

GEOGRAPHY FOR TTCs

**OPTION :
SOCIAL STUDIES EDUCATION (SSE)**

YEAR TWO

TUTOR'S GUIDE

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FOREWORD

The Rwanda Basic Education Board is honoