledge and skills acquired in mathematics and other science subjects.

a) Prerequisite/revision/introduction

The teacher is encouraged to use the introductory activity of this lesson 1.4. It is designed to enable the learners to attempt the activity as introductory task.

b) Teaching resources

- Charts of divided circles.
- Divided circles.
- Manila papers.
- Flip charts.
- Coloured pencils.
- Mathematical chalk board set.
- Internet.
- Diagrams and graph papers.
- Etc.

c) Learning activities

Activity 1.4.2

- a) Refer to the learners' book under the proportional divided circles.
- b) Refer to the learners' book under Construction of proportional divided circles.
- c) Refer to the learners' book under Advantages and disadvantages of proportional divided circles.

Activity 1.4.3

- a) Refer to the learners' book .
- b) Refer to the learners' book .
- c) Refer to the learners' book under Advantages and Disadvantages of divided rectangles.

Activity 1.4.4

- a) This is a compound divided rectangle. Refer; to the pupils' book where the description of the divided rectangles is dealt with.
- b) Refer to the advantages and disadvantages of simple divided rectangles shown in the learner's book.

Application Activity 1.4

- a) The learners are expected to use any applicable statistical method to portray the information in the table. The teacher is therefore, advised to scrutinize the method the learner will have used. These should be within the bounds of the statistical charts and diagrams.
- b) The interpretation will depend on the statistical method the learner (s) will have used.
- c)) This part of the application Activity emphasizes the cross-cutting issue of environment and sustainability. However, the answers include the following:

Effects of land-use mentioned in the table in the learner's book under application 1.4:

- Deforestation.
- Degrading land.
- Pollution.
- Contributes to the occurrence of landslides.
- Soil erosion.
- Etc.

Lesson 5: Repeated symbols

a) Prerequisite/revision/introduction

This lesson requires the teacher to use various charts and techniques that can enable the learners realize the differences between this method and the commonly used statistical method. The teacher should build on the learners' past studies especially where they used dot maps in population studies.

b) Teaching resources

- Print outs for statistical Charts.
- Base maps.
- Manila papers.
- Flip charts.
- Coloured pencils.
- Mathematical chalk board set.
- Internet.
- Diagrams and graph papers.
- Etc.

c) Learning activities

Activity 1.5.1

- a) Refer to the learner' book under Repeated symbols.
- b) Refer to the learners' book under Advantages and disadvantages.

Activity 1.5.2

- 1) Refer to the learners' book under Construction of proportional squares.
- 2) The area had the largest crop production. The second crop producer is area B, while the least area in crop production is area A.
- 3) Refer to the learner' book under advantages and disadvantages.

Activity 1.5.3

- 1) Refer to the learners' book under Construction of proportional cubes.
- 2) Beans occupied a large area, followed by sorghum and the smallest area is under Irish potatoes.
- 3) Refer to the learners' book under advantages and disadvantages.

Activity 1.5.4

- 1) The first diagram represents the proportional spheres while the second represents proportional cubes.
- 2) Refer to the learners' book under the advantages and disadvantages.

Application activity

This activity emphasizes the cross-cutting issue of peace and values, where names used for imagined schools reflect the values we expect the learners to uphold.

- 1) Refer to the learners' book under repeated symbols.
- 2) The interpretation will depend on the method used.
- 3) Guide learners to suggest ways of peace and values promotion e.g. Being friendly, loving one another, sharing, helping each other, guiding one another, brotherhood, sisterhood, caring for one another, honesty, respecting one another, respecting each other's ideas and property, avoiding conflicts, etc.

Lesson 6: Statistical diagrams

a) Prerequisite/revision/introduction

The teacher should use activity 1.6.1 to introduce the lesson. This calls for provision of the print out of the activity to groups of the students.

b) Teaching resources

- Print outs for activities.
- Base maps/samples of dot maps.
- Manila papers.
- Flip charts.
- Coloured pencils.
- Mathematical chalk board set.
- Internet.
- Diagrams and graph papers.

c) Learning activities

Activity 1.6.1

- a) The two statistical diagrams involve the use of base maps, they display the distribution and location of the values being represented.
- b) Nigeria/Rwanda ,etc.
- c) The effects include: over utilization of resources, deforestation, pollution, encroachment on the conserved and protected area etc.

Activity 1.6.2

ELEMENT	LINE
Clouds	Isonephhs
Rainfall	Isohyets
Atmospheric pressure	Isobars
Height	Contours
Salinity	Isohalines
Ocean depth	Isothermobath

- b) Refer to the learners' book under the construction of Isoline maps.

Activity 1.6.3

1. Refer to the learners' book .
2. Refer to the learners' book under construction of choropleth.
3. Refer to the learners' book under the advantages and disadvantages of choropleth.

Activity 1.6.4

- a) It shows the flow map/diagram showing the in-flow and out-flow of imports and exports.
- b) i. B imported coffee ii) B Exported cars iii) A imported cars iv) A exported coffee.

Activity 1.6.5

- a) They all show wind rose and direction in relation to compass, but A is a simple wind rose while the second shows compound wind rose.
- b) It shows the data dealing with direction.

Application activity

- a) This activity requires the learners to choose a simple wind Rose. Follow the steps of constructing the wind Rose shown in the learners' book.
- b) Area A experiences the strongest winds.
- c) Destruction of property, loss of lives, increased government expenditure, destruction of eco system, destroys biodiversity, migration of people, spread diseases.
- d) Mass education, warnings, building strong houses, creation of disaster preparedness team, etc.

7. Summary of the unit

The teacher should be aware that all the methods of statistics studied under this Unit 1, are arranged in a logical sequence. This means that, always start with the simple methods and proceed with the complex ones.

This unit looks at the definition of statistics and explanation of the importance of statistics in geography. The unit further looks at line and curve graphs, bar graphs, statistical charts, repeated symbols, circle, squares, cubes, spheres and statistical diagrams.

All these methods and their associated types (For each statistical graphs) have advantages and disadvantages.

8. Additional Information

The teacher should provide learners with statistical data that is reflecting their real-world experiences or day to day encounters.

9. End unit assessment

- a) The learners are expected to extract the raw data as shown in the table below:

The table showing the number of people affected by landslides in some different areas

of Rwanda in 2016

Area	Number of people affected
Gakenke	34
Muhanga	8
Rubavu	4
Ngoreroro	3

b) The learners are expected to select the most suitable statistical method. Therefore, since the data is simple requires the simple statistical methods such as: simple divided circles, simple bar graphs.

c) Landslides and floods.

d) Plant trees, use good farming practices, practice agro-forestry, mass education, terracing, slope stabilizing, rechannelling the run-off, intercropping, use of mulching, crop rotation, etc.

e) Flooding, landslides, water pollution and such can be addressed through: Plant trees, use good farming practices, practice agro-forestry, mass education, terracing, slope stabilizing, rechannelling the run-off, intercropping, use of mulching, crop rotation, etc.

10. Additional activities

Remedial Activities:

1). The table showing Zambia's education expenditure from 2013 to 2017

Year	Percentage
2013	17.5
2014	20.2
2015	20.2
2016	17.2
2017	16.2

Source: Wikipedia

- a) Use the above data to draw a divergence line graph.
- b) State and explain the advantages and disadvantages of statistical method drawn in (a) above.
- c) Comment on the Zambia's education expenditure from 2013 to 2017.

Possible answers:

- a) Reference to the learners' book under the steps of constructing a divergence line graph.
- b) Refer to the learners' book under the advantages and disadvantages of divergence line graph.
- c) From 2013 to 2005, there was a steady increase in Zambia's education expenditure. There was a decline in Zambia's education expenditure from 2016 to 2017.

The teacher is advised to use this activity to guide the learners on how to determine the percentage increase or decrease, since it is paramount in statistics.

2). Using the text books, internet and other resources; research on:

- i) Advantages of divergence line graph.
- ii) Disadvantages of divergence line graph.

Discuss with the classmates the findings in form of a class presentation.

Possible answers:

- i. Refer to the learners' book under advantages of line graph.
- ii. Refer to the learners' book under disadvantages of line graph.

This activity can be used to develop some generic competences such as communication skills, cooperation skills, use of ICT,etc

Consolidation activities:

Study the table below showing the traditional work schedule on John's farm land:

Month	Season	Farm work
December	A	Land clearing
January		Ploughing the farm lands
February		Planting beans
March	B	Sorghum
April		Peas
May		weeding
June	C	Weeding
July		Ripening
August		
September	D	
October		Harvesting
November		

- Use the above statistical data to construct a circular graph.
- Research on the effects of the activities shown in the table above on the physical environment and suggest workable solutions.

Possible answers:

- Refer to the learners' book under the steps involved in construction of circular graphs.
- Effects of farming operations or activities.
 - Deforestation.
 - Soil erosion.
 - Flooding due to the silt deposited by run-off from the poorly farmed areas.
 - Ecosystem is affected.
 - Reduction in bio-diversity.
 - Pollution due to erosion and artificial fertilizers.

Measures

- Good farming methods.
- Application of organic manure.
- Mass education.
- Terracing.
- Contour ploughing.
- Intercropping.
- Crop rotation.
- Etc.

This Activity also can be used to strengthen the integration of cross-cutting issue of environment and sustainability.

Extended activities:

The table showing the population totals in Percentages for country X

Population age	Male	Female
0-4	14.99	14.27
5-9	14.04	13.55
10-14	12.26	11.9
15-19	10.61	10.29
20-24	8.52	8.61
25-29	9.05	8.74
30-34	7.68	8.25
35-39	5.57	5.97
40-44	4.03	5.46
45-49	3.14	3.14
50-54	3.38	3.16
55-59	2.52	2.51
60-64	1.78	1.94
65 and above	2.48	3.28

Use the data below to answer the questions that follow:

- Choose a suitable statistical data to portray the above data.
- Examine the advantages and disadvantages of the method used in (a) above.
- Describe the population structure of country X.

Possible answers

- Age-sex graph/population pyramid.
- Refer to the learners' book under the advantages and disadvantages of population pyramid.
- The population structure is described by a broad base and a narrow apex.



UNIT 2: BEARINGS, DIRECTIONS, DISTANCES AND AREAS ON A MAP

2

1. Key unit competence:

The learner should be able to measure the bearings and the directions, calculate distances and areas on a map.

2. Prerequisite (knowledge, skills, attitudes and values)

Learners in senior five should have knowledge, skills, attitudes and values in what they acquire at school. Learners are not studying this topic for the first time. They have mastered the content of unit 2 of S1, unit 1 of S2 and unit 4 of S4, where they have studied map work, elements of a good map, location of places and features on maps, direction and bearing, use of grid references, measuring distances and areas on a map, use of contours, use of trigonometric stations and use of spot heights.

What they have learnt in past studies will provide a strong foundation that learners can use to understand better the content of this unit 2 of senior five.

It's very important to note that, they already have necessary knowledge, skills and attitudes. The difference is that, at this level the content as that in the Pupils' book is more detailed and goes beyond what the ordinary program demanded.

This already acquired knowledge, skills, attitudes and values, should be used by the teacher to conduct diagnostic assessment as a way of measuring each learner's abilities.

3. Cross-cutting issues to be addressed:

There are many cross-cutting issues that can be applied in this lesson. In the learners' book, some cross-cutting issues were used in an integrated manner within activities. The most highlighted are financial education and environment and sustainability.

However, teacher is advised to improve and use other cross-cutting issues by innovating and creating

eating new situations. The activities used were just a sample. This calls for the teacher to take note of the cross-cutting issues that he/she is interested in. Peace and values education can also be integrated in every situation where students themselves in community are taught to say thank you wherever their peers or any person responds to a given answer.

4. Guidance on the introductory activity:

The introductory Activity aims at highlighting the knowledge, skills and attitudes that learners, acquired previously in classes. This activity prepared, requires learners to put to better use of all the competences, knowledge together with attitudes in understanding the new topic of Senior 5 unit 2. Activities in this unit 2 can be answered by most of the learners. The teacher can provide enough time for every learner so that individual participation can be respected. The intention of this activity is to see the ability of each learner so that throughout the unit the teacher plans on how to aid his/ her students.

The way answers are provided for the introductory activity, some require reviewing the past studies while others require learner's to think deeply and read geographical documents.

1.5. List of lessons and End Unit assessment

#	Lesson title	Learning objectives (knowledge, skills and attitudes).	Number of periods
1	Location of places using grid references.	Identify the places on a topographic map using Easting and Northing. Locate the places using the geographical coordinates/grid reference systems.	2
2	Stating directions and bearings on topographic maps	Tell the directions and bearings on the topographic maps.	2
3	Measure distance on the Maps (straight line, curved line	Estimate the distances and areas on the topographic maps. Measure the distances and the surface areas on the topographic maps.	2
4	Calculate areas on topographic maps (regular and irregular shapes).	Give the areas on the topographic maps. Calculate the areas on the topographic maps.	2

5	Representation of relief on the map (contours, colouring, shading)	Interpret the relief on the maps using contours, spot heights, Trigonometrical stations and the colours. Describe the relief on the topographic map.	4
6	Calculation of vertical interval and amplitude of relief / spot heights.	Appreciate the importance of using the geographical coordinates and the compass in locating places on the topographic maps.	1
	End Unit assessment		1

6. Guidance on different lessons

The above table highlights all the lessons that have been created in relation to dividing the unit content into 6 lessons with different number of periods. Below is the guidance on the how to go about each lesson or sub heading.

Lesson 1 :Location of places using grid references

This is the first sub-heading that immediately follows the introductory activity. This lesson deals with the definition of grid reference and ways it is used. The teacher should be aware that the way the learners' book is written, under this sub heading, learners are supposed to be helped or guided on how to use grid reference to locate features on a map.

Features on map can be identified using the grid references. The grid references in two ways. Four figure grid reference and six-figure grid reference.

a) Prerequisites/Revision/Introduction:

The introductory Activity 2.1, in this lesson connect learner to what they have acquired in past studies at the same time it intends to introduce the lesson. Therefore, the Activity supports diagnostic assessment (Formative assessment) to see how much the learners know about the grid reference.

b) Teaching resources

The teacher is advised to bring a map and learners' book as tools to facilitate all learning and teaching activities. Teacher can also use illustrations made manually.

c) Learning activities

The Activity 2.1 in the learners' book on is intended to be used for introducing the lesson. The activity can be done in pairs. The answers from each pair are written down and shared with the rest of the class.

The possible answers for the activity 2.1, are the following:

- a) Vertical lines printed on map are called Eastings while horizontal ones, Northings.
- b) Grid reference is a series of straight lines drawn vertically and horizontally on the map.

Application activity 2.1

1. The four- grid reference of the Geo farm is 0839.
2. The six-grid references of the two brigges shown on the map: refer to the learne' book and calculate these six gride references.

Lesson 2 :Stating directions and bearings on topographic maps

This is the second lesson intending to inform learners on how they can use directions and bearings on the topographic map.

a) Prerequisites/Revision/Introduction

All activities used in this lesson are focusing on what learners already know as they have acquired knowledge, skills, values and attitudes in their past studies related to finding direction and bearing on topographic maps. Activity 2.2 and application activity 2.2 are formulated in order to assist learners and check their level of achievement, in relation to the instructional objectives of the previous lesson.

b) Teaching resources

The teacher is advised to have maps, flash cards, and protractor. The Activity 2.2 and application activity 2.1 are designed to facilitate learners to work in groups. This will assist in the acquisition of generic competences such as critical thinking, collaboration, communication, and problem solving skills.

c) Learning activities

This part of learning activities will help teacher to assist learners in their learning activities.

The expected answers in *activity 2.2* include the following:

1. The term direction is the relative position of a place from another using the points of the compass.
2. Directions and bearings are terms used to communicate where one location is relative to another location. Direction is shown using the four points of the compass (North, South, East and West) and bearing is expressed using a system of 360° and a protractor.

The using of four cardinal points does not accurately tell the exact location of a place rather it informs one that a place is located either in the North, south, East or West. Bearing is the location of one place from another in degrees by using a protractor.

Application activity 2.2

- a) The bearing of the Beach from the Tower is 135°
- b) The Tower from the Church is $180^\circ + 90^\circ = 270^\circ$
- c) The Mine from the Tower is $180^\circ + 135^\circ = 315^\circ$
- d) The church is to the west of quay.

Lesson 3.: Measure the distance on the maps: (straight line and curved line)

This is the third lesson under unit 2 of senior five. It deals with measuring distances on map.

a) Prerequisite/Revision/Introduction:

This lesson which deals with measuring of distance on the map is not a new topic for senior five learners since it was studied in senior 2 in unit 2 of map work interpretation. Introducing the lesson will start by activity 2.3 to check the prerequisite knowledge, skills, attitudes and values in relation with measuring of the distances on the maps.

b) Teaching resources

For a good delivery of the lesson, the teacher should ensure the following resources or any other important teaching aids available: Recommended text books, maps, atlas, ruler and threads.

c) Learning activities

The teacher helps learners to form small groups and have access to books or print outs. Learners work in their groups and present their findings. The expected answers to this activity include the following:

1). The actual distance from GS St Alloys Rwamagana to Kayonza is $30 \times \text{cm}50,000=1500,000 \text{ cm}$. The answer got must be converted into appropriate unit, km. in this case it is 15 km.

2). Sarah and Paul cannot walk within 2 hours from GS.St Aloys Rwamagana Tto Kayonza. Because Kayonza is far from GS St. learners will suggest other responses to this question, remember that Sarah and Peter are still young, it is difficult for them to travel such a long distance.

Application activity

The distance between two points A and B. The scale is 1:50,000 . The distance between A and B will be measured using 1 cm on the map = 50,000 cm on the ground.

Lesson 4. : Calculate the areas on topographic maps: regular and irregular shape

a) Prerequisites/Revision/Introduction

Calculating the areas on topographic maps is not new to learners in Senior 5. It was studied in S2 in unit one: map work interpretation. It is therefore, important to link the content studied with what is going to be learnt in S5.

Guide learners to review the Senior 4 contents by asking learners how the area on a map is calculated.

b) Teaching resources

For effective delivery of the lesson the teacher should ensure the following resources or any other appropriate teaching aids available:

- - Recommended text books.
- - Internet.
- - Maps.

c) Learning activities:

Guide learners to work in groups and discuss how to calculate an area of irregular shape and share knowledge and skills on in relation to the various ways features with different shapes on a map are calculated. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Activity 2.4

1. 1cm on a map represents 0,5 km. * therefore 1cm^2 on a map represents $0,5\text{km} \times 0,5\text{ km} = 0,25\text{ km}^2$ the area of forest has 15 square or 15 cm^2 on the map.

the area of forest represents on the ground = $0,25\text{ km}^2 \times 15 = 3,75\text{ km}^2$

2. Getting the area of a regular body on maps is simple. This is because the body may be a square, rectangle, triangle or a circle. Once the distances are obtained, the formulae applied in mathematics are used.
 - a) Square and rectangle: multiply the length by the width.
 - b) Triangle: half base multiplied by height.
 - c). Circle: Pi multiplied by square of radius.

Application activity 2.4

If the farm has 13 cm length, and 8 cm width the area of the farm is:

$$13\text{cm} = 13 \times 50000 = 650000\text{ cm} = 6.5\text{ km}$$

$$8\text{cm} = 8\text{ cm} \times 50000 = 400000\text{ cm} = 4\text{km}$$

Therefore, the total area is $6.5\text{ km} \times 4\text{ km} = 26\text{ km}^2$

Lesson 5. :Representation of relief on the map

a). Prerequisites/Revision/Introduction

This lesson is related to another lesson learnt in senior 1 unit 2: Elements of a map. So in senior five, learners have opportunities to go deep into ways of how representing the relief on the map is conducted.

b). Teaching resources

It is better for teacher to bring maps during lesson delivery to facilitate learners and teaching program. The teacher is also advised to provide appropriate books to the learners so that they are able to visualize what is being taught.

c). Learning activities

Activity 2.5

1. Relief is the general appearance of the land's surface.
2. Elevation is the vertical distance above the sea level while Height is the vertical distance from the base to the top.
3. The teacher may ask learners to identify different methods to represent relief features on the map after knowing what relief is.

Application activity 2.5

To apply knowledge and skills in representing relief features and interpreting it, the teacher provides atlas or any topographic map of Rwanda and asks learners to describe relief features on the map using signs that are on map.

Lesson 2.6 :Calculation of the vertical interval and the amplitude of relief /spot heights

a). Prerequisites/Revision /Introduction

Learners in senior five have learnt how to represent relief features on a map. So, this is a continuation lesson which is directly linked with vertical interval and amplitude of relief.

b). Teaching activities

An effective way to teach this lesson, is providing learners with topographical map.

c). Learning activities

Activity 2.6

The vertical interval on that map in learners' book is 100 cm

The teacher should ask learners to analyse the map and find how vertical interval of 100 cm above was obtained.

Application activity 2.6

The contour interval is 20 m, the vertical interval between A and B is about 125 m.

7. Summary of the unit

This unit number 2: Bearings, directions, distances and areas on a map in senior five is a very important topic as it involves the application of measuring distances, locating features, and calculating areas on map at the same time, improves the generic competence of problems solving.

The first lesson in this unit talks about how to find places, features on map using grid references. The second one, emphasises on locating features on the map using bearing and compass direction. The next lesson deals with calculation of distances on map either straight distances or curved distances. The fourth lesson focuses on calculating areas of different shape on the map. The fifth lesson deals with relief representation on the map and the last lesson . This unit deals with calculation of contour interval and amplitude.

8. Additional Information

Learners in senior five learnt many concepts of map work but not all. So, the teacher is advised to help learners on how they can construct a cross-section when they have finished mastering using contours and calculating vertical interval on the map.

9. End unit assessment

a). Measuring straight line distances on a map.

By measuring distance on a map, one can work out how far the distance is.

This measurement is sometimes referred to as: ‘as the crow flies’

- Use a ruler and measure the distance between two places in centimetres, in this case it is between Kigali and Mombasa.
- Convert the centimetre reading into kilometres by multiplying by 0,5km if the map scale is (1:50 000) to obtain the kilometres on the actual ground.
- For example, the distance as the crow flies from A to B is 5 cm on a map. Therefore, $5\text{cm} \times 0,5\text{km} = 2,5\text{km}$ on the ground.

b). Measuring a curved line distance

- Put and hold a thread along the road from Kigali to Mombasa.
- convert the centimetres got between Kigali and Mombasa into kilometres by multiplying by 0,5 km if the map scale is (1:50 000) to obtain the kilometres on the actual ground.

2. a). The teacher should guide learners to calculate area of the farm. Learners work in group to find the answer to the calculation.

b). Within the group work, learners exchange their findings as a way of sharing

what they have found in their calculation both in (a) above and (b).

- 1). The bearing of Kinigi from Kigali is 135°
- 2). The relative position of Kinigi from Kigali is NW.
- 3). The teacher engages a brief discussion on what learners know about Musanze, its relief features and other human activities.

10. Additional activities

Remedial Activities:

Question

Describe the characteristics of a good map.

Answer: A good map should have: a title, a scale, a direction compass, frame work, and key or legend.

Consolidation activities:

Question

What is the map distance in cm of 4 km when the scale is 1 : 50, 000?

Answer: 4 kilometres real distance = 4,000 metres = 400,000 centimetres

The map distance in centimetres = $4\ 000,000\ \text{cm} : 50,000 = 8\ \text{cm}$

UNIT 3: MAP WORK INTERPRETATION

3

1. Key unit competence:

The learner should be able to explain the relationship between the physical and human activities on maps.

2. Prerequisite

The unit 2 of Senior 4 introduced the studying of map work to the learners. It provided deeper understanding and meaning of the maps. This unit gave the insight on the definition of a map, elements of a good map and categories of the maps.

The unit 2 of Senior 5 provided the competences to the learners in relation to locating places on maps using the grid references, identifying directions and bearings on the topographic maps. Thereafter, it enlightened the learners on measuring the distance and calculating the areas on maps. Furthermore, this unit provided learners with competences needed to represent relief on the map. The acquired competences in the above mentioned unit constitute a milestone to study easily this new Unit 3 of Senior 5, which is entitled “Map work interpretation”.

The introductory activity presented in the learner’s book intends to remind learners to appreciate the map works and make links between the physical and human features represented on the map and their environment. This gives a foundation upon which the learners are able to interpret physical and human features represented on maps and associate them with those which are available in their environment. It is of paramount importance to integrate also in this unit cross-cutting issues of environment and sustainability, financial and inclusive education, peace and values.

3. Cross-cutting issues to be addressed

a) Environment and sustainability

It is an obligation of human being to maintain and conserve the environment. Therefore, the environmental protection and management may also be integrated in this unit of map work interpretation as it is focusing on physical and human features which are the main components of environment. It will be very important to put emphasis on the need for environmental protection and management to promote better life on this planet especially for future generation.

b) Financial education

Furthermore, financial education may also be covered in this unit to enlighten the learners about sustainable use of available natural resources on the earth's surface for the sake of better life for future generation.

c) Inclusive education

Through learning and teaching process of this unit, care will be given to all learners. At this time, all learners will be given equal consideration and more attention would be given to the learners with special needs. It will be necessary to understand learner's diversity, backgrounds and abilities to be able to help them adequately in teaching-learning process.

d) Peace and values

It is worth talking about peace and values in teaching-learning process of this unit because the interpretation of physical and human aspects on maps/photographs includes also natural resources which are parts of physical features. Illegal exploitation of natural resources has been the cause of conflicts and wars in various parts of the world. Therefore, the learners should be taught to respect each others' properties, human rights and promote social values in order to avoid any conflict.

4. Guidance on introductory activity

The selected map representing physical and human features should be used to introduce the unit on "map work interpretation". Enough time should be given to the learners to observe all physical and human features represented on a map/photograph. Then, they should identify the main physical and human features represented on the map and show the signs and symbols used to represent those identified features. The learners should use a photograph taken from the environment around their schools to identify all physical and human features shown on that photograph.

5. List of lessons (including assessment)

SN	Lesson title	Learning objectives (knowledge, skills and attitudes)	Number of periods
1	Interpretation of physical aspects from maps/ photographs	Use topographic map and key to identify the physical aspects. Observe physical features critically and interpret them on a map.	4
2	Interpretation of human aspects on maps	Use maps of human activities and key to identify the physical aspects. Observe human features critically and interpret them on a map.	4
3	Relationship between physical and human aspects on maps/ photograph	Record the observations and identify the links between the physical and human features	5
4	End unit assessment		1

6. Guidance on different lessons outlined above

Lesson 1. : Interpretation of physical aspects from maps/photographs

a) Prerequisites/Revision/Introduction

The lesson on maps/photographs is not new to the learners in Senior 5 since maps and cartographic projections; bearings, directions, distances and areas on a map were taught in S4 and S5 respectively. Hence, the new lesson on interpretation of physical aspects should be built on the content studied in previous units. For instance, in S4 the learners studied different topics including definition of a map, elements of a good map and categories of the maps. While in S5, they learnt how to locate places using the grid references and to identify directions and bearings on topographic maps. Thereafter, learners learnt how to measure and calculate distance and areas on the maps respectively. For that reason it will be necessary to provide to the learners the application activities aiming to review the above mentioned content studied in Senior 4 and 5.

After this review, learners will be requested to use geographical documents and internet to research on interpretation of physical aspects from maps/photographs. The focus will be made especially on interpretation of geology, slope, drainage and soils on maps/photographs.

b) Teaching resources:

For effective delivery of the lesson the teacher should avail the following resources to the learners.

- Students' book for S5.
- Recommended text books.
- Topographic maps.
- Aerial photographs.
- Ground photographs.
- Atlases.
- Internet.

However, any other teaching aid judged relevant in the course of lesson delivery may be also used.

c) Learning activities:

Guide learners to work in groups and discuss on the interpretation of physical features on a topography map or on photograph. The illustration of the introductory activity in the learner's book and the content acquired in previous units of S 4 and 5 should be used. Then, learners will make research on signs and symbols representing the geology, slope, drainage and soils on maps/photographs.

The learners will be engaged in activities like discussions, asking and answering questions by referring to the learner's book.

Activity 3.1

Refer to the learners' book under the interpretation of physical aspects from maps and photographs.

Application 3.1

- a) Hills, drainage/river/lakes/streams/mountains swamps etc.
- b) Refer to the learners' book .
- c) The environmental conservation measures e.g. planting trees, strict laws against poaching, mass education etc.

Lesson 2: Interpretation of human aspects on maps

a) Prerequisites/Revision/Introduction:

The lesson on interpretation of features on maps/photographs is not new to learners in Senior 5 since interpretation of physical features on maps/photographs was taught in previous lesson. Therefore, the new lesson on interpretation of human aspects should be built on the acquired competences from interpretation of physical features on maps/photographs. After the review of previous lesson, the learners will be guided to use geographical documents, and internet learners to research on the interpretation of human features on maps/photographs. The focus will be made especially on the interpretation of agricultural activities, mining and quarrying, industrial areas, and settlements on maps/photographs.

b) Teaching resources

For effective delivery of the lesson the teacher should avail the following resources:

- Students' book for S5
- Recommended text books
- Thematic maps
- Aerial photographs
- Ground photographs
- Atlases
- Internet

However, any other teaching aids judged relevant in the course of lesson delivery may be also used.

c) Learning activities

Activity 3.2

Guide learners to work in groups and discuss on interpretation of human features on a topographic map/photograph. The illustration of the introductory activity in the learner's book and the content acquired in the previous lesson should be used. Then the learners will make research on signs and symbols representing the agricultural activities, mining and quarrying, industrial areas, and settlements on maps/photographs.

The learners will be engaged in activities like discussions, asking and answering questions by referring to the learner's book.

Application 3.3

Refer to the learners' book under the symbols used to represent mining.

Lesson 3: Relationships between physical and human aspects on maps/ photographs

a) Prerequisites/Revision/Introduction

The interpretation of physical and human aspects on maps/photographs will constitute a milestone to identify and describe the relationship between physical and human aspects on maps/photographs. The learners will be given time to observe topographic and thematic maps to discover on their own the relationship which may exist between physical and human features.

The learners will be engaged in activities like discussions, asking and answering questions by referring to the learner's book for S5. Thereafter, learners may be asked to identify and describe the relationship which may exist between physical and human aspects on maps/photographs.

b) Teaching resources:

For effective delivery of the lesson the teacher should avail the following resources:

- Students' book for S5
- Recommended text books
- Topographic maps
- Thematic maps
- Aerial photographs
- Ground photographs
- Atlases
- Internet

However, any other teaching aids judged relevant in the course of lesson delivery may be also used.

c) Learning activities

Guide learners to work in groups and discuss on interpretation of physical and human features on a topographic map or in a photograph. The illustration of the introductory activity in the learner's book and the content acquired in previous units of S 4 and 5 should be used. Then, the learners will make research on signs and symbols representing the physical (geology, slope, drainage, landforms, and soils) and human (agricultural activities, mining and quarrying, industrial areas, settlements) features on maps/ photographs.

The learners will be engaged in activities like discussions, asking and answering questions by referring to the learner's book.

Activity 3.3

Refer to the key used under activity 3.3 in learners' book.

Refer to the learners' book .

7. Summary of the unit:

This unit covers the interpretation of physical and human features from maps/ photographs and their relationships on maps/photographs.

Physical features to identify from maps/photographs include: (1) geological features like rocks, cliff and quarries; (2) slopes such as gentle and steep; regular and irregular, concave and convex slopes; (3) drainage like lake/sea/ocean, rivers; (4) landforms such as valleys, plains, plateau and mountains; (5) soils based on their texture and structure.

Human features to identify from maps/photographs include: (1) agricultural activities like coffee and tea among others; (2) mining and quarrying (3) industrial areas (4) settlements.

The relationship between physical and human aspects from maps/photographs will focus especially on drainage and settlement patterns, vegetation and communication networks.

8. Additional information:

(a) Basics on Geographical Information System (GIS) and Remote Sensing.

(b) Preparation of sketch maps of physical and human features available in the environment of learners.

9. End unit assessment:

Question 1

1. As it is difficult to reach all parts of the world; the photographs and maps help to explore different physical and human features on the earth.
 - a. identify physical and human features on topographic map of Rwanda.
 - b. Identify the human features on thematic maps of Rwanda.
 - b. Show different signs and symbols to be used in representing physical and human features existing in your district.

Attempted answers:

Learners identify properly the physical features (geology, slope, drainage and soils) on topographic maps or photographs. They refer to the sign and symbols representing various aspects of geology: (slope, drainage and soils) while identifying them on a topographic map of Rwanda/photograph. These signs and symbols will be seen from the legend or key of topographic map.

Learners identify properly human features (agricultural activities, mining and quarrying, industrial areas, settlements) on maps/photographs. They refer to the signs and symbols representing various aspects of agricultural activities (mining and quarrying, industrial areas, settlements) while identifying them on thematic maps or photographs. These signs and symbols will be seen from the legend or key of thematic maps.

Learners should make a list of physical and human features along with signs and symbols used to represent them on maps/photographs. The following are some example of signs and symbols:

A depression on top of a volcano



Crater



Woodland trees at least 6feet tall



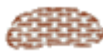
Sand or muddy area, dunes or shifting sand



Gravel beach or glacial moraine



Tailings pond



Gravel, sand, clay, or borrow pit



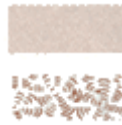
Mine dump



Mining area



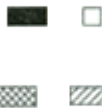
Mine tailings



Quarry



Building



School; church



Built-up area



Airport



Cemetery: small; large



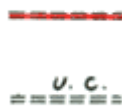
Primary highway



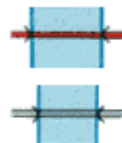
Secondary highway

















Road under construction



Bridge



Power transmission line: pole; tower	
Telephone line	 <u>Telephone</u>
Aboveground oil or gas pipeline	
Underground oil or gas pipeline	 <u>Pipeline</u>
National boundaries	
State or territorial boundaries	
Civil township	
Park, reservation, or monument	
Intermittent stream	
Intermittent river	
Disappearing stream	
Perennial stream	
Perennial river	
Small falls; small rapids	

Large falls; large rapids



Marsh or swamp



Submerged marsh or swamp



Land subject to inundation (flooding)



Question 2

Discuss the relationships existing between settlement patterns and physical features in your district and present them on a sketch map using signs and symbols.

Possible answers:

Physical aspect of an area plays a major role in the activities people do. It also has an influence on the number of people who settle in an area. The learners give the examples of the ways settlements and drainage patterns, vegetation, communication networks have been influenced by physical and human features in their district or/and on maps/ photographs.

Question 3

Take photographs at different places in Rwanda and then prepare a sketch map of captured physical and human features by using conventional signs and symbols.

Attempted answers:

Learners take photographs at different places in Rwanda and thereafter they will prepare a sketch map of captured physical and human features by using conventional signs and symbols.

10. Additional Activities

a) Consolidation activities:

- Show the signs and symbols used to represent various physical and human features on maps/photographs.
- Name and describe physical features which may be represented on maps/ photographs.

- c. Name and describe human features which may be represented on maps/ photographs.

Guide learners on how to answer the above questions using the learner's book and research.

b) Remedial activities (for slow learners)

Such learners take time to understand what has been taught.

Teachers should not reprimand such learners or show them they are poor compared to others and should do the following to help them:

- Giving them more attention;
- Being more patients with them;
- Guiding them carefully and creating time for them after the lesson;
- Encouraging them by motivating them to do better;
- Ensuring that they have understood a sub-topic before moving on to the next sub-topic.

c) Extended activities (for gifted and talented learners)

This category of learners understands concepts very fast because they are extremely intelligent. Teachers can assist them by:

- Providing extra-activities so as to keep them occupied;
- Assigning them the responsibilities of leading and assisting others in group discussion;
- Encouraging them to conduct further researches on the topics related to the unit content.

UNIT 4 : THE UNIVERSE AND THE SOLAR SYSTEM

4

1. Key unit competence:

The learners should be able to distinguish between the components of the Universe and the solar system.

2. Prerequisite (knowledge, skills, attitudes and values)

The learners are expected to have mastered the content of Unit 3 of S1, where they studied the earth in relation to the universe. This unit of senior one, greatly provides strong foundation that learners can use to understand better the content of this unit 4 of senior five. It's very important to note that, they already have necessary knowledge, skills and attitudes. The difference is that, at this level the content as that in the Pupils' book is more detailed and goes beyond what the ordinary level program demanded.

These already acquired knowledge, skills, attitudes and values, should be used by the teacher to conduct diagnostic assessment as a way of measuring each learner's abilities.

3. Cross-cutting issues to be addressed

There are many cross-cutting issues that can be applied in this lesson. In the learners' book, the writers or authors used activities to integrate the crossing-cutting issues. The most highlighted one is that of environment and sustainability and peace and values education.

Even though the writers used few cross-cutting issues, that should not limit the creativity and innovativeness of the teacher. The activities used were just a sample. This calls for the teacher to take note of the cross-cutting issues that he or she is interested in. What is important to note, is that the following list of cross-cutting issues can be applied: Gender, peace and values, Financial education. However, all these require planning in advance on how the teacher is to develop them.

Peace and values education can be integrated using the class room situation where students themselves are taught to thank you wherever their peers respond to a given answer.

4. Guidance on the introductory activity

some of the answers to this introductory activity some are embedded in the passage and the learners are requesting to think out of the box. That is, they should relate the narrative and associate it with the studied topics in S1 under unit 3.

The answers to part (a) include: Meteorites/meteors, moon, stars and Sun. For part (b), the possible answers refer to the table indicated in the learners' book on page..... under the components of the Universe.

5. List of lessons and End Unit assessment

#	Lesson title	Number of Periods
4.1	Definition of the universe: components of the universe	1
4.2	The solar system: sun and planets	1
4.3	Earth: peculiar elements of the earth	1
4.4	Earth's movements	1
4.5	The moon	1
4.6	Other heavenly bodies(Asteroids, comets, meteors and Meteorites, constellations and Galaxies e.g. the milk way)	1
4.7	End Unit Assessment	1

6. Guidance on different lessons

The above table highlights all the lessons that have been created in relation to dividing the unit content into 6 lessons and each having 1 period. This implies that under this lesson, the duration is composed of one period. Below is the guidance on how to go about each lesson or sub heading.

Lesson 1: Definition of the universe and its components.

a) Prerequisites/Revision/Introduction:

There is a direct link of Activity 4.1, intended to introduce the lesson, with what the learners studied in senior 1. Therefore, the Activity supports diagnostic assessment (Formative assessment) to see how much the learners know about the universe. At the same time, preparing the learners for the lesson.

b) Teaching resources

- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet
- Etc.

c) Learning activities

Activity 4.1

- a) Universe or solar system
- b) Refer to the learners' book under the definition of the universe and components of the universe.
- c) Refer to the learners' book under the definition of the universe and components of the universe.

Application Activity 4.1

The teacher should know that this activity involves integration of the cross-cutting issue of environment and sustainability.

- a) The learners are expected to give a wide range of answers. But all should rotate around the importance of the universe to mankind.
E.g. - It is where we belong (Planet earth), provides us with life, air to breathe, The sun the source of energy etc.
 - It is where we belong
 - Planet earth provides us with life and air to breathe
 - The sun is the source of energy
- b) The illustration represents the universe where our planet earth and other planets belong. We should love it because of the reasons shown in (b) above).

Lesson 2: The solar system: Sun and Planets

a). Prerequisites/Revision/Introduction

The learners should have completed properly the content of lesson one. The teacher should also use previous lessons the learners had in senior one, to create more introductory activity.

b). Teaching resources

- Flip charts
- Manila papers
- Print outs for the activity
- Text books

- Internet
- Etc.

c). Learning activities

Activity 4.2

1. Refer to the learners' book on solar system and its components.
2. Refer to the learners' book on the characteristics of the sun and planets.

Application Activity 4.2

The possible answers for the first part of the application activity: Refer to the content of solar system: Sun and Planets in learners' book.

The earth supports life because it is the only planet that supports life. Because; it has water, favourable temperature, receives rainfall, supports both animal and plant life, it has non-poisonous air etc.

Lesson 3: Earth: Peculiar elements of the earth.

a). Prerequisites/Revision/Introduction:

The teacher should use Activity 4.3 for introductory purposes. This will help the learners to connect the lesson content to be learnt with the real-world experiences.

b). Teaching resources

- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet
- Etc.

c). Learning activities

Activity 4.3

- 1). Refer to the learners' book on the peculiar elements of earth.
- 2). Refer to the learners' book on the peculiar elements of earth.
- 3). Refer to the unit 1 of statistics on the construction of a pie chart or divided circle in the learners' book.
- 4).Learners are expected to talk about the environmental conservation measures: Afforestation, reforestation, mass education, etc.

Application Activity 4.3

- a) The students should look at the importance of peculiar elements to mankind. E.g. provision of water, home for mankind, supports life etc.

- b) Emphasize environmental conservation measure, protection of the environment/ utilization of the resources in a sustainable manner.

Lesson 4. :Earth's movements

The previous lessons should have enabled the students to have enough knowledge, skills, attitudes and values that will help them to understand the characteristics of varying planets and their position.

a). Prerequisites/Revision/Introduction:

The learners must have covered the content of lesson 4.3. They should also have mastered the concept of universe.

b). Teaching resources

- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet
- Etc.

c). Learning activities

There are two instructional activities and one application 4.4.

Activity 4.4

- 1). Refer to the learners' book on the earth's movements.
- 2). Refer to their effects in the learners' book on the earth's movements.
- 3). Refer to the learners' book under the effects of the earth's movements.

Application Activity 4.4

- a) Determine the time at Greenwich first. The possible answer to the question is 12 midnight.
- b) Determine the time at Greenwich using the time given located at 30° degree East: 30 degree = 2 hrs. Since it used to determine the time at Prime meridian, subtract 2 from the time at 30 degree. This gives you 12:00 O'clock. Then, subtract 1 hr to get 11:00 am west of Greenwich. The longitude therefore is 15°w
- c) Guide the students to brainstorm on the causes of climatic changes in relation to the world's climatic regions.
 - This part (b) of application activity 4.6, enables the teacher to integrate the cross-cutting issue of environment and sustainability.
 - It enhances acquisition of varying skills such as application skills, critical thinking among many others.

Lesson 5: The moon

a) Prerequisite/Revision/introduction

The learners should have covered the content of the previous lesson.

b) Teaching resources

- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet
- Etc.

c) Learning activities

Activity 4.5

Parts (a) to (e) refer to the learners' book on the Moon.

Application Activity 4.5

This is because of the rotation of the earth and the moon.

Solar eclipse.

Lesson 6: Other heavenly bodies

a). Prerequisites/Revision/Introduction:

The learners must have covered the content of lesson 4.5. They should also have mastered the concept of the universe to a reasonable length.

b). Teaching resources

- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet
- Etc.

c). Learning activities

Activity 4.6

- Meteor and planets
- Refer to the learner's book on other heavenly bodies
- Refer to the learner's book on the planets

Application 4.6

- a) Good climate/favourable climate/clean air that supports life/availability of clean and drinkable water/plants and animals that provide food etc
- b) The teacher should at least challenge learners to find areas where such heavenly bodies have ever landed.

Benefits– touristic attraction/ scientific research/ provision of unique minerals of high chemical content/help to understand practically that there are other heavenly bodies

7. End unit assessment

The possible answers for End unit assessment area)

- a) The heavenly bodies shown in the two photographs are:
 - i. Stars
 - ii. Moon
- b) Refer to the learner's book .
- c) The teacher should enable the students to understand the following : The first photograph shows a desert area while the second represents a forested area in equatorial region.

Much emphasis should be put on what caused these areas especially in the first photograph to be a desert and non-habitable. So, answers such as listed below are more likely to be witnessed:

- Dry conditions.
 - Harsh man's activities that led to environmental degradation such as open cast mining.
 - Latitudinal location.
 - Influence of ocean currents.
 - Poor farming methods.
 - Deforestation.
 - Bush burning.
 - Climate.
 - Nature of soils.
 - etc.
- d) The programs: The teacher should guide learners towards the acquisition of values of respect and conserving the earth and universe in general. Therefore, environmental conservation measures and sustainable utilization of the resources should be emphasized. Etc.

2. Possible answers

- a) Refer to the content of the influence of the moon and sun on the earth.
- b) You select the area that is beyond the tidal range.

c) The key measures that may be included in addressing the effects of tides on the coastal diversity include the following:

- Sensitization.
- Creation of embankments, all use of sand bags.
- Planting more cover crops in areas neighbouring the ocean.
- Creation of buffer zones around the coastal areas.

8. Summary of the unit

The unit 4 of senior 5 deals with the coverage of the content concerning the universe and the solar system. Under this, the definition of the universe, and its components are all dealt with. It further deals with the solar system and its components. The sun, its description and influence on the earth are all covered. The unit stretches hand to include the characteristics of different heavenly bodies, peculiar elements of the earth and the earth's movements. The moon and its influence on the earth and other bodies are all emphasized.

9. Additional Information

There is no much additional information the teacher needs. The teacher should take note of the following: The concept of light year is a new notion. There is nowhere students have come across it right away from ordinary level to senior four. It is a concept that may challenge both the teachers and learners. It is therefore, advisable that a teacher must make more research and make a better use of the pupils' book.

The curriculum requires the teacher to guide learners to study and master the concept of the universe. At the beginning of the unit, the components of the universe are dealt with and at the last part of the unit, they come across of other heavenly bodies. This should not create a spot of doubts and confusion. The text book clearly addresses this issue,

10. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial purposes. They are phrased in a way that the slow learners can also be assisted to raise their self-confidence and at the same time learn in the simplest way possible.

Questions	Possible answers
Distinguish between the universe and the solar system.	Refer to pupils' book on universe and the solar system
Explain the meaning of meteors.	Refer to pupils' book on other heavenly bodies
How do meteors and meteorites differ?	Refer to pupils' book on other heavenly bodies
List the components of the solar system.	Refer to pupils' book on page on solar system
With the help of a diagram, describe how solar eclipse is formed.	Refer to pupils' book on page on types of eclipses : solar eclipse.
State and explain the effects of the earth's rotation.	Refer to pupils' book on influence of the moon on the earth.
Explain the differences existing between earth's rotation and earth's revolution.	Refer to pupils' book on page earth's movements

b) Consolidation activities:

Questions	Possible answers
<p>“With Cosmic distances, kilometres or miles are not appropriate unit of measure for distances” Explain why it is like that.</p>	<p>There are millions and billions of miles or kilometres between one component of the universe to the other especially the stars, galaxies, planets among many others.</p> <p>This implies that if kilometres are to be used the figures would be too huge. Therefore, astronomic units are used for cosmic distances. This is known as the light year.</p> <p>The distances are therefore determined or calculated using the speed of light (i.e. the distance the light can travel in a year.</p>
<p>Describe the astronomical units used for distances and show how it is used.</p>	<p>Refer to the Pupils’ book on page ...</p>
<p>Name the biggest galaxy in the universe.</p>	<p>The biggest galaxy is Andromeda and it is the nearest galaxy to the Milky way galaxy where our planet earth belongs.</p>
<p>Show how you would explain to someone who has never studied in geography the concept of eclipse.</p>	<p>This question will be approached in differents ways. But the learners are guided by the content studied about eclipse.</p>

c) Extended activities:

Research on the influence of the sun and moon on human activities and the physical environment in general.

Possible answers:

Refer to the learners' book on : Influence of the moon and influence of the sun.



UNIT 5: ORIGIN OF THE EARTH

5

1. Key unit competence:

By the end of this unit, you must be able to discuss the theories of the origin of the Earth

2. Prerequisite (knowledge, skills, attitudes and values)

This is a crucial time to point out what learners should have in terms of knowledge, skills, attitude and values. This will make a way through which learners in senior five are getting some new concept like the origin of the Earth. Unfortunately, it is the first time to learn this concept but in senior one unit 3, they have learnt the Earth in relation to the universe.

Consequently, learners in senior five lack profound knowledge, skills, attitude and values about this new concept of origin of the earth even if they have mastered the Earth in relation to the universe.

With this unit, the author has gone in deep about theories about the origin of the Earth and this will enable learners to get new and detailed knowledge, skills, attitude and values that will be a foundation from which the teacher starts to assess how much learners are able.

3. Cross-cutting issues to be addressed

This book is written in the way that many cross-cutting issues are easily applicable with the content. The writer has created useful activities for students. One of the most utilised cross-cutting issues in this unit is Environment and Sustainability. Activity 5.1 and application activity 5.1, are used to highlight the cross-cutting of environment and sustainability.

In this unit, there is the use of few cross-cutting issues, but this does not mean that it's enough to use one cross-cutting issue. The teacher is free to set other cross-cutting issues that are related to the lessons being covered in this unit. It is very important for the teacher to create new scenario, that support the integration of other cross-cutting issues. This will be favourable to the teacher when he/she plan, it in advance.

4. Guidance on the introductory activity

One way to hold the learner’s attention and keep them learning actively is to incorporate activities in the teaching. So, in our case, every lesson starts by an activity. The objective of introductory activity is to open up learners’ possibilities of knowledge, skill and attitudes that they have acquired or expected to learn directly in their class.

All activities in this unit, aim at preparing and helping senior five learners to get a deep understanding of origin of the Earth. Activities are prepared and organized in a way that all learners will be able to respond to them. They can be answered individually or in pairs. The role of the teacher is to guide and facilitate the accomplishment of all activities.

Some activities have their answers in their correspondent passages, others require a high critical thinking and analysis while others necessitate experiment.

An example of experiment is found in activity 5.1.

5. List of lessons and End Unit assessment

#	Lesson title	Learning objectives (knowledge, skills attitudes and values)	Number of periods
5.1	Theories of the origin of the earth (The big bang theory, the creation, theory/ biblical theory).	Explain the origin and gravity of the earth Apply the knowledge to explain how the earth came into existence. Appreciate the importance of the earth as the only planet in the solar system that supports life.	1
5.2	Characteristics of the Earth (The shape and evidence to prove that the earth is spherical :size, diameter, circumference, volume, mass and gravity) of the earth.	Outline the evidences to prove that the earth is spherical/geoid Explain the evidences which prove that the earth’s shape is spherical/ geoid	1

5.3	The internal structure of the earth. (Mineral composition.)	Explain the internal structure, mineral composition and the superficial configuration of the earth Carry out research to find the internal structure, mineral composition	2
5.4	Superficial configuration of the earth (continents and oceans).	Explain the superficial configuration of the earth Carry out research to find the superficial configuration of the earth.	1
5.5	Geological time scale. (Definition of key geological terms).	State the major geological eras and the periods Describe the geological time	1
	End Unit assessment		1

6. Guidance on different lessons

All lessons are given in the table above and are prepared in a way that the entire unit is divided into lessons where each is allocated one or two periods depending on the extent of content.

Here below there are some details about the structure of each sub heading.

Lesson 1: Theories which explain the origin of the earth

In this sub heading, there is an introductory activity that warms up and engages learners in full participation of the lesson. This sub heading clarifies all the theories dealing with the origin of the Earth.

The author suggests to the teacher to go deep even beyond of what is in the pupil's book, and at the same time supporting learners in their activities.

a) Prerequisites/Revision/Introduction:

The activity 5.1 provided in lesson 5.1 is given for the purpose of assessing the level of understanding of learners about the theories of the origin of the earth. This also is provided in order to prepare learners for the new lesson.

b) Teaching resources

Teaching resources in this lesson vary depending on whether they are easy to find or the way to apply them in a certain situation. Many resources are now available in the pupil's book where there are many photographs. In case where relevant resources are not available, the teacher can improvise sketches by using manila papers, or flip chart to be used in prepared activities.

c) Learning activities

As said in guidance on the introductory activity, a good learning strategy is to incorporate activities in teaching.

Activity 5.1 was prepared for learners to introduce the lesson in the pupil's book. As the activity involves experiments, it is better to be done in a small group. The teacher will give instructions on how the activity is going to be done basing on the objectives of the lesson. Learners will demonstrate how balloon starts small and expands outwards at roughly the same speed around as they blow air in to create a simulation of the universe.

As learners carry out an experiment, it will prove them how the universe works.

Application 5.1 involves learners in a cross-cutting issue of environment and sustainability.

The answers are the following:

a) Refer to the learner's look on the biblical theory and the big bang theory. Guide learners to differentiate these theories and to develop some generic competences such as critical thinking, research skills, cooperation and communication skills, etc.

b) Guide the learners to research on other theories of the origin of the earth use the text from additional information of this unit where other theories of the origin of the earth are developed.

Lesson 2.: Characteristics of the Earth

(The shape and evidence to prove that the earth is spherical, size, diameter, circumference, volume, mass and gravity of the earth).

In first lesson, learners acquire knowledge, skills and attitudes and values related to the origin of the Earth. In this lesson, the second one called the characteristics of the Earth (shape and evidence to prove that the earth is spherical).

Learners will gain more knowledge, skills and attitude and value to build their capacity of thinking and create curiosity of travelling in the world to appreciate the beauty of the world.

a) Prerequisites/Revision/Introduction

In this lesson, the authors used many activities to check the understanding of learners in comparison with objectives set. For example, Activity 5.2 tells a story about what many people wonder about the shape of the Earth. The application activity 5.2 integrate learners with more scientific experiments. All activities in this lesson contribute much as they work as a diagnostic assessment

b) Teaching resources

The teacher in a class is a guide and facilitator. It is better for him or her to use possible tools that will make his/her lesson easy to understand. Activity 5.2 and application activity 5.2 can be easily understood by using simple tools such as egg-ball and watching videos related with the characteristics of the Earth.

As the teacher remembers that planning plays a great role towards the achievement of a successful teaching activity, this planning should be done prior as it will help the teacher to manage the time and all learning activities.

Learners should also be familiar with drawing by using manila papers or their note book.

c). Learning activities

This lesson contains learning activity for example, activity 5.2, and application activity 5.2 and 5.3 they have in common, the shape and size of the Earth. They explain how big the Earth is, how heavy the Earth is, and in what way the Earth is influenced by gravity. Both learning and application activities indicated in learner's book are purposely to help learners and teacher.

Activity 5.2

This activity is related with the shape and evidence to prove that the Earth is spherical. It is set to enable the teacher to develop this lesson. This is an activity that covers the entire content that follows under the lesson title: Characteristics of the Earth. The expected answers for this activity include the following:

a) The passage is talking about the shape of the Earth.

b) The Earth is spherical in shape this means that the Earth is an oblate spheroid, slightly

flattened at the poles and bulging a little at the equator.

c) The evidences to support the spherical shape of the Earth are the following:

- The circumnavigation/travel that circle the Earth: When one travels across the world along the straight path without stopping, he or she would come back to the point of origin (or where the journey started from).
- Images from the space: Photographs taken from space by satellites show that the Earth's surface is curved/ spherical shape.
- Riding of a plane: If one takes a trip, especially long destination he or she would notice 2 interesting facts about planes and the earth:
 - Plane can travel in a relatively straight line a very long time and not fall off any edges.
 - If one looks out through the window on a trans- Atlantic flight, he or she most of the time sees the curvature of the Earth in the horizon.
- The view of other planets: All observations from telescopes reveal that the planetary bodies are spherical from whatever angle.
- The shadow of the Earth during eclipses: The eclipse of the moon (Lunar eclipse) provides a straightforward evidence of the shape of the Earth as reflected in the cast shadow of the Earth onto the moon. The shadow shows that the Earth is round.
- Day night and seasonal change: The Earth's tilted axis produces seasonal weather and gives days of different length. If the Earth was at a right angle to the sun, day and night would always be of equal length, and there would only be one season throughout the whole year.
- The size and diameter of the Earth: the Earth has an equatorial diameter of 12, 751 km and its circumference are 40,080 km. It is however little flattened at both ends like an orange and therefore not a perfect sphere but a geoid.
- The International Date Line: If two people started off from the prime meridian and one went east while another went west, both would meet at the International Date Line which separates east from west and if they continue moving, each would end up where they started at the prime meridian.

- The sun rises and sun sets: If the earth was flat, the sun would rise and set at the same time in all countries. The sun rises and sets at various times in various places

The polar star holds evidence that proves the shape of the Earth to be spherical. As one moves towards the poles, the size of the polar star increases and when one moves away from the Polar regions it decreases. This means that the Earth is round. If it was flat, the size of the polar star would remain the same.

- d) The Earth's mass is 5.9736×10^{24} kg and its volume are 1.08321×10^{12} cubic kilometres. The average radius of the Earth is 6,371 kilometres. The Earth's equatorial diameter is 12,756 kilometres. Its polar diameter is 12,714 kilometres while its circumference at the equator is 40,075 kilometres and its circumference pole to pole is 40,008 kilometres around.

Application activity 5.2 this activity provides instructions to follow so that the learners can successfully achieve their work.

a) Requires materials to be used such as an egg, a piece of thread, a ruler and a marker.

b) The teacher will guide learners and provide them with materials to use in this activity.

c) The teacher also will help learners by forming small groups then the learners themselves will measure the lines drawn around the egg.

d) After getting the findings from measurements, learners will describe the shape of the Earth.

The parts of the egg not named are:

X stands for North Pole.

E stands for Equator.

Y stands for South Pole.

f) Gravity plays a key role in maintaining all celestial bodies in equilibrium. This gravity pulls everything towards the centre. That is why people on Earth feel comfortable because they cannot fly off into space as gravity maintains people and other objects on it.

Lesson 3.: The internal structure of the Earth. (Mineral composition.)

This is the third lesson under unit 5 of senior five. It is a sequence from lesson 5.2. It concerns with internal structure of the Earth and its mineral composition.

a) Prerequisites/Revision/Introduction:

The present lesson has only one activity 5.8 and one application 5.4. These activities intend to assess the level of achievement.

b) Teaching resources

In this lesson 5.3 internal structure of the Earth, the teacher is suggested to use materials that are locally available for example, using an avocado, orange or any other fruit that has a core at the centre. This will help learners discover and share findings by simulating the structure of the Earth from known materials.

c) Learning activities

Activity 5.3 deals with the internal structure of the Earth.

The answer to question 1

In this activity the answer is that the interior structure of the Earth is layered in spherical shells, whereas the outer part is solid and visible where all human activities take place, there is a highly viscous part called mantle where volcanic activities originate, a liquid core outer that is much less viscous than the mantle, and finally a solid inner core.

Question 2

- a) Learners are asked to fill/complete the missing words within the illustration in learners' book and the gaps are now complete.
- b) Description of mentioned parts, refer to the learners' book

Question 3

The teacher will guide the learners to do research into the main mineral composition of the Earth, first by forming small groups, then they will use their books and other geographical sources of information that can assist them to register a successful piece of work.

Application activity 5.3

This application (5.3) is set to assess and ensure that the learners have achieved successfully the knowledge, skills and attitudes acquired in relation to the notion of the interior structure of the Earth.

The expected answers to question 1 in this application are the following:

1. Mount Muhabura is directly connected to the internal structure of the Earth. As the writers said above in this lesson, Muhabura is a result of volcanic activity. Such volcanic activity takes place when the hot molton material erupts from the mantle and escapes up to the the Earth's surface.
2. The Earth is rich in various minerals. All minerals in nature are not the same. The most common and abundant chemical elements found in the Earth's crust are Oxides which represent 46.6 % and Silicon which represent 27.7 %.

Lesson 4.: Superficial configuration of the Earth

The fourth lesson in this sequential unit 5 in senior five is superficial configuration of the Earth. The writers have combined two lessons of continents and oceans because they are interconnected.

a). Prerequisites/Revision/Introduction:

In this lesson superficial configuration of the Earth, activity 5.4 and application activity 5.4, all intend to facilitate the teaching and learning processes by introducing the new topic.

b). Teaching resources

To achieve successful teaching and learning practice, the teacher in senior five is suggested to use print outs, world map and the globe to show them to the learners during learning activities. As learners observe and see different features on the map, this will help them discover different areas and associate them with reality.

c). Learning activities

In learner's book, there are activities that should be answered by learners either in a group or pairs. Possible answers that match with the prepared activities and application activities are the following:

Activity 5.4

1. The superficial configuration of the Earth refers to the way parts or elements of the planet Earth are arranged on its surface. Superficial configuration deals with the distribution of continents and oceans.
2. The teacher will guide learners during the drawing of the world map. This activity should be individual.

3. a) The part covered by the green colour are continents.
- b) The subdivision of green colour/ continents make up the 7 continents.
- c) The blue colour represents oceans and seas.

Application activity 5.4

1. North Korea is in Asia, Germany is situated in Europe, Japan is located in Asia, Brazil is located in America, Senegal is situated in Africa and New Zealand is found in Oceania.
2. The teacher will organize a group work for the class, provide them with a globe and world map as resources which can facilitate them to conduct appropriate research.
3. The teacher also will allocate tasks to the learners after they have formed groups. One group discusses the importance of water, another group discusses on how water can be conserved. Then, the two groups exchange and share their findings.

Lesson 5.: geologic time scale

a) Prerequisites/Revision/Introduction:

This is the last lesson in this unit. The lesson “Geological time scale” is related to “unit 6 rocks” learnt in senior one. So, learning geological time scale will be easy for learners in senior five because it is associated with the strata of rocks already covered in past studies. The lesson has only one activity and one application activity.

b) Teaching resources

Teaching geologic time scale in senior five will be easy if the teacher organizes a fieldwork in areas where learners can observe how layers of rocks differ in terms of their deposition. The teacher is also advised to use print outs and videos.

d) Learning activities

Activity 5.5

1. The passage is talking about the geological time scale.
2. Fossil means the remains of prehistoric plants or animals that are found inside a rock.
3. The teacher, as a facilitator and guide, will give learners books then let themselves search for various geological eras and periods recorded in history.

Application activity 5.5

- a) In answering this question, the teacher is suggested to organize a class debate on how to promote archaeological research and environmental protection.
- b) The teacher is advised to let learners know themselves the importance of geological time scale by preparing a class discussion.

7. Summary of the unit

This unit 5 deals with the origin of the Earth. The origin of the Earth is a controversial topic in many communities because many people do not share the common view on how the Earth came into existence. But most researchers agreed that the Earth and other planets in the solar system were formed at basically the same period from the same primordial material like the sun. Many theories were set to justify the origin of the Earth and the most popular are big bang and biblical theories.

In this unit, the writers have talked about the characteristics of the earth where they have pointed out its shape and size,

Unit 5 also talks about the internal structure of the earth. The earth is composed of different component parts. For example, rocks, mountains, water, minerals, plants, etc.

At the end of the unit, the writers have described the history of the Earth talking about geologic time scale.

8. Additional Information

A. In learners' book, only two theories of the origin of the Earth (Big bang theory and Biblical/Creation theory)were developed. In this teacher's guide, additional theories are being described below.

1. The dust cloud theory

This theory was developed by three individuals between 1940 and 1955. They were Carl F. VonWeizsacker, Gerald P. Kuiper and Harold C. Urey.

The dust cloud theory is also referred to as protoplanet hypothesis, condensation contraction theory or the nebular contraction theory. According to this theory, planet Earth formed from a very big rotating disk of dust and gas called nebular. These gas and dust condensed forming solid materials of spherical shape.

The smaller individual dust particles joined together in a colliding manner, fusing and therefore forming protoplanets that turned into the present planets. These dust particles were on the other side of the disk where tiny concentrations of material began to stick together leading to the formation of planets and hence the Earth.

2. The Kant-Laplace nebular hypothesis or theory

This theory was first developed by Immanuel Kant in 1755. According to this theory a massive cloud of dust and gas called nebular was pulled together under the influence of intense gravity. It further explains that the cloud of gas and dust cooled down and turned into a flat shaped disk. According to Kant, the flat disk became the sun and the planets.

The theory suggests that all planets, including Earth, formed in a rotating disk of gas and dust that surrounded the sun in the same way it was formed.

In 1796, Pierre-Simon Laplace further analyzed Kant's theory and suggested that the birth of planets including our planet Earth was due to the intense centrifugal force. That force plucked off the rings of matter from the rotating nebular. According to him, the matter that remained turned into the sun and the rings of matter formed the planets. It is on this basis that the theory is called the Kant-Laplace theory because it was developed and supported by the two.

Nebular hypothesis

3. The Chamberlin-Moulton planetesimal hypothesis

According to this theory advanced by Chamberlain and Moulton, planets share a common origin. The theory is founded on the thought that all planets were formed due to the interaction between the sun and another big star.

The theory continues saying that the time the star reached the sun, it created tidal bulges accompanied by eruptive forces found in lower parts of the sun and this greatly affected the sun's mass. As a result of this event, there was the presence of small jets of silic matter that were escaped to far distances. These individual jets condensed and resulted into the Earth formation and other planets, hence accounting for the origin of our planet Earth and other planets.

4. Cometary collision hypothesis

This theory was developed by Georges Louis Leclerc, Comte deBuffon in 1749. The theory suggests that a comet hits the sun and broke off fragments which formed the planets. This collision ended up with the breakup of the sun. The remains of the sun continued rotating under great speed and further sub divided into various pieces that formed the planets among which the Earth is found

5. The encounter hypothesis

This theory was first developed by G.L.L. de Buffon in 1745. It proposes that the planets formed from material ejected from the sun or a companion star during an encounter with another object. There was a collision between the sun and a rogue star about 5 billion years ago. Material in the form of hot gas was stripped from both the star and the sun. The material fragmented into smaller parts forming the planets including Earth. This hypothesis explains why the planets all revolve in the same direction (from the encounter geometry). It also provides an explanation for why the inner worlds are denser than the outer worlds.

6. The tidal wave theory

This theory was developed by James H. Jeans and Harold Jeffreys in 1877- 1946. According to the tidal theory, the Earth is a result of materials pulled out from the sun. This theory explains that by the time the sun existed alone at first, then a wandering star came and passed very near the sun. The movement created a huge tide that tore away some of the external gas of the sun. After a long time, the gas concentrated and formed bodies that became planets.

7. The fission theory

This theory was propounded by George Darwin. The theory proposes that one day, the sun burst into pieces and all the planets in our solar system came into existence from it. It further gives an account of the creation of the moons. According to George Darwin, moons ejected out of every planet, became static and took another direction. They started circling the created planets, each attending the planet from which it came from. The theory holds that the present Pacific Ocean basin is the site for the part of the Earth from which the moon came.

8. Accretion theory

The accretion theory was developed by M. Bishop, B. Sutherland and P. Lewis in 1981. This theory suggests that a cloud of gaseous material and dust contracts due to the extreme forces of gravity. Spinning mass forms a disc, probably with a bulge at the centre where a warm protostar undertakes a gestation period. And then eventually the central region of this locality collapses under the hostile force of gravity. This allowed the centre to continuously heat up, as the ambient gases continue to gather toward its core. From then on, the protostar dispenses and radiates much of its heat and ejects matter outwards from its polar regions, where the disc itself offers little restriction to this process. And during this period, a lot of the protostar's dust and debris is removed toward the newly forming solar-system's periphery. From there, fusion commences at the star's core, and the star begins its active nuclear life.

9. Stellar collision theory

Stellar collision means the colliding of stars. This theory suggests that the solar system came into existence due to the collision between stars. This implies that stars pre-existed before the sun. When the stars collided, the sun and other heavenly bodies were formed.

B. It is better for teacher to have the knowledge of different minerals. Here below there is a table describing **Silicate minerals and igneous rocks**

Felsic minerals (felsic mineral group) quartz and feldspars treated as a mineral group of light color and relatively low density (see also mafic minerals.) dominantly composed of mafic minerals.

Mafic minerals (mafic mineral group) minerals, largely silicate minerals, rich in magnesium and iron, dark in color, and of relatively greater density.

Ultramafic igneous rock, igneous rock composed of almost entirely of mafic minerals, usually olivine or pyroxene group.

9. End unit assessment

1. Read the following discussion between two students and answer the questions provided.

Two students Mugisha and Uwamahoro were discussing the origin of the Earth. Mugisha said that the Earth and other celestial bodies came into existence in different ways, some were formed due to the collision of stars, others by explosion. On the other hand, Uwamahoro with confidence said that everything in the universe was created by God.

- a) Who is right, who is wrong?
 - b) Describe four theories of the origin of the Earth
2. The physical features of the Earth are changing day by day due to natural reasons and human activities. Suggest ways people can do to conserve nature for its sustainability.

Answers for end unit assessment

1. a) Both students Mugisha and Uwamahoro are right because their discussions is based on the truth of two most accepted theories that are Big bang and Biblical theory.
b) Refer to the teacher's guide under additional information where all theories on the origin of the earth are provided.

- The learners will discuss different techniques people can use to conserve the physical features of the Earth for its sustainability such as proper planning of land use, avoiding forests fire, afforestation, using good farming practices, etc.

10. Additional activities

a) Remedial Activities

Identify and describe evidences to prove that the Earth is not a perfect sphere.

Answer: Refer to the learner's book in relation to the shape of the earth.

How are minerals different from rocks?

Answer: A rock is a combination of rocks while a mineral is a naturally occurring inorganic substance, often with a crystalline structure and composition.

a) Consolidation activities

- Describe how minerals are so important to the economy of the country

Answers: minerals are extracted for many purposes, they are raw materials for many industries such as electronic industries, metallurgical industries, etc.

Minerals are associated with mining activities, this activity provides jobs to many people.

Mining sites owners pay tax to the government.

Minerals are exported abroad. thus a country gain foreign exchange.

b) Extended activities:

Referring to the superficial configuration of the Earth, some parts of the Earth suffer from drought while others suffer from flooding.

Suggest the measures that should be taken to avoid floods.

Answer:

- Population living near high risk zones should be sensitised about likely dangers.
- People should construct buildings above flood levels, this means at least 40 metres from the ground to prevent flood damage.
- To protect wetlands and plant many trees strategically
- Widening river channels so that water can flow freely.
- Put up more flood barriers as defence in high risk zones.



UNIT 6: INTERNAL LANDFORM PROCESSES

6

1. Key unit competence:

The learners should be able to examine the internal processes responsible for the evolution of different relief landforms.

2. Prerequisite/introduction

The learners are expected to have mastered the content of Unit 3 of Senior 4, where they studied the formation of relief features in Rwanda. That unit of senior four greatly provides strong foundation that learners can use to understand better the content of this unit 6 of senior five. It is very important to note that, they already have necessary knowledge, skills and attitudes about the internal processes that led to formation of Rwandan relief. The difference between the senior four content and senior five content is that, at this level of Senior five, the content in the student's book is more detailed and goes beyond Rwanda to the landforms of the World in general. The already acquired knowledge, skills, attitudes and values from senior four, should be used by the teacher to conduct diagnostic assessment as a way of evaluating each learner's abilities.

3. Cross-cutting issues to be addressed:

There are many cross-cutting issues that can be applied in this unit. In the learners' book, the writers or authors used activities to integrate the crossing-cutting issues. The most highlighted is that of environment and sustainability.

Even though, the writers might have used few cross-cutting issues, this should not limit the creativity and innovation of the teacher. The activities used were just samples. This calls for the teacher to take note of the cross-cutting issues that he or she is interested in. What is important to note, is that the following list of cross-cutting issues can be applied where possible depending on occasions: Gender, peace and values, Genocide studies, inclusive education, standardisation of culture and comprehensive sexuality education. However, all these require planning in advance on how the teacher should be able to develop them. Peace and values, gender and financial education can be integrated using the class room situation

- **Environment and sustainability:** The teacher is requested to give more explanations on the activities describing the importance of landforms produced by vulcanicity, warping, faulting and folding. The teacher should help learners be aware of what extent the landforms produced by internal processes play a considerable role to their life, therefore a need to be conserved. He should also help students understand carefully the measures that should be taken to conserve and preserve; for example the teacher should guide learners on how to plant trees on steep slopes and escarpments in order to control soil erosion and mass wasting. This will help students be equipped with more knowledge and skills on environment and sustainability.
- **Peace and values education** could be addressed in activity 6.3 where the use of names Mahoro and Bumwe the teacher has to reinforce on how Mahoro referring to peace is a crucial thing in life and Bumwe (referring to unity), show positive attitudes of someone who has peace. In this activity the teacher should reinforce the need of peace in the society.
- **Activities 6.8 and 6.17** can be used to address financial education to the students. Here, the teacher has to explain using typical examples on how relief features can help students operate their own business by using local materials provided by mountains, valleys, plains and basin lakes from their area. For example learners can quarry stones, sand, gravel which can be later sold to earn money. The teacher's explanation should reflect on the small scale income generating activities that are likely to take place in local areas. He can use landforms and drainage features such as rift valley lakes that can be worked in small scale fishing to generate money/income. Volcanic features associated with soil are used to grow of vegetables and fruits in which learners can do small scale projects to generate income/money.
- **Inclusive education:** The teacher is advised to cater for special needs of learners with disabilities. For example; the teacher has to use audio materials for students with visual impairments, audio-visual materials to those who have physical impairments so that they can see and hear the samples brought. The teacher should select conducive environment to all students so that students with disabilities can participate in learning activity.

4. Guidance to the introductory activity:

In conducting the introductory activity, the teacher has to allow students to observe critically the diagrams provided related to the introductory activity and try their best to give answers to the questions about the given diagrams. Answers to questions are supposed to be provided by students.

Students may not be able to find the right answers but they are invited to predict possible answers.

In case the learners fail to come up with right answers to the questions related to the given diagrams, the teacher may immediately provide the possible answers but he/she should allow learners to discover the right answers themselves through the learning and teaching process.

Possible answers for the introductory activity include:

(a) Faulting, vulcanicity, folding and warping.

(b) Possible answers are found in the student's book on faulting.

(c) The possible answers for question (c) may include:

- Mountains formed like volcanoes attract tourists,
- Lakes formed favour fishing, water transport
- Mining for the case of methane gas in Lake Kivu and petroleum in lake Albert.
- Valleys, plains and plateaus formed favour agriculture, settlement, road construction, etc

5. List of lessons

S/N	Lesson title	Learning objectives (Knowledge, skills and Attitudes and values)	Number of periods
1.	Faulting and processes leading to the formation of different faulted features	Recall the processes leading to the formation of different faulted features. Explain the processes responsible for the formation of different faulted landforms.	2
2.	Types of faults	Identify the major types of faults and impact of faulting on landscape and drainage.	5
3.	Influence of faulting on landscape and drainage	Investigate the impact of different faulted landforms on landscape and drainage.	3
4.	Impact of faulting on man	Identify the influence of faulting on man. Appreciate the impact of internal processes on the landscape. Describe the influence of faulting on man.	1
5.	Distribution of landforms associated with faulting	Identify other areas that are associated with faulting in the World. Locate the different areas associated with faulting.	1
6.	Definition of folding and its processes	Recall the processes of folding. Explain the processes responsible for folding.	1
7.	Types of folds	Recall the types of folds.	3

8.	Influence of folding on landscape and drainage	<p>Explain the influence of folds on landscape and drainage.</p> <p>Appreciate the importance of folding on human activities.</p>	2
9.	Meaning, causes and types of warping	<p>Explain warping, types and causes of warping.</p> <p>Explain the impact of warping and associated landforms.</p> <p>State the influence of warping on the drainage.</p> <p>Describe the influence of warping on drainage.</p>	6
10.	Processes of vulcanicity and volcanic materials	<p>Define vulcanicity, volcanicity and recall the volcanic processes.</p>	1
11.	Intrusive and extrusive features	<p>Explain the processes responsible for the formation of different intrusive and extrusive landforms.</p> <p>Appreciate the perspectives responsible for the formation of different volcanic landforms.</p> <p>Describe the different relief landforms associated with intrusive and extrusive processes.</p>	1
12.	Types of volcanoes and their characteristics	<p>State the types of volcanoes and their characteristics.</p> <p>Carry out research on the types and characteristics of volcanoes.</p>	2
13.	Influence of vulcanicity on drainage	<p>Explain the impact of different volcanic landforms.</p> <p>State the impact of vulcanicity on drainage and to man.</p> <p>Identify the major volcanic regions in the world.</p>	1
14.	Impact of vulcanicity on man	<p>Appreciate the importance of vulcanicity in shaping the landscape.</p>	1
15.	World distribution of volcanoes	<p>Locate the major volcanic regions.</p>	1
16.	Meaning of earthquake and its related concepts	<p>Define the concept of earthquakes.</p> <p>Explain the concepts of earthquake.</p>	1

17.	Causes, consequences and measures of earthquakes	<p>Explain the causes and consequences of earthquakes.</p> <p>Investigate the causes and effects of earthquakes. Show concern for the causes and consequences of earthquakes.</p> <p>Identify the measures to curb earthquake effects. Show concern devise emergency and preparedness measures.</p> <p>Propose possible measures to regulate earthquake effects.</p>	2
18.	World distribution of earthquakes	<p>Identify the major earthquake zones of the world.</p> <p>Locate the major earthquake zones of the world.</p>	1
	End unit assessment 6.1.		1
	Total		36

6. Guidance on different lessons

The above table highlights all the created lessons relating to the content of unit 6. There are 16 lessons developed from that content with unevenly distributed period depending on its content or volume.

Lesson 1: Faulting and processes leading to the formation of different faulted features

a) Prerequisite/introduction:

There is a direct link of Activity 6.1, intended to introduce the lesson, with the lessons studied in Senior four. The activity 6.1 requests learners to recall the knowledge and skills gained from previous lesson of senior four about relief formation in Rwanda, this will be through diagnostic assessment/ evaluation by teacher. This will enable learners to follow the lessons by linking it to Rwandan landforms formation processes.

b) Teaching resources

- Diagrams
- Pictures
- Flip charts
- Manila papers
- Print outs for the activity
- Text books

- Internet
- Field work to the surrounding area.

c) Learning activity 6.1

In conducting this learning activity, the teacher will guide learners to use available resources like textbooks and internet to answer the questions related to learning activity. Then the learners try their best to give answers to the learning activity and try their best to answer them. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

- a) The meaning of faulting and fault: refer to student's book on faulting
- b) Processes of faulting include tensional, compressional and differential uplift. Refer to the learner's book under Faulting.

Possible answers to the application Activity 6.1

- Faulting process in Rwanda led to formation of Bugarama plain in south western Rwanda.
- Faulting led to formation of Lake Kivu banks in western Rwanda.
- Faulting led to the formation of River Rusizi as fault guide valley in south western Rwanda.

Lesson 2: Types of faults

a) Prerequisite/Introduction:

There is a direct link of Activity 6.2, intended to introduce Lesson 2 with what the learners studied in Lesson 1 above. The activities of this learning activity has a link with lesson 1 ,therefore the teacher has to help learners remember the process of faulting and its associated concepts with a main focus on the types of fault.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams
- Pictures
- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet

- Field work to the surrounding area

c) Learning activity 6.2:

In this activity the teacher should allow students to observe critically the diagrams provided and identify their names and their characteristics. Then, he will answer the questions related to the learning activity. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment. Emphasis should be taken to help learners with special needs use gestures, tactile materials, sign language or video clips.

Possible answers to learning activity:

- A= Normal fault, B= Reverse fault , C= Step faults, D=Tear fault, E=Hinge fault
- Refer to the student's book on the explanation of the types of faults.

Possible answers to application Activity 6.2

- The learners are expected to give a wide range of answers. But all should rotate around any one type of fault and its influence on Rwandan landscape.

Lesson 3: Influence of faulting on landscape and drainage

a) Prerequisite/Introduction:

In the activity 6.3 that intended to introduce Lesson 3 has a direct link with lessons 1 and 2, the teacher has to help learners to recall the previous content for a better introduction of Lesson 3.

Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams
- Pictures
- Flip charts
- Manila papers
- Print outs for the activity
- Text books
- Internet
- Field work to the surrounding area

c) Learning activities 6.3

In this activity, the teacher should allow students to read carefully the passage. For this activity, the teacher will give learners an opportunity to read attentively the passage and give them time to reflect on the provided questions and then give up their answers. Learners are expected to give answers that rotate on the influence of faulting on landscape.

They will then answer the questions related to learning activity. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment. For the case of the learning activity 6.3, in terms of generic competences, the reference has resulted into creativity and innovation as well as communication skills. Solutions to questions are supposed to be provided by learners under the teacher's guidance of.

Possible answers to learning activity:

Refer to learner's book on influence of faulting on the landscape and drainage system in the context of Rwanda

Possible answers to the application Activity 6.3

- The students are expected to give their own view/opinion in answering the question of application and all should rotate on the relief and drainage features formed or influenced by faulting in Rwanda. For example in Western Rwanda, faulting led to formation of Lake Kivu, Mount Muzimu, etc.

Lesson 4: Impact of faulting to man

a) Pre-requisite/Introduction:

Activity 6.4, which intends to introduce Lesson 4 has a link with lesson 3 studied above. Through observation the teacher has to help student link the produced landforms with its impacts on man.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.

- Internet.
- Field work to the surrounding area.

Learning activity 6.4.

For this activity, the teacher will give learners an opportunity to observe critically the provided diagrams. Then, the teacher should allow students to read carefully the questions related to learning activity and answer them. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues. But he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment. For the case of Learning Activity 6.4, in terms of generic competences the reference has led to creativity and innovation as well as communication skills. Solutions to questions are supposed to be provided by learners under the teacher guidance .

Possible answers to the learning activity:

- a) Rift valley lake and block mountain.
- b) Guide learners to identify different human activities which take place in the illustration. Learners are guided to discover the relationship between these human activities and the physical features.

Possible answers to the application Activity 6.4.

- The students are expected to provide their own opinions/view on the negative and positive impacts of faulting to man. For example: Rift valley lakes attract tourists, provide water for home and industrial purposes.

Lesson 5: Distribution of landforms associated with faulting

a) Prerequisite/Introduction

The learners should have skills and knowledge about map interpretation studied in unit 2 studied in term one senior five. The learning activity 6.5 intended to introduce lesson 5 is about the world areas affected by faulting.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible

- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps and atlas.

c) Learning activity 6.5

When conducting this activity, the teacher will give learners an opportunity to observe critically the provided maps and give them time to reflect on the provided questions and then give their answers. The teacher is requested to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers learning activity 6.5

Learners are expected to give answers that rotate on the distribution of landforms associated with faulting.

- East African region covering East and Western branch of East African rift valleys.
- Refer to the learners' book on distribution of landforms associated with faulting

The possible answer for application activity:

- The main areas affected by faulting in the world include East African rift valley, Rhine rift valley, Arabian rift valley and San Andreas Fault.

Lesson 6: Definition folding and its processes

a) Pre-requisites/Introduction:

Activity 6.6, is intended to introduce Lesson 6 and it has a link with unit 3 studied in senior four on the formation of relief features in Rwanda.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible

- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.
- Field trips

b) Learning activity 6.6

For this activity, the teacher will give learners an opportunity to read attentively the passage on the relief of Rwanda and give them time to reflect on the provided questions and then give their answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

- a)Folding process: Folding is a process in which crustal rocks bend due to compression forces.
- b)Refers to student’s book on definition of folding and its processes

Possible answers to the application activity 6.6

- The students should look at the importance of folding and faulting on the landscape. For instance faulting led to formation of Bugarama plain and folding led to formation of the central plateaus of Rwanda.

Lesson 7.: Types of folds

a) Introduction:

The previous lessons should have enabled the students to have enough knowledge, and skills about folding that can help them to describe the characteristics and types of folds.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Field trip.
- Maps.

c). Learning activity 6.7.

For this activity, the teacher will give learners an opportunity to reflect on the provided question and then give answers to the questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity

Learners are expected to give answers that rotate on the distribution of types of folding.

- Referring to the characteristics and categories of limbs, syncline and anticlines there are different types of folds that include: Symmetrical fold, Asymmetrical fold, over fold and others in the learner’s book on types of folds

Possible answers to the application activity 6.7.

- With a brief explanation the learner should use a diagram to differentiate symmetrical fold from (other types of folds). Possible answer refer to the learner’s book on types of folds

Lesson 8.: Influence of folding on landscape and drainage

a) Pre-requisites/Introduction

The learners should have gained more knowledge and skills about folding in the content of the previous lesson. The learners with the guidance of the teacher, have to examine critically the relationship between folding process and the environment.

- Teaching resources
- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Field works.
- Maps .

b) Learning activity 6.8

For this activity, the teacher will give learners an opportunity to read attentively the provided questions and give them time to reflect on them and then give answers. The teacher is requested to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

1. Impact of following on landscaoe

- Folding led to formation of fold mountains.
- Folding led to formation of rolling plains.

2. Impact of folding on drainage system

- Formation of waterfalls
- Formation of river catchment area for instance Mountains in Nyungwe forest.
- Folding led to river reversal.

Possible answers to the application Activity 6.8

- 1) The possible answers, refer to student's book on the influence of folding on drainage and landscape
- 2) The learners are expected to give their view/opinion about the positive and negative significance of Jali fold mountain to the economic development of Rwanda.

Possible answer include: The development of communication through construction of telecommunication masts, attract tourists, quarrying, etc.

Lesson 9.: Meaning, causes and types of warping

a) Pre-requisites/Introduction:

The learners must have covered the content of unit 3 of senior four and relate the knowledge and skills to the worldwide context.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Field trips.
- Maps.

Activities

c) Learning activity 6.9

For this activity, the teacher will give learners an opportunity to read attentively the passage on warping in Rwanda, and give them time to reflect on the provided questions. and then let them give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

- a) Warping.
- b) Refer to the students' book on meaning, causes and types of warping.

c) The possible answers for this question include: warping process led to up and down warped landforms in Eastern Rwanda. On drainage this process led to the formation of basin lakes that include lake, Muhazi and Mugesera in Eastern Rwanda.

Possible answers to the application activity 6.9

1) Warping has led to the formation of different landforms in East Africa including Rwanda. Lakes Muhazi and Mugesera in the eastern region of Rwanda, lake Kyoga and Victoria in Uganda and many plateaus in East Africa can prove that the east African region has been affected by warping.

2) The learners have to draw a sketch map of Rwanda, label and mark the basin lakes (Lake Muhazi and Mugesera) and plateaus of the eastern province of Rwanda.

3) Learners should give their views on the formation of lakes and rivers formed through warping in East Africa. For example the formation of lake, Victoria and Muhazi.

Lesson 10.: Processes of vulcanicity and volcanic materials

a) Pre-requisites/Introduction:

Activity 6.10 that intended to introduce Lesson 12 has a link with the content of unit 3 of senior four. There learners should have gained knowledge and skills about the formation of North Western Rwanda relief, which has been formed through vulcanicity.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Fieldwork.
- Maps.

c). Learning activity 6.10

For this activity, the teacher will give learners an opportunity to observe the provided diagram/picture, allow them to get time to reflect on the provided questions and then give their answers. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

- 1) Intrusive and extrusive vulcanicity. More details refer to student's book
- 2) Refer to students book in the learner's book on intrusive and extrusive features

Possible answers to the application 6.10

- Possible answers refer to the learner's book on Processes of vulcanicity and volcanic materials.

Lesson 11. :Intrusive and extrusive features

a). Pre-requisites/Introduction:

The learners must have covered the content of lesson 11; they should also have mastered the concept of vulcanicity. This intended to introduce the extrusive and intrusive features.

b). Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

c) Activities

c) Learning activity 6.11

In conducting this activity, the teacher will give learners an opportunity to observe critically the provided picture, allow them to get time to reflect on the provided questions and then give their answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

The learners should have understood the content of from unit 3 of senior four. Possible answers are:

- Volcano
- Sill
- Lacolith
- Batholith
- Dyke, etc.

Possible answers to the application activity 6.11

- The learners should show their view by reinforcing their answers rotating on the difference between extrusive and intrusive, but with the help of a diagram.

Lesson 12. :Types of volcanoes and their characteristics

a). Revision/prerequisites In terms of conducting this activity, the teacher has to introduce by asking questions on the previous lesson to recall prerequisites. He/she should allow students to read and reflect on the given questions so that the introduction can be easy.

b). Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

c) Learning activity 6.12

For this activity, the teacher will give learners an opportunity to read the questions attentively and give them time to reflect on them before giving answers. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

Learners are expected to give answers that rotate on the types of volcanoes.

- a) Refer to student's book on types of volcanoes and their characteristics
- b) Refer to student's book on types of volcanoes and their characteristics

Possible answers to application activity 6.12

- a) Active volcanoes: These are volcanoes which constantly eject volcanic lavas, gases, ashes and fragmental materials. Examples are: Nyiragongo and Nyamuragira in DRC.

Dormant volcanoes: These are volcanoes which have been quiet for a long time. However, they still show signs of erupting again or at one given time in the future. Therefore, it is believed that they will at one time suddenly erupt violently and cause huge damage to human, animal and plant life around them.

Extinct volcanoes: Show no signs of future eruptions. A good example is Mount Sabyinyo in Rwanda.

- b) Refer to the learner's book on the classification of volcanoes basing on the nature of eruptions.

Lesson 13: Influence of volcanicity on drainage

a) Introduction/Revision:

In this activity the teacher should give enough time to students to observe carefully the provided photographs/diagrams. The teacher should remember to link lesson 12 and lesson 13. Since the learners have acquired knowledge and skills from the content of lesson 12, it will be easy to introduce the lesson.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

c) Learning activity 6.13

The teacher will give learners an opportunity to observe critically the provided picture, allow them to reflect on the provided questions and then give their answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity:

- 1) Crater lake.
- 2) A crater lake is formed when a crater formed after volcanic eruption, is filled with water. More details refer to students' book on influence of volcanicity on drainage.

Possible answers to the application 6.13

- The teacher should first remind students to draw the sketch map of Rwanda and locate it, volcanic regions. They are expected to show drainage features formed as a result of volcanicity, for instance lava dammed lakes of Burera and Ruhondo.

Lesson 14.: Impact of volcanicity to man

a) Introduction:

The learners are expected to come up with opinions about the physical features formed by volcanicity covered in content of lesson 13 in order to introduce new contents.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

Activities

c) Learning activity 6.14

For this activity, the teacher will give learners an opportunity to read attentively questions and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competencies as

well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity 6.14:

- Refer to student's book under: Impact of volcanicity to the human

Possible answers to the application 6.14

- 1) Refer to students' book on impact of volcanicity to the human.
- 2) role played by volcanicity:
 - a) Volcanoes attract tourists due to its biodiversity (flora and fauna).
 - b) Volcanic soils are the most fertile soil in Rwanda that favour crop growing.
 - c) Lava dammed lakes and waterfalls formed are used in generating Hydro-electric power.

Lesson 15.: World distribution of volcanoes

a) Introduction/Revision.

The learners are expected to have understood the content of lesson 14. They should also have chance to access library and internet.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

Activities

c) Learning activity 6.15

For this activity, the teacher will give learners an opportunity to read attentively the question, allow them to reflect on them and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity 6.15:

- 1) Refer to learner's book on the world distribution of volcanoes.
- 2) Refer to learners book on the world distribution of volcanoes.

Possible answers to the application 6.15

Possible answers refer to students' book on the world distribution of volcanoes

Lesson 16. :Meaning of earthquake and its related concepts

a) Pre-requisite/Introduction:

The teacher should guide learners while reading the provided passage. Learners must have acquired knowledge and skills about earthquake studied in unit 3 of senior four.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

c) Learning activity 6.16.

For this activity, the teacher will give learners an opportunity to read attentively the passage and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers for the learning activity 6.16:

- 1) Refer to learners book on the meaning of earthquake and its related concepts.
- 2) Refer to learners book on meaning of earthquake and its related concepts.
- 3) Refer to learners book on meaning of earthquake and its related concepts.
- 4) Refer to learners book on meaning of earthquake and its related concepts.

Possible answers for the application activity 6.16

- 1) The epicenter of the earthquake of August 2015 and february was in Bukavu at 20 kilometres north of Bukavu, in DRC.
- 2) The magnitude intensity of the 2008 earthquake was 6.1 and 5.0, that of 2015 was 5.8 on Richter scale.

Lesson 17.: Causes, consequences and measures of earthquakes

a) Introduction:

The teacher must guide in observing critically the provided photograph. Learners must have understood the content of lesson 17. They should also have acquired knowledge and skills on the process of earthquakes.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Fieldwork.

c) Learning activity 6.17

For this activity, the teacher will give learners an opportunity to observe critically the provided photograph, give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers for activity 6.17

- 1) Destruction of buildings.
- 2) Earthquake.
- 3) Refer to students' book on causes, consequences and measures of earthquakes.
- 4) Refer to students' book on causes, consequences and measures of earthquakes.

Possible answers to the application 6.17

- a) The region is located in the area of rift valley which is subjected to earthquake.
- b) Refer to learners book on the causes, consequences and measures of earthquakes.
- c) Refer to learners book on the causes, consequences and measures of earthquakes.

Lesson 18: World distribution of earthquakes

a) Prerequisites/Revision/Introduction:

The teacher should guide learners to read carefully the passage provided. Students must have understood the content of lesson 17. The knowledge and skills acquired help learners understand the lesson 18.

b) Teaching resources: During this teaching and learning process, the teacher will refer to the following teaching resources where possible.

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.
- Field work.

c) Learning activity 6.18

For this activity, the teacher will give learners an opportunity to read attentively the passage and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity 6.18:

- 1) Refer to passage in learners book on the world distribution of earthquakes and the passage provided.
- 2) Refer to learners book on the colourworld distribution of earthquakes.

Possible answers to the application 6.18

Possible answers, refer to learner's book on world distribution of earthquakes.

7. Summary of the unit

Unit 6 of senior 5 deals with internal processes leading to the formation of landforms. The content of this unit describes the processes of faulting, folding, warping, vulcanicity, and earthquake, and how those processes influence the landscape and drainage system. This unit content gives more details about the relationship between the man and landforms produced by the mentioned internal processes.

8. Additional information

There is no much additional information the teacher needs. However, the writers wish to bring to the attention of the teacher teaching this unit to emphasize the following: The landforms resulted from faulting, folding, warping and vulcanicity in the world with case studies found in Rwanda. For instance; volcanic region of North Western Rwanda, Western faulted region of Rwanda and the central plateaus as folded region for more clarification.

The teacher is requested to help and motivate learners to make more research via internet, field works on areas affected by certain internal processes for instance visiting Nyamyumba hot spring, volcanoes, etc and even library visiting.

9. End unit assessment

However the learners should give their opinions/views or self constructed answers. Their answers will rotate around the content in reference with the following possible answers for end unit assessment:

1. The impact of faulted landforms on the East African landscape and drainage where faulting has led to formation of different landforms and drainage features.
 - Faulting led to formation of Rift valley: This is a trough or hollow/depression (graben) which may result from both tensional and compressional forces. This formed when two faults developed in the regions of Western Rwanda and Uganda where Lake Kivu, George, Albert an Eduard are located.
 - Faulting in East Africa led to the formation of block mountains which are uplands bordered by fault scarps on both sides (the block of land between two faults being uplifted because of compressional forces and tension). Such mountains include Muzimu in Western Rwanda.
 - Faulting in East Africa led to the formation of fault step landscape/tilt block landscape which is formed when vertical tectonic forces push a block of land upwards. Sometimes these forces may push some parts of the middle block higher than others due to uneven forces and this results into horst titled landscape formed by several faults carps (step faults) due to differential uplift, typical examples are found in Kenya.
 - Faulting led to river reversal (change of direction). The typical example include; river Nyabarongo in Rwanda which used to flow Northwards and changed the

direction to flow Eastwards and Akagera river to Lake Victoria in East Africa

- Most of times water passes through the valleys, depressions and fractured areas hence forming fault guided valleys. A good example is River Rusizi in western Rwanda.
- Some of the waterfalls are located in faulted areas eg: Rusizi, Mururu, Kamiranzovu water falls in Rwanda and Mubuku water fall in south western part of Uganda.
- Faults give rise to the underground water table along fault planes. The typical examples are: Mwiyanike, Nyamyumba in Rwanda.

2. The significance of folded relief features in the socio-economic development of any country can be explained as follow:

- Firstly, fold mountains receive heavy rainfall on the windward side hence favoring crop growing while the leeward side receives little or no rainfall only to be utilized in favour of livestock keeping on the windward side.
- Again, fold mountains are a source of clean water, which is used by human beings for either domestic or industrial purposes.
- The fold mountainous areas can be used for lumbering activities; where forests have been grown.
- During folding, some valuable minerals are brought closer to the earth's surface. This promotes mining activities. However, in some instances; minerals can be taken deeper into the ground and become hard to exploit.
- Some features resulting from folding attract tourists who support foreign exchange.
- The foehn winds, common in fold mountain areas, destroy crops. Hence, hindering agriculture in folded areas.
- Fold mountains are barriers to the development of transport and communication lines.
- They hinder air transport due to poor visibility.
- The steep and rugged slopes of fold mountains discourage settlements, agriculture, and livestock keeping.

3. Possible answers include:

The process of warping has a considerable significance to the development of drainage system of Africa in the following ways:

- Some rivers change their courses due to warping in a given area. A good example is the case of hydrography of East Africa where some rivers changed direction and other filled depressions to form lakes.
- Warping led to the formation of many lakes in East Africa. Good examples include: Lake Victoria and Lake Kyoga in Uganda, Lake Muhazi and Mugesera in Rwanda.
- Some of the waterfalls are located on the upward warped areas.
- The drainage of Rwanda flows from west to east from the warped features of Rwanda.

4. Volcanicity has led to the formation of various landforms to the landscape of East Africa.

- The major landforms include the volcanoes, lava plateaus, lava plains, lava dammed lakes, crater and caldera, crater lakes and caldera lakes, hot spring, fumeroles and geysers. The above features can be seen in around Mt.Kenya, around Birunga Mountain, around Kilimanjaro etc. On the other hand, not only volcanicity that led to its current landscape but also folding, faulting and warping played a considerable role in the formation of East African scenery.

5. The learners are expected to come up with clear explanations on the negative effects of earthquakes/Tsunami in Japan or in Haiti. Possible answers include:

- Tsunami/earthquake led to loss: of life and destruction of property that happens when violent shaking of the land causes cracks on walls which makes the buildings to collapse. The rehabilitation of the destroyed properties results into high expenditure incurred by governments.
- Tsunami/earthquake led to outbreaks of fires. Such occur when the earthquake destroys oil and gas pipelines and this led to imbalance of economy of countries.
- Tsunami/earthquake led to huge sea waves, which are very destructive. Their occurrence has disturbed the economic development of the affected countries and the rest of the world.
- Tsunami/earthquake cause landslides which are sudden movements of large masses of rock and soil downhill which results into decline of agriculture.
- Tsunami/earthquake has caused displacement of crustal rocks. This takes place vertically or laterally, leading to damaged transport and communication lines such as roads, railways and other infrastructure.

6. Possible answers:

- Mass education on the importance of wetlands and lakes.
- Restriction laws on swamp reclamation.
- Terracing to reduce siltation/sedimentation of lakes.
- Family planning.
- Reduce water pollution (led by dumping wastes,...)

10. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial activities. They are rephrased in a way that the slow learners can also be assisted to raise their self-confidence and at the same time learn in the simplest possible way.

Questions	Possible answers
1 .Distinguish between internal processes and external processes.	Refer to students' book on internal and external processes.
2 .Identify the internal processes responsible for relief formation in Rwanda.	Refer to students' book on internal processes.
3 .Locate the area in Rwanda affected by faulting?	Refer to students' book on faulting
4. Locate the area in Rwanda affected by volcanicity.	Refer to students' book on volcanicity.
5 .Locate the area in Rwanda affected by folding.	Refer to students' book on folding
6. Locate the area in Rwanda affected by warping.	Refer to students' book on warping.
7 .Locate the area in Rwanda affected by earthquakes.	Refer to students' book on earthquakes
8 .What are the impacts of faulted relief and drainage features to man.	Refer to students' book on impacts of faulted relief and drainage features on man.

d. Consolidation activities:

Questions	Possible answers
1) Describe the negative and positive effects of faulting East Africa.	<p>Positive effects:</p> <p>Rift valley lake attract tourists, favour fishing, favour transport ,favour mining and provide water for domestic and industrial purposes.</p> <p>Block mountains and rift valleys favour communication and agriculture.</p> <p>Negative effects:</p> <p>Rift valley lakes and fault guided valley are associated with accidents while block mountains hinder transport development.</p>
2) Explain the measures that can be taken to control negative effects of earthquakes	<p>Construct strong resistant houses, live far away the area prone or subjected to earthquake such as volcanic regions.</p> <p>Make deep research on the prediction of earthquake occurrence.</p>

<p>3) Identify the relationship between volcanicity and human activities.</p>	<p>Volcanic features may determine the human activities likely to take place in a region where they are found. For instance due to its associated fertile soils, crop cultivation is dominant.</p> <p>Lava dammed lakes stimulate the development of fishing and water transport.</p> <p>Some volcanic features are</p>
	<p>associated with minerals hence favouring mining.</p> <p>Some volcanic features provide material for construction</p>
<p>4) On a sketch map of East Africa label mark the areas affected by faulting with illustrated example.</p>	<p>Some volcanic features are homelands for animals that attract tourist.</p> <p>On the other hand, volcanic features are associated with accidents, habitant of dangerous animals that are harmful to human beings.</p> <p>The map should show the faulted features in the Eastern (arm lake Manyara, Eyasi, Turkana,...)and the western arm (lake Kivu, Tanganyika, Eduard, George and Albert).</p>

d) Extended activities:

1. Conduct deep research on the effects of Eartquake in Haiti in 2010.

Possible answers:

After research, the talented learners are requested to explain their answers with their own well rephrased sentences. Possible answers include:

The earthquake in Haiti took place at 16:53 local time on Tuesday, 12 January 2010, with magnitude of 7.0 Mw earthquake, with an epicenter near the town of Léogâne, approximately 25 kilometres (16 mi) west of Port-au-Prince, Haiti’s capital.

The earthquake was associated with different negative effects a follows:

Death of people (loss of lives) where an estimated three million people were affected by the Earthquake. According to haitian government Death toll estimates range 220,000 to 316,000 but these have been widely characterized as deliberately inflated by the Haitian government. the possible real estimate range from 100,000 to about 160,000.

Property destruction: The government of Haiti estimated that 250,000 residences and 30,000 commercial buildings had collapsed or were severely damaged.

Increase of government's expenditure: The nation's history of national debt, prejudicial trade policies by other countries, and foreign intervention in national affairs, contributed to the existing poverty and poor housing conditions that increased the death toll from the disaster. The earthquake caused major damage in Port-au-Prince, Jacmel and other cities in the region. Notable landmark buildings were significantly damaged or destroyed, including the Presidential Palace, the National Assembly building, the Port-au-Prince Cathedral, and the main jail. Among those killed were Archbishop of Port-au-Prince Joseph Serge Miot, and opposition leader Micha Gaillard. The headquarters of the United Nations Stabilization Mission in Haiti (MINUSTAH), located in the capital, collapsed, killing many, including the Mission's Chief, Hédi Annabi.

Forced migration: People in the areas affected by that earthquake were forced to move from their areas to the neighbouring regions and countries to look for shelter and other primary needs.

Economic decline and poverty associated with the destruction of properties occurred just after this earthquakes. However, the rehabilitation has been done by the Government, other partners, and the international community.

1. Key unit competence:

To be able to investigate the different constituents and morphological properties of soil.

2. Prerequisite/introduction

The learners are expected to have mastered the content of unit 7 of S1, unit 8 of S2, unit 3 of S3 and unit 5 of S4, where they studied the soils. These units of senior one, senior two, senior three and four greatly provide strong foundation that learners can use to understand better the content of this unit 7 of senior five. It's very important to note that, they already have necessary knowledge, skills and attitudes. The difference is that, at this level the content in the students' book is more detailed and almost differ from what they learnt previously. The already acquired knowledge, skills, attitudes and values from previous classes, should be used by the teacher to conduct diagnostic assessment as a way of evaluating each learner's abilities.

3. Cross-cutting issues to be addressed:

There are many cross-cutting issues that can be applied in this lesson. In the learners' book, the writers or authors used activities to integrate the crossing-cutting issues. The most highlighted is that of environment and sustainability.

Even though, the writers used few cross-cutting issues, this should not limit to the creativity and innovativeness of the teacher. The activities used were just a sample. This calls for the teacher to take note of the cross-cutting issues that he or she is interested in. What is important to note, is that many cross-cutting issues can be applied where possible depending on occasion, for example:

a) Environment and sustainability can be integrated in some learning activities where the aspects related to the soil fertility are addressed. Thus the teacher will be required to reinforce the factors affecting soil fertility. Hence, developing the cross-cutting issue known as environmental and sustainability. This cross-cutting issue will be integrated in lesson two: morphological properties, profile and catena, fertility of the soil

b) Financial Education can be integrated in learning activities when studying the relationship between soil fertility and human activities. For example, the teacher can remind his /her student using typical examples on how soil fertility can help students to practice small agriculture like growing fruits and vegetables on small pieces of lands. Thus, this can generate income/money.

c) Inclusive education can be integrated in classroom situation where teacher pays attention on learners with special needs such as learners with physical disabilities, hearing disabilities or communication difficulties and visual impairment.

For the learners with physical disabilities, the teacher will refer to video clip, or bringing some samples in classroom. For learners with hearing disabilities or communication difficulties, in different learning activities the teacher will use enough illustrations, diagrams and sign languages where possible. For learners with visual impairment, the teacher will help children to use their other senses like hearing and touch because these senses can help them to play and carry out some of learning activities thus, promoting their learning and development. This cross-cutting issue can be integrated in all lessons.

4. Guidance on the introductory activity:

The teacher has to allow students to read critically the passage provided related to introductory activity and try to give answers to the questions about the passage. Answers to questions are supposed to be provided by students. Students may not be able to find the right answers but they are invited to predict possible answers. In case the learners fail to come up with right answers to questions related to the given passage, the teacher may not immediately provide the possible answers but he/she should allow learners to discover themselves the right answers through the learning and teaching process.

Possible answers to introductory activity 7.1

For question (i) the answers include:

- Inorganic material.
- Organic matter or humus.
- Soil water and moisture.
- Soil air.
- Biological system of living organisms and bacteria.

For question (ii) possible answers are found in students' book on morphological properties, profile and catena, fertility of soil.

The possible answer for question (iii) is: soil fertility. Soil fertility is the ability of a soil to support plant growth. A fertile soil, therefore, is rich in nutrients that plants use to grow.

5. List of lessons

S/N	Lesson title	Learning objectives (Knowledge, Skills and Attitudes)	Number of periods
1.	7.1. Soil constituents	<ul style="list-style-type: none"> -State the constituents of soil. -Investigate the constituents of soil. -Appreciate the importance of soil constituents. 	1
2.	7.2. Morphological properties, profile and catena, fertility of the soil	<ul style="list-style-type: none"> -Outline the different morphological properties of soil. -Describe the properties of soil. -Arrange and categorize soils according to their morphological properties. -Appreciate the importance of morphological Properties of soil. 	5
3.	End unit assessment		1
	TOTAL		7

6. Guidance on different lessons

The above table highlights all the created lessons relating to the unit content. There are 2 lessons developed from the content of unit 7 with unevenly distributed period depending on its content.

Lesson 1: Soil constituents

a) Prerequisites/Introduction:

The Activity 7.1 tends to introduce the lesson 1. The activity 7.1 also requests learners to recall the knowledge and skills gained from previous lessons of senior one, two, three and four. This will enable learners to follow the lesson by linking it to what they have learnt in previous classes.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.
- Field work to the surrounding area.

c) Learning activity 7.1

For this activity, the teacher will give learners an opportunity to read attentively the question on soil constituents, and give them time to reflect on the provided questions. Then the teacher will let them give answers. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activity 7.1

- a. For the definition of soil please refer to student's book on soil constituents
- b. Constituents/components of soil refer to students' book on soil constituents
- c. The pie-chart is in students' book on soil constituents

Possible answers to application activity 7.1

- The constituents of the soil that students will find out after carrying out a tour around their schools will differ from one school surrounding to another since all of the school surroundings do not have the same soil constituents .
- For this question students will be required to observe carefully their school surroundings and verify whether the soil found there may contain the soil components like inorganic material, organic matter or humus, soil water and moisture, soil air, biological system of living organisms and bacteria.

Lesson 2: Morphological properties, profile and catena, fertility of the soil

a) Prerequisite/Introduction:

There is direct link between activity 7.2 and lesson one therefore the teacher has to introduce the lesson 2.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.
- Field work to the surrounding area.

c) Learning activity 7.2

For this activity, the teacher will give learners an opportunity to observe critically the different figures and photos and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers

1)(i) Soil structure=A, (ii) Soil texture=B, (iii) Soil colour=E, (iv) Soil profile=None, (v) Soil Catena=C, (vi) Soil porosity=F.

2). Refer to the students' book on the explanations associated with soil profile and soil catena, lesson two: Morphological properties, profile and catena, fertility of the soil.

3). Refer to the students' book on the explanations associated with soil structure and soil texture, lesson two (2): Morphological properties, profile and catena, fertility of the soil.

Possible answers to Application Activity 7.2

1. a) The learners are expected to give a wide range of answers, but all answers should rotate around soil porosity of sand soil in Eastern Rwanda and porosity of clay soil in Northern Rwanda.

b) The learners are expected first of all to provide the meaning of soil porosity which refers to the number of pore spaces in the soil and apply this definition to the context of sand soil in Eastern Rwanda and clay soil in Northern Rwanda. Therefore, in different explanations of students there will be the need of this answer: The clay soil in Northern Rwanda is non-porous, since it is made up of small soil particles while the sand soil in Eastern Rwanda is porous, because it is made up of large soil particles.

2. For this question the students will verify if the factors influencing soil fertility learnt in classroom setting are applicable in their region. For more details please refer to student's book on factors affecting soil fertility.

7. Summary of the unit

The unit 7 of senior 5 deals with soils. The key points of content to be highlighted in the unit are the soil constituents, morphological properties of soil, soil profile and catena, soil fertility as well as the factors affecting soil fertility. This unit content gives more details about the soil constituents, morphological properties of soil and factors affecting soil fertility.

8. Additional Information

Concerning with additional content for the teacher to have a deeper understanding of the topic, there is no much additional information the teacher needs while delivering different lessons associated with the unit 7. This is so, because students have got sufficient information related to soils in the previous classes (S1, 2, 3 and 4). However, the writers wish to bring to the attention of the teacher while teaching this unit to emphasize the following: Soil constituents with reference to the classroom surroundings, morphological properties of soil with reference to soils which are nearby their school settings, soil profile and soil catena referring to the case of their school surroundings and factors affecting soil fertility referring to the case of their local environments.

The teacher is requested to help and motivate learners to make more research via internet, field works to different areas within and out of their school environments, for instance visiting school garden and make analysis of different soil constituents as well as morphological properties of the soil that is found there.

However the learners should give their own opinion/view or self constructed answers,

9. End of unit assessment

Possible answers to End unit assessment

The learners should give their own opinion/view or self constructed answers, their answers will rotate to the content in reference with the following possible answers:

- a) Student will conduct a trip around their school and collect soil samples then they will study them in order to identify their constituents. The students will verify if the soil samples collected have all the soil constituents studied in classroom.
- b) Refer to students' book on soil catena
- c) Refer to students' book on soil structure, soil texture, soil colour and soil pH

10. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial activities (activities for slow learners). They are rephrased in a way that the slow learners can also be assisted to raise their self-confidence and at the same time learn in the simplest possible way.

Questions	Possible answers
1. Identify the main soil constituents.	Refer to students' book on soil constituents.
2. Differentiate soil structure from soil texture.	Refer to students' book on soil texture and soil structure.
3. Differentiate soil catena from soil profile.	Refer to students' book on soil profile and soil catena.
4. What do you understand by soil porosity?	Refer to students' book on soil porosity.
5. Differentiate soil permeability from soil salinity.	Refer to students' book on soil permeability and soil salinity.

b) Consolidation activities:

The following are suggested questions for deep development of competences.

	Possible answers
1. Establish the link between soil permeability and soil fertility.	The students will first of all define the concepts of soil permeability and that of soil fertility. After defining the two concepts, the student will be supposed to come up with the link between soil permeability and soil fertility by saying that permeable soils allow water to pass through them and therefore are much more fertile than non-permeable soils
Collect soils from different parts of the school compound, observe and describe the samples collected in order to determine : Soil colour and Soil texture	The answers for this question will largely depend upon the soil samples that will be collected. This means that one answer may differ from another one as a result of soil samples collected and observed. But in all their answers should rotate around the real meaning of soil colour as well as soil texture.

c) Extended activities:

The following is suggested question for gifted and talented students.

Distinguish soil of lowland from that of highland in terms of :(i) Soil moisture; (ii) Soil porosity

Possible answers:

Before coming up with answers to this question, students should first of all define what is all about soil moisture as well as soil porosity. The definitions associated with the key terms are very important since they help the students to understand and distinguish soil of lowland from that of highland in terms of soil moisture and soil porosity. The students may say that in terms of soil moisture, the soil of lowlands contain much water than soil of highlands because the lowlands contain clay soils which keep water for long. On the other side the soils of highlands do not contain much water since they experience sandy soils which allow water to pass easily. They are well drained.

When it comes to distinguish soil of lowlands from that of highlands in terms of soil porosity, students may say that the soils of lowlands are non-porous because they have small pores (pore space occupied by water is small) on the other hand the soils of highlands are porous, because they have large pores (pore space occupied by water is large).



UNIT 8: WEATHER AND CLIMATE OF THE WORLD

8

1. Key unit competence:

The learner should be able to appreciate the importance of the atmosphere, weather and the impact of climate on the environment and human activities in the world.

2. Prerequisite/introduction

The learners are expected to have mastered the content of unit 8 in S1, unit 9 in S2, unit 4 in S3 and unit 6 in S4, where they studied weather and climate. These units of senior one, senior two, senior three and four greatly provide strong foundation that learners can use to understand better the content of this unit 8 of senior five. It is very important to note that, they already have necessary knowledge, skills and attitudes. The difference is that, at this level the content in the students' book is more detailed and almost differ from what they learnt previously.

3. Cross-cutting issues to be addressed:

There are many cross-cutting issues that can be applied in this lesson. In the learners' book, the writers or authors used activities to integrate the crossing-cutting issues. The most highlighted is that of environment and sustainability.

Even though, the writers used few cross-cutting issues, this should not limit the creativity and innovation of the teacher. The activities used were just a sample. This calls for the teacher to take note of the cross-cutting issues that he or she is interested in. What is important to note, is that many cross-cutting issues can be applied where possible depending on the occasion, for example:

a) Environment and sustainability can be integrated in some learning activities where the aspects related to the conservation of atmosphere can be referred to.

b) Financial Education can be integrated in learning activities when studying the relationship between climate and human activities. For example the teacher can remind his /her student using typical examples on how good climate can help them to practice small scale livestock farming on small pieces of lands. Thus, this can generate income/ money.

c) Inclusive education can be integrated in classroom situation where the teacher pays attention on learners with special needs such as learners with physical disabilities, hearing disabilities or communication difficulties and visual impairment. For the learners with physical disabilities, the teacher will refer to video clip, or bringing some samples in classroom. For learners with hearing disabilities or communication difficulties, in different learning activities the teacher will use enough illustrations, diagrams and sign languages where possible. For learners with visual impairment, the teacher will help children to use their other senses like hearing and touch because these senses can help them to play and carry out some of learning activities thus promoting their learning and development. This cross-cutting issue can be integrated in all lessons.

4. Guidance on the introductory activity:

The teacher has to allow students to read critically the passage provided related to the introductory activity and try to give answers to the questions about the passage. Answers to questions are supposed to be provided by students. Students may not be able to find the right answers but they are invited to predict possible answers. In case the learners fail to come up with right answers to questions related to the given passage, the teacher may not immediately provide the possible answers but he/she should allow learners to discover the right answers on their own through the learning and teaching process.

Possible answers for introductory activity 8.1

1. For the answers related to question 1 refer to learner's book.
2. For the answers related to question 2 please refer to learner's book.
3. For the answers related to question 3 please refer to learner's book.

5. List of lessons

S/N	Lesson titles	Learning objectives(Knowledge, Skills and Attitudes)	Number of periods
1	8.1.Atmosphere: definition and the structure of the atmosphere	<ul style="list-style-type: none"> - Define the atmosphere. - State the layers of the atmosphere. - Define the structure of the atmosphere. - Identify the importance of the atmosphere. - Identify the composition of the atmosphere. - Infer the influence of the layers of the atmosphere to the changes in the atmosphere’s conditions. 	3
2	8.2.Elements of Weather and climate	<ul style="list-style-type: none"> - Define the concept of weather and climate and identify their elements. - Define temperature. - Outline the factors for the variation of temperature of a place. - Measure and record the temperature. - Define the concept of precipitation and rainfall. - Define water cycle. - State the types of rainfall. - Outline the factors for the rainfall formation. - Measure and record the rainfall. - Define the concept of winds. - Measure and record the wind speed, the strength and the direction. - Identify the factors influencing the nature and the movement of the winds. 	14

- Give the influence of winds on weather conditions and on the human activities.
- Define air masses and state their characteristics, formation and the effects.
- Give the meaning of cyclones, anti-cyclones and outline their characteristics.
- Outline the effects of cyclones and anti-cyclones on the environment.
- Define the concept of humidity.
- Identify the major types of humidity.
- Outline the factors influencing the humidity and state its significance to the environment.
- Identify the major types of clouds and outline their characteristics and the factors for their formation.
- State the effects of the clouds on the weather.
- Define the concept of sunshine.
- State the factors influencing the amount of solar radiation and its influence on the environment.
- Define the concept of the atmospheric pressure.
- Outline the factors influencing the distribution of atmospheric pressure.
- Name different world pressure belts.
- Differentiate weather from climate and identify the weather elements.
- Examine the factors responsible for temperature variation of a place.

- Describe the measurement and recording of temperature.
- Describe the forms of precipitation.
- Explain the process of water cycle.
- Illustrate and explain the formation of the different types of rainfall.
- Describe the factors influencing rainfall formation. Describe the measurement and the recording of rainfall.
- Explain the concept of winds.
- Illustrate the measurement and recording of winds. Explain the factors influencing the nature and the movement of winds.
- Describe the major types of winds and their characteristics.
- Explain the influence of the winds on the weather conditions and on the human activities.
- Describe the major types of air masses, their characteristics, formation and the effects.
- Compare the different types of cyclones, anti-cyclones and describe their characteristics.
- Demonstrate the measurement and recording of humidity
- Explain the factors influencing the humidity and clarify its significance to the environment.
- Describe the different types of clouds and the factors influencing their formation.

- Explain the effects of the clouds on weather.
- Demonstrate the measurement and recording of sunshine.
- Describe the factors influencing the amount of solar radiation and its effects on the environment.
- Illustrate the measurement and the recording of atmospheric pressure.
- Describe the factors influencing the distribution of atmospheric pressure.
- Locate the major pressure zones of the world.
- Appreciate the importance of the weather elements on the human activities.
- Show the continual desire to interpret the weather conditions based on the knowledge acquired from the topic of the weather and the climate.

3	8.3.Factors that influence World climate	- List the factors that influence the world climates. - Explain the factors influencing the climate of the world	1
4	8.4.Types of climate and their characteristics	-Name the major climatic zones of the world and outline the characteristics of each zone. -Locate the major climatic zones on the world map and describe the characteristics of each climatic zone.	1
5	8.4.Types of climate and their characteristics	--State the influence of climate on human activities. - Explain the influence of the climate on the human activities. -Show concern for the causes and the effects of climate change and the desire to preserve or retain the stability of the atmosphere.	1
6	End unit assessment		1
	TATAL		21

6. Guidance on different lessons

The above table highlights all the created lessons relating to the unit content. There are 5 lessons developed from the content of unit 8 with unevenly distributed period depending on its content.

Lesson 1: Atmosphere: Definition and structure of atmosphere

Prerequisites/Introduction

The Activity 8.1 tends to introduce the lesson 1. The activity 8.1 also requests learners to recall the knowledge and skills gained from previous lessons of senior one, two, three and four. This will enable learners to follow the lesson by linking it to what they have learnt in previous classes.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.

- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.
- Field work to the surrounding area.

c) Learning Activity 8.1

For this activity, the teacher will give learners an opportunity to observe critically the figure and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Application Activity 8.1

Possible answers

- For answers related to question a please refer to students' book on atmosphere: its definition and structure
- For answers related to question b please refer to students' book on atmosphere: its definition and structure
- For answers related to question c please refer to students' book on atmosphere: its definition and structure

Lesson 2: Elements of Weather and climate

a) Prerequisite/Introduction:

The teacher will be required to introduce the lesson 2.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.

- Internet.
- Maps.
- Field work to the surrounding area.

Learning Activity 8.2

For this activity, the teacher will give learners an opportunity to observe critically the figure and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2

1. For answers related to question 1 please refer to student's book on elements of weather and climate.
2. For answers related to question 2 please refer to student's book on elements of weather and climate.

Learning activity 8.2.1

For this activity, the teacher will give learners an opportunity to read critically the context/passage and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2.1

1. Climate conditions.
2. Temperature.
3. For answers related to question 3, please refer to the students' book on elements of weather and climate.

Learning activity 8.2.2

For this activity, the teacher will give learners an opportunity to read critically the figure and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2.2

1. The possible answers are: rain, snow, sleet and hail.
2. For answers related to question 2, please refer to student's book on elements of weather and climate.

Learning activity 8.2.3

For this activity, the teacher will give learners an opportunity to observe critically the photo and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2.3

1. Wind blowing.
2. For answers related to question 2, please refer to students' book on factors influencing the nature and movement of winds.
3. For answers related to question 3, please refer to the students' book on instruments used to measure the direction and speed of wind.

Learning activity 8.2.4

For this activity, the teacher will give learners an opportunity to observe critically the given figure and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activity 8.2.4

1. For answers related to question 1, please refer to the learner's book on types of atmospheric humidity.
2. For answers related to question 2, please refer to the learner's book on significance of humidity to the environment.

Learning activity 8.2.5

For this activity, the teacher will give learners an opportunity to read critically the given passage and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2.5

1. The different types of clouds are responsible for the occurrence of different colours that arise in the horizon of the sky.
2. For answers related to question 2, please refer to students' book on effects of clouds on weather.

Learning activity 8.2.6

For this activity, the teacher will give learners an opportunity to observe critically the given figure and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2.6

1. The sun, Earth and sunshine
2. For answers related to question 2, please refer to learner's book on factors influencing the amount of solar radiation.
3. For answers related to question 3, please refer to learner's book on influence of sunshine on the environment.

Learning activity 8.2.7

For this activity, the teacher will give learners an opportunity to observe critically the given figure and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.2.7

1. There is a man exerting pressure using a straw and the atmosphere is also exerting its pressure on the same liquid in a container.
2. The pressure in straw is less than atmospheric pressure.
3. For answers related to question 3, please refer to the learner's book: under the factors influencing the distribution of atmospheric pressure

Application Activity 8.2

Possible answers to application activity 8.2:

1.
 - (a) June.
 - (b) August.
 - (c) Total annual rainfall = 1,101 mm.
 - (d) Annual temperature mean = 28.8°C ; $12 = 24^{\circ}\text{C}$
 - (e) The graph portraying the data given (temperature and rainfall data): The students may draw a combined line/curve (line for temperature) and bar graph (rainfall graph) referring to knowledge and skills gained from the previous studies such as the lesson on how to construct simple line and curve graphs and the simple bar graphs.
2. For being aware of the total rainfall received in the area around the school, the students are supposed to visit a weather station nearby their school.
3. The teacher will request his/her students to walk around their school and observe the way the wind is blowing by the movement of tree branches, then basing on that, they will describe the direction in which the wind is blowing.

Lesson 3: Factors that influence World climate

a) Prerequisite/Introduction:

The Activity 8.3 tends to introduce the lesson 3. The activity 8.3 also requests learners to recall the knowledge and skills gained from previous lessons of senior one, two, three, and four. This will enable learners to follow the lesson by linking it to what they have learnt in previous classes.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.

- Text books.
- Internet.
- Maps.
- Field work to the surrounding area.

c) Learning activities

Learning activity 8.3

For this activity, the teacher will give learners an opportunity to read critically the given question and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.3

- a. For answers related to question a please refer to learner's book: Under the factors influencing the world climate.
- b. For answers related to question b please refer to learner's book: Under the factors influencing the world climate.
- c. For answers related to question c please refer to learner's book: Under the factors influencing the world climate.

Application Activity 8.3

Possible answers to application activity 8.3

The students on one side are supposed to establish the link between the physical factors (Latitude, altitude, water bodies, vegetation, ocean currents and aspect) and climate of Rwanda. They have to show if the mentioned factors are applicable in Rwandan context.

On the other side, the same students have to establish the link between human factors (Pollution from industries, Chemicals released into the atmosphere, cutting down of forests/deforestation, over cultivation, overgrazing, land reclamation and construction) and climate of Rwanda. They also have to show whether the identified human factors are applicable in Rwandan context.

Lesson 4: Types of climate and their characteristics

a) Prerequisite/Introduction:

The Activity 8.4 tends to introduce the lesson 4. The activity 8.4 also requests learners to recall the knowledge and skills gained from previous lessons of senior one, two, three and four. This will enable learners to follow the lesson by linking it to what they have learnt in previous classes.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.
- Field work to the surrounding area.

Learning activity 8.4

For this activity, the teacher will give learners an opportunity to observe critically the given maps and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.4

The types of climates shown by Q is Tundra climate. The type of climate shown by P is Equatorial climate. The types of climates shown by X is Mediterranean climate.

Application Activity 8.4

Possible answers to application activity 8.4

The teacher will guide the students so that they can draw a world sketch map then after they will be guided on how to mark and label the world climatic zones.

The teacher will guide the students on how to describe the characteristics of each climatic zone shown on that world sketched map already drawn.

Lesson 5: Influence of climate on human activities

a) Prerequisite/Introduction:

The Activity 8.5 tends to introduce the lesson 5. The activity 8.5 also requests learners to recall the knowledge and skills gained from previous lessons of senior one, two, three and four. This will enable learners to follow the lesson by linking it to what they have learnt in previous classes.

b) Teaching resources:

During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

- Diagrams.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.
- Field work to the surrounding area.

c) Learning activities

Learning activity 8.5

For this activity, the teacher will give learners an opportunity to read critically the given passage and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 8.5

The teacher will refer to relationship between climate and human activities and guide the students on how they can explain how those crops grown are influenced by climatic condition in each part.

Application Activity 8.5

Possible answers to learning activity 8.5

The teacher will guide the students on how to discuss about the given statement.

7. Summary of the unit

The unit 8 of senior 5 deals with Weather and Climate of the World. The key points of content to be highlighted in the unit are the atmosphere: definition and the structure of atmosphere, elements of weather and climate, factors that influence world climate, types of climate and their characteristics and influence of climate on human activities.

8. Additional Information

Concerning with additional content for the teacher to have a deeper understanding of the topic, there is no much additional information the teacher needs while delivering different lessons associated with the unit 8 since the students have got sufficient information related to weather and climate in the previous classes (S1, 2, 3 and 4). However, the writers wish to bring to the attention of the teacher while teaching this unit to emphasize the following: The definition and the structure of atmosphere, elements of weather and climate, factors that influence the world climate, types of climate and their characteristics and influence of climate on human activities.

The teacher is requested to help and motivate learners to make more research via internet, field works to different areas within and out of their school environments, for instance visiting a weather station which is nearby their school environment.

9. End unit assessment

However the learners should give their own opinions/views or self constructed answers, their answers will rotate on the content in reference with the following possible answers for end unit assessment:

Possible answers:

- 1) For answers related to question one, please refer to student's book on structure of atmosphere
- 2) For answers related to question two, please refer to student's book on the structure of atmosphere
- 3) The teacher will remind his/her students to visit a weather station nearby their schools and then, after reaching that weather station they will identify the instruments used to measure and record weather conditions.
- 4) (a) The teacher will guide his /her students on how to describe briefly the characteristics of Rwandan climate referring to knowledge and skills gained from the previous lessons.

(b) The teacher will guide his /her students on how to explain the factors influencing the climate of Rwanda referring to knowledge and skills gained from the previous lessons.

5. The teacher will guide the students on how to support the given statement. But the teacher has to remind his/her students that while supporting the given statement they have to refer to the previous lesson about the influence of climate on human activities.

10. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial activities (activities for slow learners). They are rephrased in a way that the slow learners can also be assisted to raise their self-confidence and at the same time learn in the simplest possible way.

Questions	Possible answers
Identify the instrument used to record the day temperature.	Refer to the learner's book on instruments of weather and climate.
Differentiate rain gauge from hygrometer.	Refer to the learner's book on instruments of weather and climate.
Differentiate weather and climate.	Refer to the learner's book on difference between weather and climate.
Identify the factors influencing the world climate.	Refer to the learner's book on factors influencing the world climate.
Identify the main factors influencing the temperature variation of a place.	Refer to the learner's book on factors influencing temperature variation of a place.

c) Consolidation activities:

The following are suggested question for deep development of competences.

Question	Possible answer
1. Describe the factors influencing the amount of solar radiation and its effect on the environment.	Please refer to the students' book on factors influencing the amount of solar radiation and its effect on the environment.

d) Extended activities:

The following is a suggested question for gifted and talented students:

Explain the factors influencing the humidity and clarify its significance to the environment.

Possible answers:

Please refer to the students' book on factors influencing humidity and its significance to the environment.

UNIT 9: NATURAL VEGETATION OF THE WORLD

9

1. Key unit competence:

The learner should be able to appreciate the distribution of different types of vegetation in the World.

2. Prerequisite/introduction

The learners are expected to have mastered the content of Unit 7 of S4, where they studied the vegetation in Rwanda. This unit of senior four greatly provides a strong foundation that learners can use to understand better the content of this unit 9 of senior five. It is very important to note that, they already have the necessary knowledge, skills and attitudes. The difference is that, at this level the content is more detailed and goes beyond Rwanda to the natural vegetation of the World

The teacher should conduct diagnostic assessment as a way of evaluating each learner's abilities. They (Learners) should use the already acquired knowledge, skills, attitudes and values from previous classes. The teacher should refer to knowledge, skills, attitudes and values associated with vegetation that learners acquired from the previous classes with the aim of establishing connections between the new learning activities and the previous ones.

3. Cross-cutting issues to be addressed:

There are some cross-cutting issues which can be applied in the lesson. In the learners' book, the writers or authors used activities to integrate the cross-cutting issues. The most emphasized are that of environment and sustainability and inclusive education.

Even though the writers used few cross-cutting issues in his / her activities, it does not limit to the creativity and innovativeness of the teacher. The activities used were just an example. This calls for the teacher to take note of the cross-cutting issues that he or she is interested in. What is important to note, is that many cross-cutting issues can be applied where possible depending on occasion.

- a) **Environment and sustainability** can be integrated in some learning activities where the questions related to why it is important to conserve natural vegetation and how it can be preserved/conserved are addressed. Thus, the cross-cutting issue of environmental and sustainability is developed.

- b) **Inclusive education** can be introduced during the class situation for example if the teacher wants her/his students to make a field study outside classroom.

With the purpose of observing natural vegetation the teacher will consider the learners with physical disabilities and react accordingly by choosing appropriate methodology, which may help those learners with special disabilities to cope with the situation. Nevertheless, the teacher can use video containing different images or photographs of different vegetation.

The teacher can even bring different types of vegetation in the classroom setting for those who will not be able to go outside for fieldwork. For instance; learners with hearing disabilities or communication difficulties in different learning activities the teacher will help them by using enough illustrations, diagrams, sign languages, and gestures where possible.

For instance, learners with visual impairment, the teacher will be able to help them to use varieties of senses like hearing and touch because these senses can help them to play and carry out some of learning activities thus promoting their learning. Therefore, the teacher will be able to provide sufficient explanations related to different contents or lessons and the learners with visual impairment can carry out the designed learning activities using their hearing.

4. Guidance on the introductory activity

The teacher will ask students to read carefully the passage and to observe the photographs related to introductory activity. The learners will try to answer the questions linked to the given passage. Learners may not be able to get the right answer but they are requested to predict possible answers. When the learners fail to come up with right answers to the questions related to introductory activity, the teacher will not immediately provide the required answers rather he /she should let students get the real answers through the course of learning and teaching process. This implies that learners will associate this lesson with the content learnt in the previous lessons of S4 on vegetation to answer the following questions:

Possible answers to introductory activity

- Refer to the student's book indicating different types of natural vegetation on the World map.
- Refer to the students books on lesson 9.9: factors which influence the distribution of World vegetation.
- Learners will brainstorm in group discussion on the the importance of conserving natural vegetation and ways of preserving natural vegetation.

5. List of lessons

SN	Lesson Title	Learning objectives	Number of periods
1	Tropical forests & their characteristics.	<p>Identify the types of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	2
2	Temperate vegetation & their characteristics.	<p>Identify the types of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	1
3	Grasslands & their characteristics.	<p>Identify the types of natural vegetation.</p> <p>State the characteristics of each type of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Examine the classifications of the major types of natural vegetation. Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	1

4	Temperate grassland & their characteristics	<p>Identify the types of natural vegetation.</p> <p>State the characteristics of each type of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Examine the classifications of the major types of natural vegetation.</p> <p>Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	2
5	Desert vegetation & their characteristics	<p>Identify the types of natural vegetation.</p> <p>State the characteristics of each type of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Examine the classifications of the major types of natural vegetation.</p> <p>Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	1
6	Mountain vegetation & their characteristics	<p>Identify the types of natural vegetation.</p> <p>State the characteristics of each type of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Examine the classifications of the major types of natural vegetation.</p> <p>Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	1

7	Aquatic/Marsh vegetation & their characteristics	<p>Identify the types of natural vegetation.</p> <p>State the characteristics of each type of natural vegetation.</p> <p>Recall the locations of different types of natural vegetation.</p> <p>Examine the classifications of the major types of natural vegetation.</p> <p>Describe the characteristics of each type of natural vegetation.</p> <p>Explain the location of the major vegetation zones of the world.</p>	1
8	Factors influencing the vegetation distribution	<p>Explain the factors influencing the vegetation distribution.</p>	1
9	Importance of the natural vegetation	<p>Outline the importance of the natural vegetation.</p> <p>Appreciate the importance of the various types of vegetation in the world.</p> <p>Show resilience for the various types of vegetation and the desire to protect and manage the natural vegetation.</p>	1
10	End unit Assessment		1
	Total		12

6. Guidance on different lessons

The above table highlights all the created lessons relating to the unit content. There are 9 lessons developed from the content of unit 9 with unevenly distributed periods depending on its content.

Lesson 1: Tropical forests and their characteristics

a) Prerequisite /introduction

There is a direct link with Activity 9.1. It is intended to introduce the lesson, . The activity 9.1 requests learners to recall the knowledge and skills gained from the previous lesson of senior four about vegetation in Rwanda, this will be through diagnostic assessment/ evaluation of teacher. This will enable learners to follow the lesson by linking it to the world natural vegetation.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.

c) Learning activity 9.1

For this activity, the teacher will give learners an opportunity to observe critically the given photo and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers for learning activity 9.1

The answers are rotating.

Answers for learning activity 9.1

For question (1) – (2) and (3), possible answers are found in learner’s book on location of equatorial forests and the importance of tropical forests.

Application activity 9.1

Possible Answer to application activity 9.1

- 1) Refer to students’ book on equatorial forests and their characteristics.
- 2) Possible answers are:
 - Tropical forests are sources of biomas.
 - Tropical forests are source of raw materials for manufacturing for various products.

- Tropical forests provide food stuffs.
- Provision of local herbals medicines.
- Tropical forests are source of tourism potential.
- Tropical forests helps in process of climate modification.
- Provision of employment opportunities.
- Tropical forests improves natural beauty of region where they are found.

Lesson 2: Temperate forests and their characteristics

a)Prerequisite /introduction

This activity is intended to introduce the lesson two and link it with lesson 1 studied before. The activity 9.2 requests learners to recall the knowledge and skills gained from previous lesson about tropical forests.

b)Teaching resources:

- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.

c)Learning activity

Learning activity 9.2

For this activity, the teacher will give learners an opportunity to read critically the given passage and give them time to reflect on the provided questions and then give the answers. The teacher is requested to try to integrate some generic competences as well as cross -cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activity 9.2

- 1) Possible answers are found in learner's book on temperate forests and their characteristics.
- 2) Possible answers are found in learner's book on temperate forests and their characteristics.

Application activity 9.2

- Possible answers: Refer to student's book on temperate forests and their characteristics.

Lesson 3: Grasslands in tropical zone and their characteristics

a) Prerequisites/Introduction:

The activity 9.3 intended to introduce the lesson 3 has a direct link with lessons studied in the content of unit 9 of S1 about types of vegetation. Therefore, the teacher has to help learners to recall the previous knowledge and skills about grasslands.

b) Teaching resources:

- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.

c) Learning activity:

For this activity, the teacher will give learners an opportunity to observe critically the given photograph and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers for learning activity 9.3

- Possible answers: Refer to the students' book on grasslands in tropical zone and their characteristics.
- Possible answers: Refer to the student' book on countries within latitude of 5° N and 15° N and 5° S and 15° S of the equator.
- Possible answers: Refer to student'book on conditions and characteristics for savannah humid and savannah dry vegetation.

Possible answers to application activity 9.3 :

- 1) Possible answer: learners apply knowledge acquired on savannah grasslands in relation to South Africa.

2) Possible answers on question 2:

- They provide forage for grazing animals and thus make vegetation suitable for human consumption.
- Animals transform vegetation and produce e.g. milk, meat and wool for human consumption and use.
- They have developed a natural environment of vegetation where medicinal plants and herbs can be collected and used for human consumption.
- Their surface cover protects life-giving soils and croplands from the harmful effects of natural disasters and human intervention, erosion and deflation.
- They provide a natural environment for smaller-larger animal species living on them, maintaining and ensuring the potentials of biodiversity.
- They keep not only surface soils, but also croplands in suitable conditions, as well. Grasses are specially related to soils: dead plant residues generate humus, which promotes the formation of different soil structures.
- The fibrous root system of grasses directly advances the formation of soil structure.
- In our direct human environment, they contribute to “human aesthetics” and relaxation. A beautiful lawn enhances the friendliness of our environment, the value of the scenery that we directly see.
- They are natural areas for doing sports, recreation activities (e.g. football fields) by the construction of manmade sports grounds in urban areas or by transforming the natural environment (golf courses).
- In the form of a naturally generated “biomass” or established culture (energy grass), they are renewable energy sources for humans.
- They directly ensure numbers of entrepreneurs (enterprises) enough to live on, as entrepreneurs produce (grass) seeds or give advice on grasses.

Lesson 4: Grasslands in temperate zone

a) Prerequisites/Introduction:

The activity 9.4 intended to introduce the lesson 4 has a link with lesson 3 studied before. Through observation, the teacher has to help student differentiate the tropical and temperate grasslands.

b) Teaching resources

- Maps.
- Pictures.
- Flip charts.

- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.

c) Learning activity

Learning activity 9.4

For this activity, the teacher will give learners an opportunity to observe critically the provided photograph and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers for Learning activity 9.4

- Possible answer refer to learner's book on grasslands in temperate zone.
- Argentina, USA, South Africa... More areas refer to learner's book on grasslands in temperate zone.

Possible answers to application activity 9.4.

The contribution of temperate grasslands to the economy of the countries:

- Temperate grasslands clearly provide the feed base for grazing livestock and thus numerous high-quality foods.
- Livestock also provide products such as fertilizer, transport, traction, fibre and leather
- Temperate grasslands provide important services and roles including as water catchments, and biodiversity reserves.
- Cultural and recreational needs, and potentially a carbon sink to alleviate greenhouse gas emissions.
- Increased production of meat and milk.
- Strategies to improve productivity include fertilizer application, grazing management. greater use of crop by-products, legumes and supplements and manipulation of stocking rate and herbage allowance.

- Provide improved tools for knowledge-based decisions on the productivity constraints of grazing animals.
- Individual electronic identification of animals offers opportunities for precision management on an individual animal basis for improved productivity.
- The majority of grasslands are located in tropical developing countries where they are particularly important to the livelihoods of some one billion poor people.
- Grasslands clearly provide the feed base for grazing livestock and thus numerous high-quality foods. On the other hand temperate grasslands are associated with different disadvantages to the economy of any country where they are found.

Temperate grasslands harbor vectors such as mosquitoes, tsetse flies that can cause diseases.

Temperate grasslands are associated with dangerous animals like snakes.

Lesson 5: Desert Vegetation

a) Prerequisite/introduction:

The teacher has to introduce this lesson and link it with the previous lessons.

b) Teaching resources:

- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Maps and atlas.

c) Learning activity

Learning activities 9.5

For this activity, the teacher will give learners an opportunity to observe critically the provided photographs and give them time to reflect on the provided questions and then give the answers. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answer to learning activity 9.5:

- Refer to the learners' book on desert vegetation.
- Refer to the learners' book on desert vegetation.

Application Activity 9.5

Possible answers to application activity 9.5

The countries which are in margins of Sahara desert such as Egypt, Libya, Algeria, Tunisia, Morocco Sudan, Chad, Niger, Mali, Mauritania and Western Sahara experience the following issues:

- There is practically no rainfall, few plants can grow there and these plants specialized for arid conditions and evenly affect agriculture.
- The population is being affected by desertification that is forcing people to relocate to other regions and change their lifestyles.
- Suffering the effects of long-term drought and devastating famine.
- Lack of farmable land, the type of flora and fauna that live there, and vast amounts of sand. It gets very hot in the day and cold at night. It has sandstorms that are very severe to population around the region.
- There are many abiotic factors in every ecosystem. In the Sahara desert sand, rocks, and its climate along with rainfall greatly affects it.
- Lack of organized infrastructure (roads, electricity, schools, hospitals), temperature extremes, wind, lack of grazing for animals, lack of water for agriculture etc.
- The military training camps in the Sahara desert effects the environment by scaring off the animals and people by gunfire and shouting.
- The populations of all such species have been greatly reduced by hunting for food, and through hunting for sport and recreation.
- The Sahara is a vast area of largely undisturbed habitat, principally sand and rock, but with small areas of permanent vegetation. The most degradation is found where water (oases, etc.) is present. Here, habitats may be heavily altered by human activities. Previously existing tree cover has often been removed for fuel and fodder by nomadic pastoralists and traders.
- Humans harm the ecosystem by drilling for oil, taking the land from animals within the ecosystem, and general pollution.
- The more persistent pressures are found in areas of permanent water (oases), or in areas where water comes close to the surface. Here, the local pressure on natural resources can be intense pressure.

Lesson 6: Tundra vegetation

a) Prerequisite/introduction:

The activity 9.6 intended to introduce the lesson 6 has a link with lesson five studied before. Through observation, the teacher has to help learners to recall the previous knowledge and skills about vegetation

b)Teaching resources

- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Maps.

c)Learning activities

Learning activity 9.6

For this activity, the teacher will give learners an opportunity to observe critically the provided photographs and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competencies as well as cross-cutting issues but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 9.6:

- 1) Tundra vegetation.
- 2) Refers to learner's book on tundra vegetation.

Application Activity 9.6

Possible Answers to application activity 9.6

- The students should answer this question essay by explaining why tundra vegetation is located in any one country chosen (between Russia and Canada). The growing seasons are extremely short ranging 6 to 10 weeks.
- There is limited precipitation and therefore, coupled with strong dry winds.
- Snowfall in the region is helpful to plant and animal life as the snow provides protection layer on the surface of the ground.

Lesson 7: Mountain vegetation.

a)Prerequisite/introduction:

There is direct link to vegetation and this should have enable the students to have enough knowledge, and skills about vegetation types and that help them to describe the characteristics of mountain vegetation in previous class S4.

b)Teaching resources

- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.
- Maps.

c)Learning activity

Learning activity 9.7

For this activity, the teacher will give learners an opportunity to observe critically the provided photographs and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to learning activity 9.7:

- 1) The description of mountain zonation bases on altitude as follow: The savannah vegetation rows from at the foothills, followed by the layer of tropical rainforests, bamboo forests, mountain heath and moorland and rest is bare rock.
- 2) The characteristics of mountainous vegetation with reference to East Africa:
 - The East African vegetation on the mountain slope grows in clearly demarcated zones from the foothills to the summit.
 - Plants characterize East African vegetation on the mountain like tussock grasses and stands of giant rosette.
 - The mountain heath and moorlands grow between the bamboo forests and the snow –line or bare rocks
 - The tree species, mainly of the lower canopy, are the wild olive.
 - Soils in the mountains are mostly are very young and fertile. they favours the growth of trees.
 - The above snow-line plant life is always impossible because of low temperature, which freeze, and the presence of eroded bare rocks makes it hard for plant growth.
 - Mountainous areas, the decrease in temperature with increasing altitude leads to the corresponding change in natural vegetation. .
 - The wet temperate type of forests are ranging between a height of 1000 and 2000 metres. Between 1500 and 3000 metres, there are temperate forests containing coniferous trees like pine, deodar, silver fir, spruce and cedar.

Application Activity 9.7.

Possible answer to application activity 9.7:

- 1) The importance of mountainous vegetation with reference to Northern Rwanda: Tourism activity, gazetting of national park and game reserves, Provision of raw material for craft industry.
- 2) The role of mountain temperate vegetation to Switzerland:
 - The temperate mountain vegetation provides a wide range of economic and social benefits to humankind.
 - The temperate mountain vegetation provides employment, processing and trade of forest products and energy – and investments in the forest sector.
 - They also play a role in hosting and protection of sites and landscapes of high cultural, spiritual, or recreational value. Maintaining and enhancing these functions is an integral part of sustainable forest management.
 - Temperate mountain vegetation protects soil against soil erosion.
 - Improve natural beauty of the area.
 - Provision of raw material to use in industries.
 - Provide natural habitat for wild animals and birds.
- 3) However, side temperate mountain vegetation area associate with:
 - Excessive population encroachment on the vegetation.
 - Rapid population growth, which creates more demand for land for agriculture and settlement.
 - Pollution of the environment is indirectly affecting the survival of temperate vegetation.
 - Summer season fire –out break.
 - Temperate mountain vegetation harbour pest and diseases, which destroy tracts of vegetation.

Lesson 8: Aquatic, marsh and Swamp vegetation (Mangrove vegetation)

a) Prerequisite/introduction

The learners should have gained more knowledge and skills about other type of vegetation in the content of the previous lesson. The learners with the under guidance of the teacher have to examine critically the relationship between aquatic/mangrove vegetation with other types of vegetation.

b)Teaching resources:

- Manila papers
- Print outs for the activities
- Text books
- Internet
- Maps.

c)Learning activities

Learning activity 9.8

For this activity, the teacher will give learners an opportunity to observe critically the provided photographs and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activity 9.8

- The type of vegetation shown on the photograph: mangrove or swampy vegetation.
- The environmental conditions that influence the location and growth of the identified vegetation above : Refer to student's book on mangrove vegetation.

Possible answers to application activity9.8:

The conditions that explain why the East African coast is dominated by mangrove vegetation

- Average temperatures of the coldest month higher than 20°C. The seasonal temperature range should not exceed 5°C.
- They need a large tidal range. This causes limited erosion and deposition of sediments.
- They need a fine-grained substrate. However, there could be some exceptions. This is the case in Kenya, where the mangroves grow.
- Shores must be free of strong wave action and tidal current.
- They need a large tidal range. This causes limited erosion and deposition of sediments
- Mangrove vegetation requires swampy or marshy areas with deep soils that should be salty in nature.
- Mangrove vegetation require high temperature necessary for chlorophyll making.

Lesson 9: The factors which influence natural vegetation

a) Prerequisites/Introduction:

The learners should have gained more knowledge and skills about other factors that influence vegetation in the content of S1 in previous lesson. The teacher learners will enable the learners to understand the content.

b) Teaching resources

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.

c) Learning activities 9.9

For this activity, the teacher will give learners an opportunity to observe critically the provided photographs and give them time to reflect on the provided questions and then give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activities 9.9

- The possible answer, refer to student's book on the factors which influence natural vegetation.

Possible answers to application activity 9.9:

The influence of human activities on vegetation distribution in Rwanda:

- Human activities such as settlement, mining, farming and livestock keeping have influenced the vegetation distribution in Rwanda and the world. For example, vegetation is cleared to create space for building houses. Trees are cut for firewood and timber. New or artificial vegetation is planted.

Lesson 10: The importance of natural vegetation

a) Prerequisites/Revision/Introduction:

The learners should have gained more knowledge and skills about importance of vegetation in the content of S1 and S4 in previous lesson. The teacher will enable the learners to understand the content.

b) Teaching resources

- Manila papers.
- Print outs for the activities.
- Text books.
- Internet.
- Maps.

c) Learning activities 9.10

For this activity, the teacher will give learners an opportunity to observe critically vegetation around their homes and give them time to reflect on the provided questions, thereafter, give answers. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activities 9.10

Possible answers: Refer to learner's book on the importance of natural vegetation.

Possible answers to the application activity 9.10

The value of natural vegetation for sustainable development of the country:

- Vegetation provides food for some domestic and wild animals. Human beings also get food from some plants.
- Vegetation has contributed hugely to the World's economy, particularly in the use of fossil fuels as an energy source, but also in the global production of food, wood, fuel and other material.
- Vegetation provides timber for furniture. Such items as beds, chairs and tables are made. Timber is also used to build houses
- Vegetation also influences soil formation, including soil volume, chemistry, texture and structure, which in turn affect various vegetation characteristics.

Vegetation are associated with some pests such as tsetse flies and tick, such pests transmit animals and human diseases.

Some plants are thorny – leafed and they harmful for human beings and animals.

7. Summary of the unit

The unit 9 of senior 5 deals with natural vegetation of the world. This unit describes/ gives more details on types of vegetation, their locations, and characteristics, conditions influencing and significance to human activities.

8. Additional Information

There is no considerably additional information the teacher requires. Nevertheless, the writers wish to convey the attention of the teacher teaching this unit to focus: use of maps to facilitate the learner to locate, to be familiar with characteristics of all types of vegetation, land use and conditions necessary for growth of vegetation.

The teacher is requested to support and stimulate learners to make additional research via internet, field works to other vegetation in Rwanda and visiting libraries.

9. End unit assessment

However, the learners should give his or her opinion/view or self-constructed answers, their answer will rotate the content in reference to the following possible answers for end unit assessment:

- 1) Refer to student's book on factors of distribution of each types of natural vegetation.
- 2) Refer to student's book on the relationship between vegetation and land use for each type of vegetation.
- 3) Refer to student's book on the map given by the introductory activity.
- 4) How do the following factors influence the distribution of vegetation in Africa?
 - Variation in temperature: Temperature modifies the climate of a given area. This therefore, influences the type of vegetation to occur in a given place. There are plant species that do well in cold areas while others grow only in areas that are associated with warm conditions.
 - Variation in relief: Relief affects natural vegetation in varying ways. This especially a long the slope influences the vegetation zonations. Whereby, differing types of vegetation exist along the slope.

10. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial activities. They are rephrased in a way that the slow learners can also be assisted to raise their self-confidence and at the same time learn in the simplest possible way.

Questions	Possible answers
Identify the types of forests mentioned in the passage above.	Refer to the learner's book: Desert vegetation.
Distinguish savannah humid and savannah dry grasslands.	Refer to the learner's book: Under Grasslands in tropical zone and their characteristics, page ...
Identify the type of vegetation shown on the photograph above.	Refer to the learner's book: Under temperate forests and their characteristics.
Identify zonation mountain vegetation as shown by the above diagram	Refer to the learner's book under: Tropical mountain vegetation.

b)Consolidation activities:

Questions	Possible answers
<p>1. Examine the value of natural vegetation for sustainable development of the country.</p>	<p>Refer to the learner’s book on the importance of natural vegetation</p>
	<p>Vegetation provides food for some domestic and wild animals. Human beings also get food from some plants.</p> <p>Vegetation has contributed hugely to the world economy, particularly in the use of fossil fuels as an energy source, but also in the global production of food, wood, fuel and other materials.</p> <p>Vegetation provides timber for furniture. Such items as beds, chairs and tables are made. Timber is also used to build houses</p> <p>Vegetation also affects soil formation, including soil volume, chemistry, texture and structure, which in turn affect various vegetation characteristics, including productivity and structure.</p> <p>Negative contribution of vegetation</p> <p>Vegetation are associated with some pests such as tsetse flies and ticks, such pests transmit animal and human diseases.</p> <p>Some plants are thorny – leafed and they harmful for human beings and animals.</p>
<p>2. Critically examine the role of temperate vegetation to the economy of Switzerland.</p>	<p>Using geographical documents and internet, guide the learners to research on the role of temperate vegetation to the economy of switzerland, then refer to the learner book on temperate mountain vegetation.</p>

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UNIT 10: POPULATION GROWTH IN THE WORLD

10

1. Key unit competence:

The learner should be able to discuss the problem of the population growth and the ways of controlling the population growth in the world. Explain the impacts of early sex, HIV/ Aids, health risks and STDS on the world's population

2. Prerequisite/introduction

The learners have mastered the content of Unit 12 of S4, where they studied the population and settlement of Rwanda. This unit of senior four greatly provides strong foundation that learners can use to understand better the content of this unit 10 of senior five. It is very significant to note that, they already have necessary knowledge, skills and attitudes. The difference is that, at this level the content as that in the Pupils' book is more detailed and goes beyond Rwanda to the population distribution of the World.

3. Cross-cutting issues to be addressed:

There are some cross-cutting issues which can be applied in the lesson. In the learners' book, the writers or authors used activities to integrate the crossing-cutting issues. The most emphasized is that of environment and sustainability and inclusive education.

Even though, the writers used some cross-cutting issues in various activities. However, this should not limit the creativity and innovation of the teacher. The activities used were just an example. This calls for the teacher to take note of the cross-cutting issues that he or she is interested in. What is important to note is that, many cross-cutting issues can be applied while dealing with this unit.

a) Comprehensive sexuality education can be integrated in some learning activities where questions related to the impact of early sex, HIV/ Aids, health risks and STDS in relation to population of the World are designed.

b) Inclusive education can be introduced during the class situation for example, if the teacher wants her/his students to make a field study outside classroom. With the purpose of observing natural vegetation, the teacher will consider the learners with physical disabilities and react accordingly by choosing appropriate methodology, which may help those learners with special disabilities to cope with the situation.

Nevertheless, the teacher can use a video containing different images or photographs of different types of vegetation.

The teacher can even bring different types of vegetation in classroom for those who are not able to go outside for fieldwork. For instance, learners with hearing disabilities or communication difficulties in different learning activities; the teacher will try his/her best and help them by using illustrations, diagrams, sign languages, and guest speakers where possible.

For instance, learners with visual impairment, the teacher will be able to help children to use varieties of videos and senses like hearing and touch because these senses can help them to play and carry out some of learning activities thus promoting their learning. Therefore, the teacher will be able to provide sufficient explanations related to different content or lesson and the learners with visual impairment can carry out the designed learning activities using their hearing. However, all these require the teacher to plan in advance on how he should conduct the lesson.

4. Guidance on the introductory activity

The teacher will ask students to read carefully the passage and to observe the photographs related to introductory activity. The learners will try to answer the questions linked to the given passage. Learners may not be able to get the right answers, but they are requested to predict possible answers. When the learners fail to come up with right answers to the questions related to introductory activity, the teacher will not immediately provide the required answers rather he /she should let students get the real answers through the course of learning and teaching process. This implies that, learners will associate this lesson with the content learnt in the previous lessons of S4 on vegetation to answer the following questions:

Possible answers for introductory activity 10.1

1. Refer to student's book on world population distribution.
2. Refer to student's book on world population distribution.
3. Refer to student's book on population growth.
4. Refer to student's book on population policy in the world.

5. List of lessons and End Unit assessment

SN	Lesson Title	Learning objectives	numbered periods
1	Human diversities	<p>Mention the population diversity.</p> <p>Explain the population diversity.</p> <p>Appreciate the importance of human diversity in development.</p> <p>Show resilience for the diversities in human population.</p>	1
2	Worldpopulation distribution and density	<p>Locate the population distribution.</p> <p>Explain the factors influencing the population distribution.</p>	2
3	Population concepts and their related effects.	<p>Define population concepts.</p> <p>Differentiate among the concepts of population (optimum population, under population, over population) .</p> <p>Compare the concepts of under population and over population.</p>	2

4	Population growth and its effects	<p>Identify the factors influencing the birth and death.</p> <p>List the causes and the effects of a rapid growth, and suggest the control measures.</p> <p>State the policies of controlling population growth and migration.</p> <p>Explain the causes, the effects and the possible control measures for an early sex, health risks, HIV/Aids and STDs in the world.</p> <p>Explain the factors associated with the birth and death rates.</p> <p>Describe the factors responsible for a rapid population growth.</p> <p>Explain the effects of a rapid population growth and the control measures.</p> <p>Investigate the impact of early sex, health risks, HIV/Aids, STDs and propose different ways of their prevention in the world.</p> <p>Explain the causes and the effects of the international migration.</p> <p>Show respect to the various policies for controlling the population growth and the control measures of international migration.</p>	8
5	Case studies	Make a comparison between the population in the developing and the developed countries.	4
6	End unit assessment		1
	Total		18

6. Guidance on different lessons

The above table highlights all the created lessons relating to the unit content. There are 5 lessons developed from the content of unit 10 with unevenly distributed period depending on its content.

Lesson 1: Human diversities

a) Prerequisite /introduction

The Activity 10.1 tends to introduce the lesson 1 . The activity 10.1 also requests learners to recall the knowledge and skills gained from previous lessons of senior four. This will enable learners to follow the lesson by linking it to what they have learnt in previous classes.

b) Teaching resources: During the teaching and learning process, the teacher will refer to the following teaching resources where possible:

b) Teaching resources

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.

c) Learning activities

Learning activity 10.1

For this activity, the teacher will give learners an opportunity to read the passage provided and give them time to reflect on the provided questions, thereafter, give answers. The teacher is requested to try to integrate some generic competences as well as cross - cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to Learning activity 10.1

- Possible answers of learning activity 10.1 for question (i) – (ii) and (iii), (iv) and (v) are found in student book on human diversity.

Possible answers to the application activity 10.1

- Possible answers for 10.1 question (1) Catholic church, Adventist church, Protestant church and Islamic Religion.
- Possible answer for question (2) are found in student's book on human diversity .

Lesson 2: Population distribution in the World

a) Prerequisite /Revision /introduction

There is a direct link of Activity 10.2, intended to introduce the lesson, with what the learners studied in Senior four. The activity 10.2 requests learners to recall the knowledge and skills gained from previous lesson of senior four about population and settlement in Rwanda, this will be through diagnostic assessment/ evaluation.

This will enable learners to follow the new lesson.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.

c) Learning activity 10.2

Learning activity 10.2

For this activity, the teacher will give learners an opportunity to observe the given map critically and give them time to reflect and answer the questions. The teacher is requested to try to integrate some generic competences as well as cross -cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.2

- Possible answers to the learning activity is found in the student's book on population distribution in the world.

Possible answers to the application activity

1. The sketch map of densely and sparsely populated areas will be drawn from the map provided by the student's book.
2. Factors controlling population distribution in Rwanda.

- Promoting family planning techniques and education, for instance use of contraceptive and other methods of population control.
- Legislation to emphasize adoption of such health care and services.
- Legislation against early marriages especially of women. (In Rwanda mandatory, age 21 years).
- Provision of health care services and reduction of infant mortality rate.
- Improvements in the education facilities for women, which raises their status in society.

Lesson 3: Population Concepts and its related effects.

a) Prerequisite /introduction

There is a direct link of Activity 10.3, intended to introduce the lesson, with what the learners studied in Senior four. The activity 10.3 requests learners to recall the knowledge and skills gained from previous lesson of senior four about population and settlement in Rwanda. This will be through diagnostic assessment/ evaluation.

This will enable learners to follow the new lesson.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.

c) Learning activity

For this activity, the teacher will give learners an opportunity to read carefully the passage that is given and the learners are given time to reflect and answer the questions. The teacher is requested to try to integrate some generic competences as well as cross -cutting issues, but he/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.3

- The possible answers to the learning activity 10.3 are found in the learner's book on Population concepts and their related effects.

Possible answers to the application activity 10.3

- 1) The possible answers to the application activity 10.3 are found in the learner's book on population concepts and their related effects.
- 2) The possible answers to the application activity 10.3 are found in the learner's book on population concepts and their related effects.

Lesson 4: Population problems of developed and developing countries

a) Prerequisite /Revision /introduction

There is a direct link of Activity 10.4, intended to introduce the lesson, with what the lessons 3 studied, the activity 10.4 requests learners to recall the knowledge and skills gained from the previous lesson of senior four about population and settlement in Rwanda and the teacher decides what cross-cutting issues should be addressed during the teaching and learning process.

This will enable learners to follow the new lesson

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text books.
- Internet.

c) Learning activity 10.4

For this activity, the teacher will give learners an opportunity to read carefully the passage given and the learner is given time to reflect and answer the questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.4

1. The possible answers to question 1 on characteristics of developed countries: Refer to the student's books under Population problems of developed countries.
2. The possible answers to question 2 on challenges faced by population in developing countries, refer to the student's books under Population problems of in developing countries.

Possible answers to the application activity.10.4

- 1) Compare and contrast the population problems associated with developed and developing countries: refer to the students book on population problems of developed and developing countries.
- 2) Possible remedies to curb the problems identified in question 1 above, refer to the student's book under solutions to population problems facing developed and developing countries.

Lesson 5: Population growth

a) Prerequisite /Revision /introduction

There is a straight link of Activity 10.5, intended to introduce the lesson, with what the learners studied in lesson 4. The activity 10.5 requests learners to remember the generic competence or knowledge and skills gained from previous lesson of senior four about population in Rwanda and the teacher decides on what cross-cutting issues should be addressed during the teaching and learning process.

This will enable learners to follow the new lesson.

b) Teaching resource:

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Textbook.

c) Learning activities

Learning activity: 10.5

Learners are asked to identify the factors that affect the rate of population growth and to explain why this is an important aspect in population studies.

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it; and give them the time to provide answers to the questions. The teacher is requested to try to integrate some generic competences as well as cross -cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.5:

Refer to the student's book on factors that affect the rate of population growth to complete the discussions of students.

Possible answers to the Application activity 10.5

1. The impacts of population growth on the environment: The answers are found in the student's book under population growth.
2. The appropriate population control measures to be used in Rwanda: The learners suggest the possible population control measures for the discussion:
 - Promotion of family planning.
 - Provision of health care services.
 - The emphasize on adoption of such health services.
 - Legislation against early marriage.

Lesson 6: Population structure and composition.

a) Prerequisites/Introduction:

There is a straight link of Activity 10.6 intended to introduce the lesson, with what the learners studied in lesson 5: Population structure in Rwanda. The activity 10.6 requires learners to remember the generic competence or knowledge and skills gained from previous lesson of senior four. Teacher decides on what cross-cutting issues that would be addressed during the teaching and learning process.

This will enable learners to follow the new lesson on population structure and composition.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text book.

c) Learning activity 10.6

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it, and give them the time to give answers to the questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic

competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.6

- Possible answers for questions (1) – (2) are found in the student’s book on population structure and composition.

Application activity 10.6

- Possible answers for question (1) - (2) are found in the student’s book on population structure and composition.

Lesson 7: Population Policies in the World

a) Prerequisites/Revision/Introduction:

There is a straight link of Activity 10.7 intended to introduce the lesson, with what the learners studied in lesson 6: Population structure in Rwanda. The activity 10.7 requires learners to remember the generic competence or knowledge and skills gained from previous lesson of senior four. The teacher decides on what cross-cutting issue that would be addressed during the teaching and learning process.

This will enable learners to follow the new lesson on population policies.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text book.

c) Learning activity 10.7

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it and give them time to give answers to the questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity

- Possible answers for the questions (a) – (b) are found in the student’s book under Population policies in the world.....

Possible answers to the application activity 10.7

The population policies that have been adopted by the government of Rwanda to deal with the population problems are the following:

- Improvement in population health through access to child health care services and contraceptive measures, and sterilization.
- Eradication of mass epidemics diseases through improving the living standards conditions of population.
- Family planning as a dominant component of population policies should be integrated in schools' curriculum to avoid early marriage.
- Women of reproductive age should apply the use of modern contraceptive or traditional methods to avoid unwanted pregnancies.

Lesson 8: Impact of early sex, health risks, HIV/ Aids, STDs in the world.

a) Introduction:

There is a link between Activity 10.8 with the previous lesson .Therefore; the teacher should introduce a new lesson related to a passage of World AIDS day that takes place on the 1st December each year. Activity 10.8 requires learners to read carefully and understand it. Through this lesson the teacher must incorporate the crosscutting issue of comprehensive sexuality during the teaching and learning process.

This will enable learners to follow the new lesson above.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text book.

c) Learning activity 10.8

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it, and give them the time to give answer to questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.8

- The possible answers for the learning activity 10.8 questions (1, 2, 3, 4, 5) are found in the student's book on impact of early sex, health risks, HIV/ Aids, STDs in the world.

Possible answers to the Application activity 10.8

- The possible answers to the application activity 10.8 questions (1)–(2) are found in the student's book on impact of early sex, health risks, HIV/ Aids, STDs in the world.

Lesson 9: Migration

a) Introduction:

There is link between activity 10.9 and the previous lesson. Therefore, the teacher should introduce a new lesson related to the passage on migration.

The activity 10.9 requires learners to read carefully and understand it. Through this lesson the teacher must incorporate different cross-cutting issues during the course of teaching and learning process. This will enable learners to follow the new lesson.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text book.

c) Learning activity 10.9

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it and give them time to give answer to questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.9

- The possible answers for 10.9 questions (1) – (2) are found in the student's book: Under migration.

Possible answers to the application activity 10.9

- Possible answers for 10.9 questions (1) – (2) are found in the student's book: Under migration.

Lesson 10.10.1: Case Studies Nigeria, Bangladesh and Gabon

a) Prerequisites/Revision/Introduction:

These case studies of developing countries including Nigeria, Gabon and Bangladesh, focus on population issues. Therefore the teacher should introduce a new lesson and integrate generic competence as well as cross-cutting issues in the learning and teaching processes concerned with this new lesson. This will enable learners to follow the new lesson.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text book.

c) Learning activity 10.10.1

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it. He or she gives them the time to give answers to the questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the learning activity 10.10.1

- Possible answers for learning activity 10.10.1 questions (1) – (2) are found in the students' book under Case studies of developing countries.

Possible answers to the application activity 10.10.1

- Possible answers for 10.10 questions (1) – (2) are found in students' book under three Case studies of developing countries.

Lesson 10.10.2 : Case Studies include Germany, USA and China.

a) Prerequisites/Introduction:

The teacher should introduce the new lesson and integrate some generic competence and cross-cutting issues in the process of teaching and learning. This will enable learners to follow the new lesson.

b) Teaching resource

- Maps.
- Pictures.
- Flip charts.
- Manila papers.
- Print outs for the activity.
- Text book.

c) Learning activity 10.10.2

For this activity, the teacher will give learners an opportunity to read carefully the passage and questions related to it and give them time to give answers to the questions. The teacher is requested to try to integrate some generic competences as well as cross-cutting issues. He/she is free to choose a cross-cutting issue or generic competence taking into consideration the learning environment.

Possible answers to the Learning activity 10.10.2

- Possible answers to Learning activity 10.10.2 questions (1, 2, 3) are found in the student' book under Case studies of developed countries.

Possible answers to the application activity 10.10.2

- Possible answers to application activity 10.11.4 questions (1, 2, 3) are found in the student' book under Case studies of developed countries .

7. Summary of the unit

The unit 10 of senior 5 deals with population distribution in world. This unit describes/ gives more details on population distribution in world and effects and population policies both in developed and developing countries.

8. Additional Information

There is no considerable additional information the teacher requires. Nevertheless, the writers wish to convey the attention of the teacher teaching this unit to focus on use of maps and population pyramids to facilitate the learner to be familiar with population distribution, population problems and its consequences, population policies and measures. The teacher is requested to support and stimulate learners to make additional research via internet, field works and visiting libraries.

9. End unit assessment

The learner should give here his or her opinion/view or self-constructed answers, his/her answer will rotate to the content in reference with the following possible answers for end unit assessment:

1. Refer to the student's book on Population growth.
2. Refer to the student's book on Population growth and their related effects.
3. Refer to the student's book on Population concepts and developing countries.
4. Refer to the student's book on Population distribution in world.
5. Refer to the student's book on the effects of population growth.
6. Refer to the student's book on both population problems of developing and developed countries.

10. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial activities. They are rephrased in a way that the slow learners can also be assisted to raise their self-confidence and at the same time learn in the simplest possible way.


Questions	Possible answers
1. Name the African states and main languages used on the African continent.	Refer to the student's book on human diversity.
2. With typical examples from Rwanda, differentiate the religions operating on Rwandan territory.	Refer to the student's book on human diversity .
3. Referring to above the passage, explain the following population concepts: (i) Optimum Population, Under population and Overpopulation	Refer to the student's book on population concepts .

b) Consolidation activities:

Questions	Possible answers
With the aid of a drawn sketch of population map of the world, identify the densely and sparsely populated areas.	Refer to the students' book on population distribution.
Explain factors controlling population distribution in Rwanda.	Refer to the students' book on Population growth . Refer to the students' book on population case studies of developed countries.
Explain the challenges faced by population in Developing countries.	Refer to the students' books on case studies on developing countries.
Examine the influence of under population to exploitation of natural resources in DRC.	Refer to the students' books on case studies on developing countries.



UNIT 11: URBANIZATION IN THE WORLD



11

1. Key unit competence

The learner should be able to discuss the impact of settlement and urbanization on the sustainable development of different countries.

2. Prerequisite knowledge and skills/ Introduction

The teacher should be aware that learners have a wide range of information concerning this unit 11 of urbanization in the world. This is based on the past studies that learners were subjected to in their educational levels. The enriched prerequisite knowledge acquired obviously, equips learners with skills and values and attitudes towards understanding the concept of urbanization.

Therefore, learners should have understood the content of unit 12 of population and settlement in S1, unit 14 of rural and urban settlement in Rwanda, unit 9 of urban settlement in Africa and unit 18 of development case studies in senior 3. Again, the students are going to study this unit in Senior 5, they studied urbanization in Rwanda in the previous year when they were in senior 4 under unit 10.

This is a clear manifestation that learners have all the required knowledge, skills, values and attitudes that the teacher should build on to successfully handle this unit 11 of senior five.

The most important to take note of, is to design appropriate review activities that can incite or enflame students to look back at what they studied and make clear connection to the demands of unit 11 of urbanization in the world.

3 Cross-cutting issues to be addressed

Unit 11 of urbanization in the world, provides a good ground upon which the integration of a wide range of cross-cutting issues is possible and applicable with great ease. The following are some of the cross-cutting issues that the teacher can drill on as he or she takes and guides the learners through the studying of this unit.

- i) Environment and sustainability.
- ii) Standardization culture.

- iii) Comprehensive sexuality education.
- iv) Financial education.
- v) Peace and values education.
- vi) Inclusive education.
- vii) Gender education.

The teacher should realize that urban centers of the world are made up of people of varying classes and social classes and varying education background. Therefore, their actions sometimes affect our environment, crimes have become the order of the day such as rape and defilement, social misunderstandings because of differing beliefs and life philosophies, as well as the crushing cultural values. Urban centers require people who have all the above cross-cutting issues at finger tips. Learners should be enabled to realize that there must be peace and good values to have a harmonious urbanized society and in our homes. Therefore, the teacher, should use this unit to cement fully the value and importance of these cross-cutting issues in the lives of his or her learners.

The urban population depend on manufactured products such as drinks, processed food stuffs and all these expire. This calls for standardization culture. There are many operations or urban activities that produce handful of wastes that degrade the environment, therefore, call for environment and sustainability and many others.

4. Guidance on introductory activity

The introductory activity of this unit contains three photographs that represent both rural and urban settlements. They depict what actual learners see in their real world. This is intended to create a spark of connection between what they experience and the topic at hand. It is designed in way that simple yet demanding critical thinking to remind the students what they studied in their previous classes or educational levels.

The questions contained therein, can be answered in the following ways:

- 1) All the photographs show settlement. The learners are supposed to compare them and show the similarities and differences that exist between them. Refer to the types of settlement in the learner's book under 11.1 and 11.3.
- 2) The one with grass-roofed houses which is the second photograph to the left.
- 3) Refer to the learner's book under 11.2.4: functions of urban centers and ports.
- 4) Rural settlement influence: Refer to the learner's book under 11.2.3: effects of rural settlement and urban influence 11.2.5: Impact of world urbanization on the environment.

5. List of lessons (including assessment)

	Lesson title	Learning objectives (knowledge, skills and attitudes and values)	Number of periods
1	Rural settlement	<p>Identify the major types of settlements.</p> <p>Outline the factors, effects and solutions of rural settlements.</p> <p>Explain the major types of settlements.</p> <p>Explain the factors influencing rural settlements Explain the effects of rural settlements.</p> <p>Show concern for the effects of rural settlement and the devise measures for proper rural settlement</p>	3
2	Urbanization in the world	<p>Define the terms related to urbanization.</p> <p>Identify major urban centres and factors influencing urban development in the world.</p> <p>Identify the major cities in developed and developing countries.</p> <p>Relate Urbanisation issues of different countries.</p> <p>Describe the impact of world urbanization on the world environment.</p> <p>Explain the terms related to urbanization.</p>	4
3	Case studies of cities in developed countries	<p>State the functions of the world major cities and ports.</p> <p>Explain the functions of the world major cities and ports.</p> <p>Evaluate the impact of world urban centres on the world environment.</p> <p>Describe the characteristics of cities in developed and developing countries.</p> <p>Compare urbanization of different countries.</p>	3

4	Case studies of the cities in developing countries	<p>State the functions of the world major cities and ports.</p> <p>Explain the functions of the world major cities and ports.</p> <p>Evaluate the impact of world urban centres on the world environment.</p> <p>Describe the characteristics of cities in developed and developing countries.</p> <p>Compare urbanization of different countries.</p>	2
6	End Unit Assessment	<p>The teacher should know that the main object for end unit assessment is to determine or evaluate whether the key unit competence was achieved. However, it may have other objectives on another hand.</p>	1

6 Guidance on different lessons outlined above

Lesson 1: Rural settlement

a) Prerequisites/ Revision /Introduction

The lesson title involves most of concepts that are directly related to what the learners studied in their previous educational levels (S1, S2, S3 and S4). Therefore, students should be guided on how they can reconnect to the previous studies to understand and develop new competences in relation to rural settlement at world level.

This will assist the teacher to create activities that will evoke learners to remember what was learnt previously and display their skills at connecting their past studies with the lesson at hand.

b) Teaching resources:

The lesson to be effectively taught, the teacher should ensure that the following teaching resources are in place.

- Text books.
- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.
- The globe.
- Photographs of some rural settlements.
- Manila papers for group work drawing.

c) Learning activities:

Learning activity 11.1

Possible answers:

- 1) Refer to the learner's book under 11.1: Rural settlement.
- 2) Refer to the learner's book under 11.1.1: Types of rural settlements.
- 3) Refer to the learner's book under 11.1.2: Factors influencing rural settlement.

d) Application activities

Application Activity 11.1

Possible answers:

- a) These are activities that primarily were initially engaged in by people that settled in a given place such as fishing, crop growing among many others.
- b) Refer to the learner's book under 11.1.1: Types of Rural settlement.

Lesson 2: Urbanization in the world

a) Prerequisites/ Revision /Introduction

The teacher should ask learners to talk about the urbanization in the world using the past studies.

b) Teaching resources:

- Text books
- The world maps
- Drawing materials such as pencils, coloured markers and flip papers.
- The globe
- Photographs of some urban centers of the world.
- Manila papers for group work drawing.
- Etc.

c) Learning activities:

Learning Activity 11.2

- 1) The teacher should guide learners to allocate the areas that are most urbanized using the map shown in the activity and the atlas.

- 2) Refer to the learner's book under 11.2.3: Factors influencing urban settlement in the world
- 3) The teacher should guide the learners to associate the functions of urban centers to find out the answers for this question. Refer to the learner's book under 11.2.4: Functions of urban centers and ports.

Application activities

- 1) Refer to the learner's book under 11.2.5: Impact of world urbanization on the environment.
- 2) Isolated farm lands - Hamlet-village-Town-city-metropolis- conurbation -megalopolis.
- 3) The teacher should guide learners to use their past studies in senior 4 under the function of urban centers in Rwanda and use the general functions studied under 11.2.4 in the learner's book 5: Functions of urban centers in the world.

Lesson 3: Case studies of cities in the developed countries: New York city, London, Tokyo

a) Prerequisites/ Revision /Introduction

The teacher should make preview of the previous lesson using/asking learners to give a recap of what was covered. Then, he or she introduces the lesson with a short activity that can enable learners to connect to the lesson at hand.

b) Teaching resources:

To achieve learning objectives, the following resources should be in place.

- Text books.
- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.
- Photographs of some urban centers of the world.
- Manila papers for group work drawing.
- Etc.

c) Learning activities:

Learning Activity 11.3

Possible answers:

- 1) Refer to the learner's book under 11.2.3: Factors influencing urban development in the world.

2) Refer to the learner's book under 11.2.4: Functions of urban centers and Ports and 11.3: Case studies of the cities in the developed countries.

3) Possible answers

- Pollution.
- Over crowding.
- Lack of enough land for expansion.
- Slum development.
- Unemployment.
- Spread of diseases.
- Crime.
- Drug abuse.
- Moral decay.
- High traffic jam.
- Erosion of culture.
- High cost of living.
- Shortage of accommodation.
- Etc.

d) Application activities

Application activity 11.3

Possible answers and guidelines :

1. For problems refer to answers for question 3, under the application 11.2 in the teacher's guide unit 11 urbanization in the world.

Solutions:

- Use of cars that have regulating system of gases.
- Fly overs created.
- Use of public means of buses.
- Police and security agencies be established.
- Resettling people in better houses at affordable fees.
- Discouraging rural-urban migration.
- Creation of jobs through constructing more industries.

2) The question needs to show how land influences the functioning of cities and thereafter talk about other factors.

- For construction of houses
- Development of roads and infrastructure
- Growing green belts
- Etc.

Other factors refer to 11.2.3 Factors influencing urban development in the world.

Lesson 4: Case studies of the cities in developing countries

a) Prerequisites/ Revision /Introduction

Review the previous work covered by asking learners to think, pair and share what they learnt from the previous lessons about urbanization in the world. Later the teacher should guide the learners in finding the responses to the learning activity 11.4

b) Teaching resources:

To achieve learning objectives, the following resources should be used.

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Photographs.
- Etc.

c) Learning activities:

Learning Activity 11.4

The possible answers for learning activity 11.4:

1. Refer to the learner's book under 11.4: Case studies of cities in developing world.
2. Refer to the learner's book under 11.4: Case studies of cities in developing world.

d) Application activities

Application 11.4

Possible answers:

- Deforestation.
- Clearing and landscaping of land.

- Pollution.
- Destruction of ecosystem through urban operations such as concrete.
- Etc.

For more answers refer to the learner's book under 11.2.5: Impact of the world urbanization on the environment.

Refer to the learner's book under 11.4 Case studies of cities in developing countries: Brasilia, Johannesburg, Nairobi.

7. Summary of the unit

This unit deals with rural settlement (Types, factors influencing rural settlement, effects of rural settlements, solutions to the problems affecting rural settlements) and urbanization in the world which deals with: Definitions of terms related to urbanization, location of major world urban centers and ports, factors influencing urban development, functions of urban centers, impact of the world urbanization and case studies on both developed and developing countries.

8. End unit assessment

Possible answers:

1) They constantly grow both in population and area because of their advantages:

- Source of employment.
- Education services.
- City bright lights such as piped water, street lights and cinema halls.
- Good infrastructure.
- Administrative services.
- Medical services.
- Transport.
- Influence of relatives and peers.
- Government policies of urbanizing the country.
- Etc.

2) Refer to the learner's book under 11.2.5 and 11.3 and 11.4 case studies.

3) Refer to answers for question 3 of learning activity 11.3: Case studies of cities in developed world.

Possible answers:

- Construction of water channels.
- Establishing affordable housing system.
- Construction of many industries.

- Establishing security posts.
 - Enlarging roads and creating new ones such as fly overs.
 - Construction of sky scrapers.
- 4) Refer to the learner's book under 11.2.4 functions of urban centers and ports.
- 5) Refer to the learner's book under 11.2.3 Factors influencing urban development.

9. Additional information for teachers

The teacher should guide the learners to relate the content of this unit to what they studied in senior four in relation to Rwanda.

10. Additional activities

a) Remedial activities:

1. Give three types of rural settlements.

Possible answers

Refer to the learner's book under 11.1.1.

- 2) Suggest solutions to the problems of rural settlements in Rwanda.

Refer to 11.1.3 and 11.1.4 in the learner's book.

b) Consolidation activities

Discuss the factors influencing rural settlements in Rwanda.

Possible answers

Refer to 11.2.3 in the learner's book.

c) Extended activities

1. Explain the meaning of the following:

- (a) Trading centres.
- (b) Municipality.
- (c) Green city.

Possible answers for all the above question refer to the learner's book under 11.2.1. Definition of basic terms.

1. Key unit competence:

The learners should be able to explain the impact of agricultural activities on the sustainable development of different countries in the world.

2. Prerequisite (knowledge, skills, attitudes and values)

The teacher should guide the learners towards application of various knowledge, skills, attitudes and values, acquired and developed right way from senior one to senior five. It is vital to note that, learners already have a handful of skills that can enable them to understand and master this unit.

There is a connection and difference between the content of senior five, senior one, two and senior four. the difference is that, at this level of Senior five, the content in the learner 's book is more detailed and goes beyond Rwanda to the agriculture in the World in general. The already acquired knowledge, skills, attitudes and values from past studies, should be used by the teacher to conduct diagnostic assessment as a way of evaluating each learner's abilities

3. Cross-cutting issues to be addressed:

There is a wide range of the cross-cutting that can be integrated into the teaching of this Unit 12 senior five. In the learners 'book, the writers or authors used activities to integrate the crossing-cutting issues. The most highlighted is that of environment and sustainability, Peace and values, and financial education

Although, the writers might have utilized few cross-cutting issues, this should not be a barrier to the creativity and innovativeness of the teacher. Most of activities used are models.

It is very important to apply all possible cross-cutting issues where possible basing on occasion is. Examples are Genocides studies, gender, peace and values, inclusive education, standardization culture and comprehensive sexuality education. As a teacher, planning is main preoccupation on how and when to use and develop the above cross-cutting issues.

Peace and values, gender and financial education can be integrated using the class room situation

Environment and sustainability: the role of a teacher is to clarify the lesson, through all activities related to the topic. The teacher is requested to explain more on relationship between agricultural activities and the environment. Besides, teacher is an adviser to the learners. He/she should help learners to understand and have knowledge and skills on good farming methods which is friendly environment.

Peace and values education could be addressed in the any activity that involves learners to work in group. In any case, working in groups develops positive attitudes of someone who has peace. In any activity where teacher give tasks to the learner he/she should reinforce the need of peace in the society.

Financial education is noticeable in many activities such as 12.1, application 12.1, activity 12.3 and other many. These are good examples to be used to address financial education to the learners. One of the primordial importance of agriculture is the provision of food. Additionally, agricultural products are sold to generate money to the farmers even to the country. The teacher should explain how agriculture should be respected and how it is beneficiary to many people in terms of money, food, job, skills etc.

Inclusive education: The teacher is advised to cater for special needs of learners with disabilities. For example; the teacher has to use audio materials for students with visual impairments, audio-visual materials to those who have physical impairments so that they can see and hear the samples brought. The teacher should select conducive environment to all students so that students with disabilities can participate in learning activity

4. Guidance on the introductory activity

The introductory activity in this unit is provided to warm up learner so that they can be actively involved in the lesson. The teacher has to conduct and allow learners to observe critically the photographs provided. Learners are supposed to answer all questions. In case they fail to find out correct answers to the questions, teacher intervene immediately to provide possible right answers, but he/she should allow learners to discover themselves the right answers through the learning and teaching process. Here are possible answers for introductory activity include:

1. The photographs provided show crop cultivation and livestock farming thus agriculture is the activity of crop cultivation and rearing of animals.
2. The answer is found in the learner's Book under lesson 12.1.1 subsistence.
3. The role that agriculture plays in human development is:
it employs many people, it is a source of food, it provides raw materials to agro-processing industries, the availability of food makes people happy.

4. The answer for this question is found in the learner’s Book under lesson 12.1 crop cultivation
5. The main challenges facing agriculture are also available in learner’s Book under lesson 12.3 factors for increasing the agricultural production and problems affecting the agriculture in the developing countries.

5. List of lessons and End Unit assessment

S/N	Lesson title	Learning objectives (Knowledge, skills and Attitudes and values)	Number of periods
1	<p>Crop Cultivation</p> <p>Types of crop cultivation methods and their characteristics, subsistence cultivation (shifting cultivation, bush fallowing, small holder, cooperative, plantation), advantages and disadvantages, market gardening, horticulture and Truck farming, Intensive subsistence agriculture (collectivization, communes in China) .</p>	<p>Name the diverse types of crop cultivation methods.</p> <p>Describe the characteristics of the different crop cultivation methods.</p> <p>Show continual desire to grow different crops using different methods of farming .</p> <p>State the diverse types of farming in China.</p> <p>Describe the farming methods in China and Russia.</p> <p>Appreciate the reasons for increasing the agriculture production.</p>	9
2	<p>Factors for increasing the agricultural production</p> <p>Problems affecting the agriculture in the developing countries</p>	<p>Outline the factors responsible for increasing the agricultural production.</p> <p>Explain the factors influencing the agricultural activities.</p> <p>Evaluate the problems affecting the agricultural system in the developing countries.</p>	1

3	Case studies: Sugar cane grown in South Africa, Rubber grown in Liberia, Coffee grown in Brazil, Cotton grown in Sudan.	Outline the different plantation crops in different countries. Compare the plantation agriculture in the different countries of the world.	4
4	Livestock Farming Types of livestock farming: Pastoralism: pure nomadism, free Range and transhumance, factory farming. Ranching, dairy farming.	State the different types of livestock farming. Locate different types of livestock. Appreciate the reasons for rearing a specific type of animals like sheep, cattle, and etc.	5
5	Factors and problems affecting the livestock farming and ways of improving the livestock farming.	Outline the factors and problems affecting the livestock farming. Explain the ways of improving the livestock farming.	1
6	Case studies: Ranching in Botswana, Dairy farming in Holland, Sheep rearing in Australia.	Identify the livestock farming methods in the selected countries. Research on different types of livestock farming in the selected countries of the world. Appreciate the reasons for rearing a specific type of animals like sheep, cattle, and etc.	3
7	End unit assessment		1
	Total		24

6. Guidance on different lessons

The above table highlights all the created lessons relating to the content of unit 12. There are 7 lessons developed from that content with unevenly distributed period depending on its content or volume.

Lesson 1: Crop Cultivation / Types of crop cultivation methods and their characteristics

a). Prerequisite/introduction: There is a direct link of Activity 12.1, intended to introduce the lesson, in relation to with the lessons studied in Senior four. The activity 12.1 requests learners to recall the knowledge and skills gained from previous lesson of senior four about Agriculture systems in Rwanda, this will be through diagnostic assessment/ evaluation by teacher. This will enable learners to follow the lessons by linking it to Rwandan agricultural systems.

b). Teaching resources

For effective delivery of the lesson the teacher should avail the following resources

- Diagrams - Pictures - Flip charts - Manila papers - Print outs for the activity - Text books - Internet - Field work to the surrounding area or watching video.

c). Learning activity 12.1.1

Guide and facilitate learners to work in groups and discuss a set of questions in relation with agriculture, especially crop cultivation. Learners should use the knowledge, skills acquired in their past studies in their discussion to answer questions.

The learners will be engaged in activities like discussions, asking and answering questions by referring to the learner's book.

Possible answers for learning activity 12.1 include:

Possible answers:

1. Shifting cultivation, rotational farming, small holder farming, market gardening, plantation farming, horticulture, truck farming etc.
2. Small subsistence agriculture is the type of agriculture especially crop cultivation where a farmer owns a piece of land covers that is less than 5 hectares. Subsistence farming is a good example of small scale agriculture while large scale farming is a type of agriculture which takes place in a large area of land approximately 100 hectares. This is also known as commercial agriculture or state agriculture. The money gained from large scale agriculture is essential for keeping the system going on. The type of farming practiced is normally monoculture.

Learning Activity 12.1.2

Possible answers:

1. Refer to the learner's book under under Cooperative farming.
2. Refer to the learner's book under under Cooperative farming.
3. Refer to the learner's book under under Plantation farming.

Learning Activity 12.1.3

Possible answers

1. Refer to the learner's book under under Market gardening and Horticulture.
2. Refer to the learner's book under Truck farming.

Learning activity 12.1.4

Possible answers

- 1 Refer to the learners' Book under lesson two collective agriculture.
2. Agriculture is the best motor of growth for many countries especially developing ones.
 - i) Russians have adopted collectivization while China opted for commune system.
 - ii) Refer to the learner's Book under collective agriculture.

Application activity 12.1

Possible answers:

1. The question needs the students to look at both positive and negative effects of rapid population growth on small-scale agriculture.

Continuous increase in the number of people is a serious problem facing small scale agriculture because:

- i. It reduces the average size of land for farming.
- ii. Results into over exploitation.
- iii. Reduced soil fertility.

Etc.

However, the rapid population growth supports in one way or the other the small-scale agriculture. As shown below:

- Source of market.
- Source of labour.
- Etc.

2. The use of cocoa and rubber

a) Cocoa:

- Used in making cocoa butter.
- Chocolate.
- Lotions/cosmetics.
- Beverage.
- Used in Bakery.
- Creams.
- Tea/or cake toppings.
- Cocoa drinks.
- Used medicine.
- Etc.

b) Rubber: Refer to the learner’s book under 12.4.2 Rubber growing in Liberia.

3. The answer is no because of the following reasons:

- Collectivization was a policy of forced consolidation of individual peasant households into collective farms called “kolkhozes”. All people were obliged to join kolkhozes not because they want it but by force.
- The poor peasant were so glad to hear this news, but the rich ones were not ready to give away everything they owned.
- In despair, rich people killed their own cattle and burned their fields.
- As result, livestock population decreased to half its size. Riots started here and there, and after being suppressed, they turned into acts of terror and sabotage. The government considered rich people as public enemies and riposted violently by arresting some of them or killing them. Suddenly, Stalin addressed his citizens with an article, in which he criticized his own previous actions. Saying that it was a mistake to drive people into kolkhozes by force.

Lesson 2: Factors for increasing the agricultural production and problems affecting the agriculture in the developing countries.

a) Prerequisites/Revision/Introduction

This lesson, factors for increasing the agricultural production and problems affecting the agriculture in the developing countries is not a new topic for senior five learners since it was studied from senior 1 up to senior four. Introducing the lesson will start by activity 12.5 to check the prerequisites knowledge, skills, attitudes and values in relation to the topic.

b) Teaching resources

For a good delivery of the lesson, the teacher should ensure they have the following resources or any other important teaching aids: Recommended text books, internet, and print out of activities.

c) Learning activities 12.2

The teacher helps learners to form small groups and provide books or print out to the learners. Learners work in their groups and present their findings. The expected answers to this activity 12.2 include the following.

1. Refer to the learners' Book under factors for increasing the agricultural production.
2. Refer to the learners' Book under problems affecting the agriculture in the developing countries.

Application activity 12.2

Possible answer:

1.
 - Agricultural education.
 - Reduction of population on land.
 - Cooperative farming.
 - Provision of better manure seeds.
 - Storage facilities.
 - Changes in land tenure.
 - Land consolidation.
 - Big areas of land which are lying waste.
 - Proper marketing facilities.
 - Irrigation facilities.

- Etc.
- 2. Refer to the learner's book under the lesson two, 12.2.1 factors for increasing the agricultural production.

Lesson 3: Case studies of crop growing in selected countries

a) Prerequisites/Revision/Introduction

The teacher should guide the learners to review the previous lesson using various recap games such as cabbage game and throw the ball game.

b) Teaching resources

During the teaching and learning process, the teacher will refer to the following teaching resources where possible: - Print outs for the activity - Text books - Internet - Maps and video clip.

c) Learning activity 12.3.1 on Sugar cane in South Africa and rubber grown in Liberia

Possible answers:

Guide learners to work in groups and discuss on case studies. Then the learners will make a deep research on different case studies provided in the activity **12.3.1**:

1. Refer to the learners Book under the sugarcane growing in South Africa.
2. Refer to the learners Book under the problems facing rubber growing in Liberia.

Learning Activity 12.3.2 on Coffee grown in Brazil and cotton grown in Sudan, possible answers:

1. Refer to the learners Book under the economic use of coffee to the economy of Brazil.
2. Refer to the learners Book under the conditions favouring cotton grow in Sudan.

Application activity 12.3, possible answers:

1. Refer to the learners Book under the contribution of coffee growing in Brazil.
2. Refer to the learners Book under the factors influencing coffee growing in Brazil.
3. Refer to the learners Book under the factors encouraging cotton growth in Sudan.

4. Teacher should guide learners in their discussions on measures that should be taken to deal with the challenges facing sugarcane in South Africa and rubber in Liberia.

For sugarcane in South Africa, answers include

- Advertisement of sugar and sugar products to double the market.
- Application of fertilizers to keep soil fertility and to boost productivity.
- pests and diseases are controlled by using chemicals.
- Etc.

For rubber growing, here are some possible answers:

- Spraying chemicals to minimize the rate of pest and diseases.
- Replanting and rehabilitating rubber plantation.
- Soil exhaustion can be addressed by the application of manure and artificial fertilizers.
- Areas with drought conditions can be productive by practicing irrigation to ensure continuous rubber growing.

Lesson 4: Livestock Farming

a) Prerequisites/Revision/Introduction:

There is a close relationship between crop cultivation and livestock farming thus a learner should have covered the content of the previous lesson.

b) Teaching resources

Map, Print outs for the activities, Text books, Internet, Etc.

c) Learning activity 12.4.1. on Pastoralism, possible answers:

1. Refer to the learners' book on the livestock farming.
2. Refer to the learners' book under the characteristics of nomadic pastoralism.
3. Refer to the learners' book under challenges of nomadic pastoralism.

Learning activity 12.4.2, possible answers:

1. Refer to the learners' book under the factory farming.
2. Refer to the learners' book on ways of improving livestock farming.

Application activity 12.4

Possible answers:

1.

- As long as humans exist and increase rapidly, there will be need for food and livestock products.
- nowadays, meat is important part of daily meal in some families.
- industries need raw materials from livestock products.
- there is a high demand for livestock products.
- Livestock farming is competing with other sectors of economies.
- Farmers want to maximize the productivity of their livestock.

2. The teacher should guide the learners to realize that processed food is good but sometimes it has negative results. The teacher should use this activity to emphasize the cross-cutting issue of standardization culture. The possible answers are shown below:

Positive impact:

- Well-balanced diet.
- The quality is controlled.
- There are artificial nutrients and ingredients that are added which support good health of people.
- Etc.

Negative impact

- Sometimes they are harmful when not properly manufactured.
- They need modern equipment for preservation such as refrigerators which affect man's health because of consuming cold food stuffs.
- They lose the natural flavour.
- When they expire, sometimes they become toxic.
- Etc

3. Advantages of technology in agriculture:

Possible answers:

- Modern machines can control the efforts of farmers.
- Mainly technology can reduce the time of the farmer.
- It is used to supply water according to the requirements of crops.
- Machines are useful in sowing the seeds within a short period of time.
- Due to the technology, a farmer can provide nutrients to plant on their calculated requirement.

- Irrigational technology with remote telephone.
- through technology, farmers can apply synthetic fertilizers and chemicals to increase soil fertility and control pest.
- Through modern technology, machines can be used for harvesting of crops.
- Farmers can increase the production through modifying crop.
- Facilities in online trading and E-Commerce.

Disadvantages of technology in agriculture:

- The excessive use of chemicals by the help of machines reduces the fertility of the land.
- Lack of practical knowledge; the farmers can't handle the machines properly.
- The cost of maintenance is very high. This seem to be a financial burden to the farmer.
- Overuse of machines may lead to environmental damage.
- Even if it is efficient it has many side effects and drawbacks.

4. Possible answers:

- Animals are sold to other countries for meat. This earns the country foreign exchange. For example, in Botswana, animals and animal products are the second most important export.
- It provides employment opportunities for people living in pastoral areas.
- It leads to the development of industries.
- They provide the local people with milk and meat which are a good source of protein in their diet.
- Cattle are sold to earn income which is used to pay for their basic needs. This improves their standards of living.
- Pastoralism produces raw materials for related industries like meat canning, leather industry, animal feed industry and manufacture of curios from bones and horns.
- It makes effective use of dry areas which are not useful for crop farming or settlements.

Lesson 5: Factors and problems affecting the livestock farming and ways of improving the livestock farming

a) Prerequisite/Revision/introduction

In this lesson, the authors used activities to check the understanding of learners in comparison with objectives set. The application activity 12.5 integrates learners with real experience in our environment. All activities in this lesson contribute much as they work as a diagnostic assessment.

b) Teaching resources

This lesson can be easily understood by conducting a field work, watching video related with livestock farming. As a teacher remember that planning is a key for a successful teaching activity. This should be done prior as it will help the teacher to manage the time and all learning activities.

c) Learning activities 12.5

Possible answers for Activity 12.10:

Both learning activity and application activity are all indicated in the learner's book and are purposely to help learners and teachers.

Possible answers:

1. Refer to the learner's Book on the factors influencing livestock farming.
2. Refer to the learner's Book under the problems facing livestock farming.
3. Refer to the learner's Book on ways of improving livestock farming.

Application 12.5

1. The question requires to look at the positive and negative impact of livestock on the environment. The possible answers are:

Positive impact:

- Provides manure.
- They transport the seeds of various plants from one place to another as a form of pollination.
- Etc.

Negative effects:

- Deforestation.
 - Soil erosion.
 - Pollution.
 - Etc.
2. The teacher should guide and assist learners' discussion on importance of livestock farming.
 3. Refers to the learner's book under the ways to improve livestock farming.

Lesson 6: Case studies: Ranching in Botswana, Dairy farming in Holland, Sheep rearing in Australia

a) Prerequisites/Revision/Introduction:

The present lesson has only one activity 12.7 and one application 12.7. These activities intend to assess the level of achievement and help them to understand the lesson since there is logical sequencing of lesson content.

Learning activity 12.6

Answers for this activity include the following:

1. Refer to the learner's Book under ranching
2. Refer to the learner's Book under dairy farming

Application activity 12.6

1. Wool is popular sheep product. Wool is widely used in clothing from knitwear such as socks and jumpers to cloth used for suits and costumes. It is used in the furniture trade both for making chair covers and for upholstery. Many of the better carpets produced traditionally and today are made from wool. Wool is used to fill mattresses. It is used in diverse products, such as tennis ball covers, pool table baize, and hanging basket liners.
2. The advantages of raising exotic breeds over local breeds are:
 - The exotic breeds grow faster than local breeds.
 - Exotic breeds are more productive in terms of meat than local breeds.
 - Exotic breeds enhance milk production than local breeds.
3.
 - The regular use of antibiotics affects the soil and water in turn.
 - People suffer from different diseases connected to the use of drugs.
 - Affected by climatic changes.
 - They do not withstand the harsh physical landscape of mountainous areas.
 - They are expensive to rear.
 - Etc.
4. Cattle ranching affect forests/forestry in different ways:
 - Deforestation.
 - They destroy the young plants.
 - They cause soil erosion.
 - They spread diseases and pests that affect trees.

- Etc.

7. Summary of the unit

The unit 12 of senior 5 deals with agriculture in general. The content describes different crops methods used in farming both in developed and developing countries. Emphasis on factors, challenges in agriculture, and suggest solution. Agriculture as one of the ancient activity, deals also with animals, livestock farming. This unit goes beyond and give more details about traditional and modern livestock farming in both developing and developed countries.

8. Additional information

The commune was a type of large rural organization introduced in China in 1958. They started as amalgamations of collective farms; but, in contrast to the collectives, which had been engaged exclusively in agricultural activities, the communes were to become multipurpose organizations under the direction and management conducted by local government and the management of all economic and social activity. Each commune was organized into progressively larger units: production teams, production brigades that formed the general commune.

The organization of the commune

The structure of the commune was such that households were organized into **teams**, then teams formed **brigades**, and brigades formed the **commune**. Each level of organization was responsible for certain activities: the team for organizing farm labour, the brigade for establishing small workshops and elementary schools, the commune for large-scale land reclamation projects, a hospital, a high school, small factories, and other side-line industries, as well as a welfare fund to aid the poor communities within the commune.

9. End unit assessment

The teacher guides learners to read the passage provided. Learners answer all questions in relation to the passage that reflect on entire unit.

Here are suggested answers:

1. The type of crop cultivation practiced in Gabon is shifting cultivation/ slash and burn. Slash and burn farming is a form of shifting agriculture where the natural vegetation is cut down and burned as a method of clearing the land for cultivation, and then, when the plot becomes infertile, the farmer moves to a new fresh plot and does the same again. This process is repeated over and over.

2. First, there is a dramatic increase in tropical deforestation. Deforestation may lead to changes in evapotranspiration, runoff and local climate. If it occurs in on large scale, rainfall may be decreased, therefore, global warming sets in.

Under this practice, there is disturbance and loss of habitat for wild life, an increase in air pollution and the release of carbon into the atmosphere which contributes to global climatic change; and an increase in accidental fires.

Slash and burn agriculture also results into severe soil erosion and trigger landslides, water contamination, and/or dust clouds, as without trees and vegetation and their root systems, soil washes away during heavy rains and blows away during droughts.

3. Refer to the learner's book under 12.1.3 plantation farming.

4. Possible solutions

- Tapping underground water resources by construction boreholes.
- Construction of valley dams to trap rainwater.
- Support livestock farmers by introducing regular pest and disease control through spraying, dipping and vaccination.
- Establishing milk collecting centers with cooling and refrigerated facilities to encourage trade.
- The government should make effort to change the traditional outlook of the pastoralists especially regarding cattle as a symbol of pride, wealth and prestige .

5. Measures to prevent overstocking and overgrazing in areas of pastoralism

- a. It is advisable to the farmers to minimize /reduce the number livestock. This is necessary since the number herds will not exceed the carrying capacity of local grazing land. Therefore, over stocking and overgrazing are prevented.
- b. Land use planning should be respected. The community should decide which areas will be used as farmland, grazing land or forest. Besides livestock keepers should be encouraged to reduce the number of livestock .
- c. The government should put a price on grazing on controlled areas, this means that farmers must pay an entrance fee per head of cattle before they are allowed to the grazing area. This will influence the cattle keepers to start preferring quality over quantity.
- d. Every crop farm should have a strip of grass, pasture grass along the contour of the farm. The pasture serves as a protector of the soil and as a supplement to what is missing in grazing land.

- e. An alternative method that includes feeding animals on dried and stored crop residues (from e.g. maize, beans and pigeon peas) to the livestock. Crop residues can compensate the shortage of fodder because of overgrazing.
- f. It is important for livestock keepers to make and follow common rules and limitations related to when and where to graze. Therefore, there should also be cooperation between villages sharing grazing areas.
- g. Zero grazing farming should be encouraged. The farmers can cultivate fodder grass around farmland. If they reduce the number of livestock, they can grow enough fodder to feed a few cows on their farmland. Instead of keeping a large number of underfed indigenous cows, the cattle keepers should reduce the number and have a few healthy exotic cows or crossbreeds more yielding.

10. Additional activities

a) Remedial Activities

1. Define the word agriculture

Answer: Refer to the learner's book on introduction of agriculture.

2. Distinguish large scale farming from small scale farming.

Answer: Refer to the learner's book under introduction of agriculture.

3. Identify at least 3 advantages and disadvantages of cooperative farming

Answer: Refer to the learner's book under cooperative farming.

b) Consolidation activities

1. Agriculture is classified into three broad categories. Identify them.

Answer: These are Arable, livestock and mixed farming.

2. How does commercial farming different from subsistence farming?

Answer:

- i) Commercial farming involves farming for profit. The farmer intends to grow crops or rear animals for selling. These farms can be arable, (Just growing crops), pastoral (just rearing animals) or mixed (both arable and pastoral).
- ii) Subsistence farming is a farming whose products are intended to provide for basic needs of the farmer, with little surplus for marketing/selling.

c) Extended activities:

1. What is a food insecurity?

Answer: Is the lack of basic food. This occurs when a person is unable to obtain a sufficient amount of healthy food on a day-to-day basis. Because of food insecurity, people are subjected to chronic hunger and poor nutrition. Therefore, less likely to have healthy and productive lives.

2. Suggest measures to combat this hazard in a sustainable way.

Answer:

- Providing aid and relief to people or countries that are suffering
- Making sure that domestic agriculture continues to produce what is needed
- Importing foods that cannot be produced locally and which can be attained at affordable cost.
- Eradicating inequality and poverty by introducing rural development schemes that include vocational training and the funding of farms.
- Exporting food excesses at decent prices .
- Genetically modified (GM) foods produced from genetically modified plants or animals should be introduced under recommended standards.

UNIT 13: FORESTRY IN THE WORLD

13

1. Key unit competence:

To be able to explain the impact of forests and forestry on sustainable development

2. Prerequisite (knowledge, skills, attitudes and values)

The teacher should be aware that learners already have enough information concerning forests, forestry exploitation/lumbering. He or she should design variety of reviewing activities that would reveal what the learners know about this unit. Learners should have properly covered Unit 9 of vegetation in senior one, unit 16 of forestry in Rwanda in Senior 2, unit 5 of vegetation in Africa and the world and unit 11 of forestry in Africa in senior 3. Furthermore, unit 12 of forestry in senior 4.

The teacher therefore, as he or she is planning for this unit 13, must know that there is already a lot of knowledge, skills, values and attitudes that students have developed previously in favour of forests and forest exploitation.

3. Cross-cutting issues to be addressed

Unit 13 of lumbering/forest exploitation in the world, has several cross-cutting issues that can be associated with it. Mostly the one of environment and sustainability. The teacher should therefore, enable the learners to take note of the lumbering operations. The learners need to be assisted to realise that if lumbering operations are not monitored and executed in a recommendable way, the environment is affected and eventually the climatic changes associated with global warming will occur. However, the major cross-cutting issues that the teacher can intergrate include the following:

- I. Environment and sustainability
- II. Standardization culture
- III. Inclusive education
- IV. Gender education
- V. Peace and values education

In this Unit 13, the teacher has the opportunity of addressing other cross-cutting issues such as inclusive education, peace and values education. Such may not be applied using activities, but in the process of teaching, look for an opportunity of saying something about the two CCI (Cross-cutting issues). The teacher should also incorporate in the cross-cutting issue of standardization culture when handling the concept of products from lumbering/forest exploitation. He or she must ensure that learners realize the importance of producing products of good quality that meet the recommendable standards.

4 Guidance on introductory activity

The introductory activity for unit 13 is designed to enable learners have a chance of researching on almost what is needed to cover the necessary information in relation to forestry exploitation/lumbering. The possible answers are contained therein the following guidelines:

1. The question requires the learners to deal with both positive and negative contributions of lumbering to the sustainable development of any country like Rwanda.

Therefore, the possible answers are: Refer to the learner's book under 13.1.2: importance of forest exploitation in the world.

However-side of this question should have points/answers such as:

- Environmental degradation.
- Severe soil erosion.
- Destruction of ecosystem.
- Lack of biodiversity.
- If it is over applied, there will eventually be lack of enough supply of forest products.
- Increased carbon dioxide in the atmosphere, since trees tap this gas from the atmosphere.

2. Possible answers:

Negative effects: Refer to the answers of question (1) of introductory activity of this unit 13 in this teacher's guide book. With how forested areas of the world can be conserved and protected, Refer to the learner's book under 13.2.2 forest conservation.

3. i) The major types of forests in the world include the following; Equatorial forests, monsoon forests, temperate hardwood forests, temperate soft wood forests, coniferous/Boreal forests.

ii) This question requires learners to use the characteristics of forests/vegetation of the world, studied in Unit 9 under the lesson 9.2: Forests and their characteristics.

5. List of lessons (including assessment).

	Lesson title	Learning objectives (knowledge, skills and attitudes and values):	Number of periods
1	13.1: Lumbering/ forest exploitation Importance of forests and problems affecting lumbering.	<p>Relate the economic importance of forestry in Rwanda and problems limiting forest exploitation.</p> <p>List the products of lumbering from different countries.</p> <p>Explain the importance of forestry to the economy of countries.</p> <p>Appreciate the importance of lumbering in different countries.</p>	4
2	13.2: Methods of forest exploitation/ lumbering and forest conservation measures.	<p>Identify the forest exploitation methods of different countries.</p> <p>State the conservation measures in different countries.</p> <p>Explain forest exploitation methods of different countries.</p> <p>Explain the forest conservation measures in different countries.</p>	3
3	13.3: Forestry studies in selected countries.	<p>Communicate factors influencing forest distribution and forest conservation and management in the selected countries of the world.</p>	7
4	15.6: End unit assessment	<p>Explain the impact of forests and forestry on sustainable development.</p>	1

6. Guidance on different lessons outlined above

Lesson 1: Lumbering/ forest exploitation Importance of forests and problems affecting lumbering

a) Prerequisites/ Revision /Introduction

The teacher should make use of the skills the learners gained when they studied in Unit 9 of vegetation in senior one, unit 16 of forestry in Rwanda in Senior 2, unit 5 of vegetation in Africa and the world and unit 11 of forestry in Africa in senior 3. Furthermore, unit 12 of forestry in senior 4. The only difference is that, in senior five they will look at forestry covering the entire world. This gives an allowance to the teacher to design various recap reviewing activities. He or she introduces the actual content of the lesson.

b) Teaching resources:

The lesson to be effectively taught, the teacher should ensure that the following teaching resources are in place.

- Text books.
- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.
- The global.
- Photographs of some lumbering activities taking place in various major countries of the world.
- Manila papers for group work drawing.

c) Learning activities:

13.1: Learning activity

Possible answers:

i) Lumbering.

ii) The teacher should guide students to realize that when a question is asked using the verb “assess”, one requires to go into detailed analytical approach of the phenomenon being dealt with. The possible answers, refer to the learner’s book under 13.1.3: Problems limiting forest exploitation.

iii) The ways of promoting sustainable utilization of forests resources in a country like Rwanda, refer to the learner’s book under 13.2.2: Forest conservation measures.

d) Application activities 13.1

Possible answers:

1. Refer to the learner's book under 13.1.1: Products from lumbering
2. There are ways through which lumbering can be conducted in a sustainable manner without affecting the environment include the following:
 - Cutting trees that are only mature.
 - Felling trees as well as carrying out reforestation.
 - Emphasizing agro-forestry rather than cutting down trees for purposes of getting land for cultivation of crops only.
3. Possible answers refer to the learner's book under 13.1.3: problems limiting forest exploitation. Solutions include the following:
 - Constructing better feeder roads and improving the already existing ones.
 - Selecting and marking the trees that are suitable for felling.
 - Planting quick maturing tree species.
 - Production of high quality products from lumbering.
 - Intensive and extensive advertisement.
 - Soliciting funds from financial institutions.
 - Strict laws should be enacted against improper and non-sustainable methods of forest exploitation.
 - Use the appropriate technology.
 - Mechanization of lumbering operations to fill the gap of shortage of labour supply.
 - Hiring experts from neighbouring countries.
 - Constant patrols and constructing fire outbreak detecting watch towers.
 - Planting tree varieties that can withstand harsh climatic conditions.

Lesson 2: Methods of forest exploitation/lumbering and forest conservation measures

a) Prerequisites/ Revision /Introduction

The teacher should review the previous lesson using various techniques at his or her disposal.

b) Teaching resources:

- Text books.
- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.

- The global.
- Photographs of some methods of forest exploitations/lumbering and forest conservation measures in various major countries of the world.
- Manila papers for group work drawing.

c) Learning activities:

Learning Activity 13.2

Possible answers:

- Refer to the learner's book under 13.2.1: methods of forest exploitation/lumbering and conservation measures.
- Refer to the learner's book under 13.2.2: Forest conservation measures.

Application activities 13.2

Possible answers

- Refer to the learner's book under 13.2.2: Forest conservation measures.
- Mass education, enacting strict laws, agro-forestry, zero grazing, establishment of forest reserves.
- Refer to the learner's book under 13.3: Methods of forest exploitation.

Lesson 3: Forestry studies in selected countries

a) Prerequisites/ Revision /Introduction

The teacher should make preview of the previous lesson using/asking learners to give a recap of what was covered. Then, he or she introduces the lesson with a short activity that can enable learners to connect to the lesson at hand. This activity may be in form of a game such as, cabbage game, or throw the ball. Thereafter, the teacher uses the learning activity provided in the learner's book (Activity 13.3) .

b) Teaching resources:

- Text books.
- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.
- Photographs of forest exploitation in various countries of the world especially those under case studies.
- Manila papers for group work drawing.

c) Learning activities:

Possible answers for learning activity 13.3:

Refer to the learner's book under 13.1: Forestry case studies in selected countries.

Refer to the learner's book under 15.3: Factors affecting mineral exploitation.

d) Application activity: 13.3

Possible answers:

1. Refer to the learner's book under 13.3: Forestry case studies in selected countries.
2. Refer to the learner's book under 13.3: Forestry case studies in selected countries.

7. Summary of the unit

Unit 13 forestry deals with the major types of forestry in the world and their characteristics, factors influencing the forest distribution, importance of forests and problems affecting lumbering, products from lumbering, its importance and problems, methods of forest exploitation and forest conservation. At the end there are case studies such as forestry in Gabon, Scandinavia, and British Columbia.

8. Additional information

When the teacher is talking about characteristics of forests in lumbering or forest exploitation, he/she is requested to guide learners by referring them to another unit closely related and similar to forests in the world.

9. End unit assessment

2. Possible answers:

i. Refer to the learner's book under 13.1.2: importance of forest exploitation in the world.

ii. Possible answers: This question requires the learners to look at the positive and negative impact.

Positive impact: refer to the learner's book under 13.1.2: importance of forests and forest exploitation in the world.

Negative impact: Refer to the answers of introductory Activity, however-side in the teacher's guide book under unit 13 lumbering in the world.

iii. The answers for this question are embedded in the forest conservation measures, refer to the learner's book under 13.2.2: Forest conservation measures.

10. Additional activities

a. Remedial activities:

1. Distinguish between forest and forestry:

Possible answers:

Forest refers to a community of trees growing in a given area either artificially or naturally. Forestry: Refer to the learner's book after the Unit introductory Activity.

2. Explain how forested areas in your country are being conserved and protected.

Possible answers:

Refer to the conservation measures 13.2.2 in the learner's book.

b. Consolidation activities

To what extent is agro-forestry a solution to depletion of forests in the world? Discuss.

Possible answers:

Agro-forestry:

- Increases the number of trees existing.
- Reduces the increased population pressure on forested areas.
- Provides raw materials to human beings, which would otherwise be attained from forests.
- Enables mankind to get income hence addressing the challenge of poverty that pushes people to cut down trees from the forests for charcoal or fire wood.

However, agro-forestry is not the only single solution to depletion of forests in the world, there are other forest conservation measures. Possible answers refer the learner's book under 13.2.2 Forest conservation measures.

c. Extended activities

The effective exploitation of tropical rainforests has been majorly hindered by human factors. Discuss.

Possible answers:

This question requires the learner to first agree with the statement by showing how human factors have hindered effective exploitation of tropical rainforests. Therefore, look at physical factors on the however-side.

Human factors:

- Poor transport.
- Shortage of enough market.
- Poor methods of forest exploitation.
- Inadequate capital.
- Political instabilities.
- Limited research and studies in relation to forest exploitation/lumbering.
- Stiff competition.
- Lack of improved technology.
- Fire out breaks caused by man.
- Inadequate labour supply.
- Etc.

Physical factors:

- Trees do not appear in pure stands.
 - Trees take long to mature.
 - Harsh climatic conditions such excessive rainfall.
 - The bulky hardwood that can hardly float on water.
 - The existence of buttress roots.
 - Fire-out breaks caused by lightening.
 - Prolonged drought in some seasons.
 - Diseases and pests.
 - Flooding.
 - Land slides.
2. Assess the contribution of mining to China's economy.

Possible answers

The question requires both positive and negative contributions:

Refer to the learner's book 5.4.1: Positive effects of mining to the economies of the world and 15.4.2: The negative effects of mining to the economic development of the countries of the world



UNIT 14: FISHING IN THE WORLD

14

1. Key unit competence

The learners should be able to explain the impact of fishing on the sustainable development of different countries of the world.

2. Prerequisite (knowledge, skills, attitudes and values)

Unit 17 of Senior one dealt with fishing in Rwanda at a broader basis, Unit 12 of Senior three introduced fishing in Africa. In both classes learners studied the definition of key concepts involved in the studying of fishing as the sector of the economy. The learners further had a chance of looking at, major fishing grounds of Rwanda, Africa which gave a highlight on varying types of fisheries in the world.

Even though the two units (Unit 17 of S2 and Unit 12 of Senior 3) only dealt with Rwanda and Africa, still this provides a solid foundation upon which learners can base on to understand clearly fishing on the world general perspective. Furthermore, the learners should have covered all the aspects of fishing such as: types of fish and fishing, factors influencing the development of fishing, importance of fish and fishing, problems or challenges affecting fishing, fish and fish-product conservation measures.

In the learner's book under this Unit 13, there is an introductory activity that almost covers most of the concepts to be dealt with in the entire unit.

3. Cross-cutting issues to be addressed

There are several cross-cutting issues that can be emphasized while guiding learners to understand/or studying the unit of fishing in the world. The most looked at cross-cutting issues are:

- Environment and sustainability.
- Financial education.
- Inclusive education.
- Gender education.
- Standardization culture.

In this Unit, the teacher should be able to realize that the fishing operations affect the environment if it is not used well in a sustainable manner. Therefore, learners should

be assisted to take note of, use of better and recommendable fishing methods. The afforestation and reforestation are also needed to replace the cut trees used in the making of boats.

The fishing industry produces fish and fish-products that need to be sold. The teacher can use this as a chance of creating activities that can help the learners realize the importance of financial education. The products produced from the fishing industry must be of excellent quality and meeting the international standards. This emphasizes the cross-cutting issue of Standardization culture. Inclusive education must also be taken care of by the teacher as he or she is teaching and guiding learners throughout Unit 14.

4. Guidance on introductory activity

There is an introductory activity at the beginning of Unit 14 of fishing in the world. This activity has a sketch map of East Africa that shows water bodies that are used for fishing. The activity has questions that require answers from the learners.

The important aspect of this activity is that, the teacher can use it to task learners with research work, or do the activity in partial form, however, in line with the content supposed to be covered.

The possible answers for the introductory activity are shown below:

a)

- Inland fishing grounds.
- Marine fishing grounds.
- Utilization of water bodies in a sustainable manner.

b) i) Fishing

ii)

- South East Pacific.
- North West Pacific.
- North West Atlantic.
- North East Pacific .
- North East Atlantic .
- East African fishing grounds.
- The African marine fisheries.

c) Use of modern fishing methods as indicated in the learner's book under 14.2.1: Methods used in fishing.

d) It is flourishing because of favourable factors. Refer to the learner's book 14.3 the factors influencing the development of fishing. That of East Africa is not developed because of the challenges faced by the development of fishing sector. Refer to the learner's book under: 14.5.1: Problems affecting fishing.

e) Lessons drawn base on the level of modernization of fishing operations studied under the case studies in the learner's book (14.8.2: Japan) .

f) Implications of fishing industry to the physical environment:

- Deforestation.
- Pollution.
- Over-fishing.
- Over-fishing.
- Off-balancing the eco-system.
- Etc.

Measures for sustainable fishing operation:

- Use of discriminative fishing methods.
- Strict laws.
- Research and studies.
- Re-afforestation.
- Afforestation.
- Restocking inland waters with exotic breeds.
- Training of man power.
- Etc.

5. List of lessons (including assessment).

	Lesson title	Learning objectives (knowledge, skills and attitudes and values)	Number of period
1	14.1: The major fishing grounds of the world.	<ul style="list-style-type: none"> Identify the major marine fishing grounds. Clarify the major the location of major fishing grounds. Show respect for the fishing grounds of the world. 	2
2	14.2: Methods used in Fishing and Types of fish and fishing in the world.	<ul style="list-style-type: none"> Outline the different methods of catching fish. Describe the methods of catching fish. Understand the methods of fishing used for inland and marine fisheries. 	2
3	14.3: Factors influencing development of fishing	<ul style="list-style-type: none"> Out line the factors favouring fishing Explain the factors influencing the development of fishing. 	1
4	14.4: Importance of fish and fishing.	<ul style="list-style-type: none"> State the importance of fish and fishing. Assess the contribution of fishing to the economic development. Appreciate the importance of fishing to the economic development of some countries. 	1
5	14.5: Problems affecting marine fisheries and Solutions	<ul style="list-style-type: none"> List the problems of fishing in the world Explain the problems of fishing. Show concern to the problems affecting fishing and call for fish conservation. 	2
6	14.6: Future prospects and problems of inland fisheries.	<ul style="list-style-type: none"> Explain the problems of fishing and suggest the future prospects. 	1
7	14.7: Fish conservation and preservation.	<ul style="list-style-type: none"> State the methods of conserving and preserving fishes. Explain the methods used to conserve fishes in the world. Call for fish conservation measures. 	2

8	14.8: Case studies: Norway (North East Atlantic). Japan (North West Pacific). Peru (South East Pacific). Morocco (West Africa). South Africa (South East Atlantic)	<ul style="list-style-type: none"> Explain fishing in the selected countries of the world. 	6
9	14.9: End unit assessment	The teacher should know that the main object for end unit assessment is to determine or evaluate whether the key unit competence was achieved. However, it may have other objectives on another hand.	1

6. Guidance on the lesson outlined above

Lesson 1: The major fishing grounds of the world

a) Prerequisites/ Revision /Introduction

The lesson title; the major fishing grounds of the world entails some aspects that are directly related to what the learners studied in senior 3. Therefore, students should be guided on how they can exercise the transfer of learning or knowledge and skills developed, to expand their learning experience to include the major fishing grounds of the world.

The teacher is therefore, entrusted with the responsibility of designing prior Activities that can influence the learners to revisit and study the work of unit 12 of senior 3 that deals with fishing in Africa. This will enable both the teacher and the students to build new content related to major fishing grounds of the world on such basis. Therefore, it is vital to guide the learners to revise or review both the unit 17 of fishing in Rwanda and unit 12 of fishing in Africa of Senior 3.

b) Teaching resources:

The lesson to be effectively taught, the teacher should ensure that the following teaching resources are in place.

- Text books.

- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.
- The global.
- Photographs of some fishing activities taking place in various major fishing grounds of the world.
- Manila papers for group work drawing.

c) Learning activities:

The teacher should use various techniques that facilitate the execution or use of learner centered instructional approaches. The learning activity 14.1 has questions that learners need to find appropriate responses to. The possible answers include:

- 1) Fishing as the chief activity.
- 2) Refer to the learner's book under the factors influencing the development of fishing.
- 3) Refer to the learner's book under 14.1.1 the major fishing grounds of the world.
- 4) It is the fishing village where the available business opportunities are directly related to fishing or water resources.

- Pollution.
- Congestion.
- Deforestation.
- Over fishing.
- Etc.

d) Application activities

The application Activity requires the learner to use the map of the world provided to locate the major fishing grounds.

- 1) The teacher should guide the learners to use the Atlas book and the learner's book under 14.1.1 Major fishing grounds of the world.
- 2) Refer to the learner's book under 14.1.1 Major fishing grounds of the world.
- 3) The ways of ensuring that there are sustainable fishing practices are:
 - Use the selective and recommendable methods of fishing.
 - Restocking the over fished areas.
 - Mass education.
 - Research and studies.
 - Etc.

Lesson 2: Methods used in Fishing and Types of fish and fishing in the world

a) Prerequisites/ Revision /Introduction

The teacher should ask learners to talk about the methods of fishing and types of fish in relation to the topic of fishing they studied in senior 3 and senior 4.

b) Teaching resources:

- Photographs of fishing methods and fish.
- Text books.
- Video clip.
- Charts.
- Etc.

c) Learning activities:

The learners are expected to answer the learning activity 14.2 using the following:

1) Refer to the learner's book under 14.2.1 methods used in fishing and types of fish in the world.

2) Figure A is used to catch the demersal fish.

- The trawl net is pulled by the boat or ship.
- Figure B the net is suspended in the water.
- Used to get pelagic fish.

d) Application activity 14.2

1. The government is concerned because:

- Water resources are not used in a sustainable way.
- Fishermen are using uncommendable fishing methods.
- Illegal fishing methods.
- Risk of over fishing that may lead to depletion of fish.
- Fishing companies produce inferior quality fish.
- There is a ready demand for fish and fish-products, so the government wishes to tap that opportunity.
- Etc.

2. This method needs to talk about poor methods of fishing such as, poisoning, non-discriminative fishing nets/spear/etc.

3. Refer to the learner's book under 14.2.1 methods used in fishing especially the modern methods.

Lesson 3: Factors influencing development of fishing

a) Prerequisites/ Revision /Introduction

The teacher should make preview of the previous lesson using/asking learners to give a recap of what was covered. Then, he or she introduces the lesson with a short activity that can enable learners to connect to the lesson at hand. This activity may be in form of a game such as, cabbage game, or throw the ball. Thereafter, the teacher uses the learning activity provided in the learner's book (Activity 14.3)

b) Teaching resources:

To achieve learning objectives, the following resources should be in place.

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Etc.

c) Learning activities:

Possible answers:

1) The teacher should guide the learners to interpret the demands of the question. Facilities such as print outs, text books, ICT tools and others should be available. The answers to this question are related to: Refer to the learner's book under 14.3: Factors influencing the development of fishing in the world.

2) This question requires the learners to look at the factors that favour the development of fishing activities. Refer to learner's book under 14.3: factors influencing development of fishing.

3) The teacher should guide learners on question approach. Learners must look at physical factors thereafter, talk about human factors. The teacher need to remind the learners of the structure of an essay; introductory part, main body and logical conclusion.

d) Application activities

Possible answers and guideline:

1) The teacher should guide the learners to interpret the demands of the question. The statement shows that the Rwandan fishing sector is still having challenges that make it not to be more productive as expected. Therefore, the answers for this question are:

- Shortage of large water bodies.
- Lack of required advanced fishing methods.
- Inadequate capital.
- Shortage of skilled labour.
- Etc.

2) The question of “Account for” need the learners to give the causes. Such as those of deficiency performance of fishing in Rwanda.

Possible answers:

- Unfavourable government policies.
- Silting.
- Shortage of labour force.
- Wars and political misunderstandings.
- Predators.
- Lack of better forms of transport.
- Shortage of enough capital.
- Inadequate technology.
- Etc.

Lesson 4: Importance of fish and fishing

a) Prerequisites/ Revision /Introduction

Review the previous work covered by asking learners to think, pair and share what they learnt from the previous lessons about fishing. Later the teacher should guide the learners in finding the responses to the learning activity 14.4.

b) Teaching resources:

To achieve learning objectives, the following resources should be used.

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Photographs of fish products.
- Etc.

c) Learning activities:

The possible answers for learning activity 14.4:

(i) Refer to 14.4.1 Importance of fish and fishing in the learner’s book.

(ii) Economic implications of fishing on the development of a country from N.W pacific involve positive effects/contributions and thereafter, learners look at the negative contributions. Refer to the learner's book: 14.4.1: Importance of fish and fishing and 14.1.1: major fishing grounds

The negative implications include:

- Over fishing.
- Pollution.
- Deforestation.
- Affect the eco-system.
- etc

d) Application activities

Possible answers:

1. Guide learners to look at the business or economic opportunities available such as abundant water bodies, favourable government policies, availability of market, presence of better forms of transport etc.
2. Refer to the learner's book 14.4.1 importance of fishing and answers for learning activity 14.4 question 2 where the negative implications are explained in the Teacher's guide book.

Lesson 5: Problems affecting marine fisheries and Solutions

a) Prerequisites/ Revision /Introduction

The teacher should task the learners with a short exercise that involves throwing-ball game method, where each learner, once he/she receives the ball mentions a problem affecting fishing. The one that follows provides the suggested solution. This will enable both the teacher and the learner to preview the information related to fishing studied earlier in other classes. Such as in Senior 2,3, and 4.

b) Teaching resources:

In order to achieve learning objectives, the following resources should be used:

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Photographs representing some of the problems affecting fishing.
- Etc.

c) Learning activities:

The teacher should guide the learners to realize that fish died and were not fished. This means that the teacher can use this activity to relate the fishing to the cross-cutting issue of environment and sustainability. The major cause of death is pollution which is one of the serious problems. The possible answers:

1. Refer to the learner's book 14.5.1: Problems affecting marine fisheries and solutions.
2. Refer to the learner's book 14.5.1: Problems affecting marine fisheries and solutions.
3. Problems caused by fishing and possible solutions:

Problem caused by fishing	Suggested solutions
Over fishing/depletion of fish	Restocking the over fished water bodies.
Pollution	Cleaning the polluted water bodies/enacting strict laws against pollution of all kinds.
Off-balancing the ecosystem	Regulated fishing operations.
Deforestation because of need for ship building materials, smoking fish, etc.	Re-forestation/afforestation.

d) Application activities 14.5

Possible answers:

1. The question requires the learners to apply the studied content under this unit 14 and about senior four unit 13 of fishing to design and point out ways that can be put in place to improve fishing in Rwanda. Some of the answers include:
 - Improving fishing methods.
 - Construction of feeder roads from fishing villages to market centers.
 - Restocking of overfished water bodies.
 - Restoration and protection of water sheds.
 - Emphasizing cage fishing.
 - Etc.
2. The learners should be able to apply and relate the content under 14.5 problems affecting marine fisheries and solutions, to find the appropriate answers for the question. Refer to the learner's book under 14.5.

Lesson 6: Future prospects and problems of inland fisheries

a) Prerequisites/ Revision /Introduction

The teacher should assist the learners to know the interpretation of the term future prospects. It is very crucial for the learners to understand what the activity requires. The learners must have at least studied and completed the topic of fishing in Senior 4, senior 3 and senior 2.

b) Teaching resources:

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Etc.

c) Learning activities:

Learning activity 14.6

Possible answers:

1. The learners should realize that the two photographs are representing fishing methods. The first to the right is a traditional fishing method while the one to left is a modern fishing method. Therefore, the future prospects need to include transforming from traditional fishing methods to implementation of modern ones.
2. Refer to the learner's book 14.6.2: Problems affecting inland fisheries of the world.
3. Refer to the learner's book under 14.6.2: future prospects of inland fisheries.

d) Application activities 14.6

Possible answers:

This question requires the learner to apply the content studied under unit 14 (14.6.2: Future prospects of inland fisheries).

Lesson 7: Fish conservation and fish preservation

a) Prerequisites/ Revision /Introduction

The teacher should engage the learners into a reviewing activity that diagnoses what they may be knowing about fish conservation and fish preservation. The teacher should know that this is not the first time the learners are studying the concept under this lesson title.

b) Teaching resources:

The teacher should prepare the teaching learning resources in advance so that effective teaching-learning exercise can take place. These resources will enable the instructional objectives to be achieved.

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Etc.

c) Learning activities:

Learning activity 14.7

Possible answers:

The passage aims at the learners to be able to use various skills to find answers on their own. The possible answers are:

1.

(i) “The fishermen and fishing cooperative societies are being trained on how to store their fish products for a reasonable time”. This represents fish preservation.

(ii) “Around Lake Victoria, some measures have been adopted to protect the waters and aquatic animal more specific fish”. This represents fish conservation.

2. Refer to the learner’s book 14.7: Fish conservation and fish preservation.

d) Application activities 14.7

1. Refer to the learner's book 14.7: Fish conservation and fish preservation.
2. This calls for the learners to realize that some of the methods affect.
 - Smoking of fish that causes air pollution.
 - Deforestation because of the need for firewood.
 - Cans used are just thrown away anyhow after use.
 - Etc.
3. The learners are expected to use the fish conservation methods to ensure that there is sustainable fishing. 14.7: Fish conservation and fish preservation. The teacher is advised to borrow some points from the future prospects indicated in the learner's book under 14.6.2: future prospects of inland fisheries.

Lesson 8: Case studies

a) Prerequisites/ Revision /Introduction

Preview the previous lesson, through engaging students in group discussions.

b) Teaching resources:

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Etc.

c) Learning activities 14.8.

Possible answers:

1. The learners should first show the physical factors and give however-side of other factors: Refer to learner's book 14.8.1 Fishing in Norway.
2. Refer to the learner's book under 14.4.1 Importance of fish and fishing.
3. Refer to the learner's book under 14.8.4 and 14.4.5.

d) Application activity 14.8

Possible answers:

1. The learners should know that Norway has favourable factors that have contributed to the development of her fishing sector and the Norwegian economy is more developed than that of Rwanda. One is a developed country and another represents a developing one. Refer to the learner's book under 14.8 case studies.
2. The teacher should guide the learners to draw some good fishing practices from the case studies learnt that can support the development of fishing in Rwanda.

Possible answers:

- Use of improved fishing methods.
- Use of modern technology.
- Intensive research and studies.
- Investing huge sums of capital.
- Etc.

7. Summary of the Unit:

This unit entirely deals with fishing in the world. Under this concept there are sub topics, such as the major fishing grounds of the world, the inland fisheries, inland fishing grounds, methods of fishing, types of fish and fishing, factors influencing the development of fishing, fish conservation measures, and case studies.

8 Additional Information:

The learners should be reminded of the connectivity between the Unit 13 of fishing Senior 5 with fishing unit of senior 2, 3 and senior 4.

The learners should again be helped to realize that the factors and challenges related to fishing in the world cut across several case studies. Therefore, the teacher should create activities that may evoke the learner's transfer of learning/knowledge and skills.

9. End unit assessment

- 1) This question needs the learners to look at advantages and disadvantages of fishing/positive and negative contributions of fishing to the sustainable development of the country chosen. Refer to the learner's book 14.4.1 importance of fish and fishing and answers for learning activity 14.4.1 question 3 in the teacher's guide book.

2) Possible answers:

The teacher should guide learners to interpret the question properly. This question needs to be answered in this form, first talk about the physical factors and thereafter, show other factors. Refer to the learner's book under 14.8. case studies.

10. Additional Activities

a) Remedial activities.

(1) Define fishing.

Possible answer:

Fishing refers to the harvesting of aquatic animals from seas, oceans, lakes and other water bodies for either subsistence or commercial purposes.

(2) Giving examples, identify the major fishing grounds of the world.

Possible answers:

Refer to the learner's book 14.1.1: The major fishing grounds of the world.

(3) Using relevant examples, distinguish between marine and inland fisheries

Possible answers:

Refer to the learner's book under 14.1.1: The major fishing grounds of the world and 14.1.2: The inland freshwater fishing grounds.

b)Consolidation activities

Evaluate the environmental implications of fishing operations on man's surrounding.

Possible answers:

Refer to the learner's book under 14.4.1: Importance of fish and fishing. However, this question requires the student to look at the negative contributions of fishing such as:

- Deforestation as fishermen are looking for timber, firewood etc.
- Pollution.
- Over fishing.
- Destabilizing the ecosystem.
- Reduction of biodiversity.
- Etc.

c) Extended activities

To what extent is climate responsible for the development of fishing in the world?

Possible answers:

This question requires to first show how climate is responsible for the development of fishing in the world. Thereafter, the learners have to talk about other factors.

Influence of climate responsible for the development of fishing in the world:

- Provides rainfall that enables the formation of water bodies.
- Regulates temperatures that are favourable to fish metabolism.
- Supports forest growth which provide timber and fire wood needed by fishermen.
- Creation of rivers and swamps that support inland fresh water bodies.
- The sunlight that penetrates to the sea bed supports the growth of plankton needed by fish.
- Ideal temperatures that are warm make the fishing grounds open and ice free throughout the year which favours fishing operations.

However, there are other factors. That is, climate is not a single factor that is responsible for the development of fishing in the world: For this side refer to the learner's book under 14.3: Factors influencing development of fishing.



1. Key unit competence:

To be able to explain the impact of Mining on sustainable development of different countries in the world.

2. Prerequisite (knowledge, skills, attitudes and values)

Unit 15 of Mining senior 5 requires the students to have at least successfully covered the content under Senior 2, unit 18, senior 3 unit 13 and senior 4 unit 14. Therefore, the teacher should realize that the three units provide the prerequisite knowledge to the students. This implies that learners can participate conveniently in the teaching and learning of this unit.

3. Cross-cutting issues to be addressed

Unit 15 of mining in the world is directly connected to the cross-cutting issue of environment and sustainability. The teacher should therefore, enable the learners to realize that if mining operations are not monitored and executed in a recommendable way, the environment is affected and eventually the climatic changes associated with global warming will set in. However, the major cross-cutting issues that the teacher can integrate include the following: cross-cutting issues are:

- Environment and sustainability.
- Standardization culture.
- Inclusive education.
- Gender education.
- Peace and values education.

In this Unit, the teacher has the mandate of emphasizing other cross-cutting issues such as inclusive education, peace and values education. Such may not be applied using activity but in the process of teaching, look for an opportunity of saying something about the two CCI (Cross-cutting issues).

4. Guidance on introductory activity

The introductory activity for this unit covers almost the 95% of the content that falls under this lesson. It has questions that students should answer. The possible answers are contained therein the following guideline:

- a) The economic activity taking place in the photographs is mining.
- b) Refer to the learner's book 15.2: Methods of mining.
- c) Refer to Table 15.1: World minerals and their location under 15.1
- d) Refer to the learner's book under 15.3: Factors affecting mineral exploitation.

5. List of lessons (including assessment).

	Lesson title	Learning objectives (knowledge, skills and attitudes and values):	Number of periods
1	15.1: World distribution of major minerals.	Identify the distribution of minerals in the world. Locate the major minerals of the world on a map.	1
2	15.2: Methods used for mining.	List the methods used for mining in the world. Explain the methods used for mining.	4
3	15.3: Factors affecting mineral exploitation.	State the factors affecting the mineral exploitation. Describe the factors affecting the mineral exploitation.	1
4	15.4: The effects of mining to the economies of the world.	Outline the effects of mining to the economies of the world. Explain the effects of mining to the economy of a country. Appreciate the importance of minerals for the sustainable development of different areas of the world.	1
5	15.5: Case study: - U.S.A - Russia - China - Middle East - Nigeria - South Africa - Zambia	Explain mining in relation to the selected countries.	8
6	15.6: End of unit assessment	Explain the impact of mining on the sustainable development of different countries of the world.	1

6. Guidance on the lessons outlined above

Lesson 1: World distribution of major minerals.

a) Prerequisites/ Revision /Introduction

The teacher should take note of the skills the learners must have acquired from the three levels (Senior 2, unit 18, senior 3 unit 13 and senior 4 unit 14), where they covered a lot in relation to the mining sector. The only difference is that, in senior five they will look at mining in a broader manner covering the entire world.

This provides the teacher the chance of creating various activities, where the learners can be engaged in the introductory session, using the past studies. Here the teacher can design activities using methods of recap such as, Mind mapping, run to your friend, speed betting, throw the ball game, cabbage game and many others.

Thereafter, the teacher introduces the actual content of the lesson. This will have enabled the students to review and remember the information about mining. Therefore, when well executed the instructional objectives of the lesson are achieved.

The teacher should be observant to identify students that may have not covered the appropriate information concerning mining in their previous school/levels.

b) Teaching resources:

The lesson to be effectively taught, the teacher should ensure that the following teaching resources are in place.

- Text books.
- The world maps.
- Drawing materials such as pencils, coloured markers and flip papers.
- The globe
- Photographs of some mining activities taking place in various major parts of the world.
- Manila papers for group work drawing.

c) Learning activities 15.1:

1. Part (a) of the learning activity needs the learners to use an atlas book to know the countries where minerals indicated on the base map of the world provided in the learner's book are located. The answers therefore, can be in line with the table 15.1 and figure 15.2.

1. Refer to the learner's book table 15.1.

- Use of appropriate and recommended methods of mining.
- Emphasizing underground mining methods.
- Planting trees where or around the mining centers.
- Filling the pits or the depleted scars with soil and restored to sustain vegetation growth again.
- Specific and waste management implemented.
- Licensing the right mining companies.
- Use of metallic bars or materials instead of timber and wooden poles.

d) Application activities 15.1

The appropriate answers include:

1. Tin is found in the following areas outside Rwanda:

- China.
- Malaysia.
- Indonesia.
- Thailand.

Colten: This mineral can be found in the following countries:

- Egypt.
- Ethiopia.
- Nigeria.
- Ghana.
- Mozambique.
- DRC.
- China.
- Thailand.
- Malaysia.
- Canada.
- Colombia.
- Venezuela.

2) Refer to table 15.1 showing a list of minerals in the learner's book.

3) Refer to senior 4 geography book: Achievers geography for Rwandan schools page 287 figure 14.2.

4) Refer to the learner's book under Figure 1: The world map showing the distribution of major minerals.

Lesson 2: Methods used for mining.

a) Prerequisites/ Revision /Introduction

The teacher should ask learners to talk about the methods of mining in relation to the topic of mining they studied in senior 2, 3 and senior 4. The teacher can use various techniques of enabling or evoking learners to think harder about the methods of mining.

b) Teaching resources:

- Photographs of mining methods.
- Text books.
- Video clip.
- Charts.
- Etc.

c) Learning activity 15.2

The learners are expected to answer the learning activity 15.2 using the following

1) Refer to the learner's book under 15.2 methods of mining.

2)

- Deforestation.
- Soil erosion.
- Mass wasting.
- Removal of fertile soils that would support vegetation.
- Reduction of biodiversity.
- Off balancing the ecosystem.
- Environmental degradation.

d) Application activities 15.2

1) Figure A: Oil/gas drilling.

Figure B: Open cast mining.

Figure A-represents the drilling of oil/gas from off shore. This is a mining method used to extract minerals that are in a liquid or gaseous form. While Figure B: shows an open cast mining that is used to exploit minerals that are near or at the earth's surface.

2) Refer to the learner's book 15.2. Methods of mining.

3) Refer to the answers provided in part (ii) of 15.2 in the teacher's guide book.

Lesson 3: Factors influencing development of fishing.

a) Prerequisites/ Revision /Introduction

The teacher should make preview of the previous lesson using/asking learners to give a recap of what was covered. Then, he or she introduces the lesson with a short activity that can enable learners to connect to the lesson at hand. This activity may be in form of a game such as, cabbage game, or throw the ball. Thereafter, the teacher uses the learning activity provided in the learner's book (Activity 15.3).

b) Teaching resources:

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Etc.

c) Learning activities:

Possible answers for learning activity 15.3:

- 1) Refer to the learner's book under 15.3 factors affecting mineral exploitation.
- 2) Refer to the teacher's guide under the answers for question 2 of learning Activity 15.2.

d) Application activity: 15.3

Possible answers and guideline:

- 1) This question calls for the learners to explain the factors that have caused low levels of mineral exploitation in the developing world. These include the following:
 - Shortage of enough capital.
 - Inadequate labour supply.
 - Mineral deposits appear in small sizes.
 - Political upheavals.
 - Shortage of enough power and energy.
 - Unfriendly government policies.
 - Lack of required technology.
 - Lack of enough market.
 - Most of the large deposits occur deep underground.
 - Etc.

- 2) This question needs to first dealing with showing how the mode of occurrence influences exploitation of minerals in DRC. Thereafter, the however-side is indicated explaining other factors:

Possible answers:

The mode of occurrence of the ore influences mineral ore exploitation in the following ways:

- The mineral ore occurring near the earth's surface are easily extracted at reasonable costs.
- Determines the mining method to be used.
- Determines the cost of mining operations.
- Influences the type of technology required.

However-side, the learners are expected to look at other factors that influence the exploitation of mineral ores. Refer to the learner's book under 15.3: Factors affecting mineral exploitation.

Lesson 4: The effects of mining to the economies of the world

a) Prerequisites/ Revision /Introduction

The teacher should review with the students the content of the previous lesson. This calls for the students to be engaged in recap activities. Thereafter, as per the lesson plan made by the teacher, the lesson is introduced. The teacher should use the learning activity 15.4 contained therein the learner's book.

b) Teaching resources:

To achieve learning objectives, the following resources should be used.

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Photographs of fish products.
- Etc.

c) Learning activity 15.4

The possible answers for learning activity15.4:

- 1) The research findings expected from learners, rotate around what is indicated in the learner's book 15.4. the effects of mining on the economies of the world.

2) Refer to answers for question 3 indicated in the teacher's guide for application Activity 15.2.

d) Application activities 15.4

Possible answers:

- 1) Refer to geographical sources of information specifically Senior four textbook.
- 2) The question requires to tackle both positive and negative effects of mining in reference to Rwanda. For the answer, refer to the learner's book 15.4.1 and 15.4.2.

Lesson 5: Case study (U.S.A – Russia - China - Middle East - Nigeria - South Africa – Zambia).

a) Prerequisites/ Revision /Introduction

The teacher should task the learners with a short exercise of throwing the game, where each learner once he/she receives the ball mentions something about mining in either china, USA, Nigeria, South Africa or Middle East. The teacher therefore, introduces the lesson using learning activity 15.5 indicated in the learner's book.

b) Teaching resources

In order to achieve learning objectives, the following resources should be used:

- Text books.
- Video clip.
- World maps.
- Maps of the country to be studied.
- Charts.
- Manila papers.
- Photographs representing some of the problems affecting fishing.
- Etc.

c) Learning activity 15.5:

- 1) Refer to the learner's book under 15.5 case studies.
- 2) Refer to the learner's book under 15.5 case studies.
- 3) Refer to the learner's book under 15.4.1 and 15.4.2.

d) Application activities 15.5

Possible answers:

- 1) Refer to the learner's book under 15.3: Factors affecting mineral exploitation and 15.5: Case studies.
- 2) The teacher should guide learners on how USA is using sustainable methods of mining without greatly affecting the environment. Therefore, this calls for a proper research on what USA does in relation to mining. Thereafter, the learners should be assisted to see what can be good help to the country of Rwanda.

7. Summary of the unit

This unit 15, deals with the world distribution of minerals, methods of mining, factors affecting mineral exploitation, the effects of mining to the economies of the world and case studies (USA, Russia, China, Middle East, Nigeria, South Africa and Zambia).

8. Additional information

The teacher is supposed to guide the learners on the case studies. Most of the case studies such Russia and China share factors that have influenced the growth and development of mining. Therefore, the learners should be guided on how to execute transfer of knowledge and skills to find responses to any associated learning activity or any other assessment task subjected to them.

9. End unit assessment

- 1) Refer to the learner's book under 15.4.1 and 15.4.2: The effects of mining.
- 2) Challenges likely to be faced:
 - Shortage of clean and safe water for domestic use.
 - Non-productive soils.
 - Spread of diseases.
 - Increased number of deaths.
 - Loss of well-balanced eco-system.
 - Lack of biodiversity.
 - Degradation of the environment.
- 3) The program can include the following:
 - Registration and of all mining companies.
 - Afforestation and reforestation of areas around the mines.
 - Mass education.
 - Environmental impact assessment reports should be made.
 - Exploit minerals that require underground methods of mining.

4) The environmental concerns associated with mining:

- Deforestation.
- Soil erosion.
- Mass wasting.
- Removal of fertile soils that would support vegetation.
- Reduction of biodiversity.
- Off balancing the ecosystem.
- Environmental degradation.

10. Additional activities

a) Remedial activities:

1) Describe the distribution of minerals in the world.

Possible answers refer to the student's book.

2) Give the suitable methods of mining for the following minerals:

- i) Gold.
- ii) Diamond.
- iii) Petroleum.

Possible answers:

- 1) Panning.
- 2) Panning/placer mining.
- 3) Drilling.

b) Consolidation activities

1) To what extent is mining beneficial to Nigeria's economy?

Possible answers:

Refer to the learner's book under 15.4.

2) Give five factors that favour the development of mining in the USA.

Possible answers:

Refer to the learner's book under 15.5: Case studies.

c) Extended activities

1) Evaluate the effects of the overdependence of the Middle East countries on oil and natural gas.

Possible answers:

- Loss of revenue.
 - Over exploitation.
 - Stand risk of not getting another source of foreign exchange once oil is exhausted.
2. Assess the contribution of mining to China's economy.

Possible answers

The question requires both positive and negative contributions:

Refer to the learner's book 5.4.1: Positive effects of mining to the economies of the world and 15.4.2: The negative effects of mining to the economic development of the countries of the world.

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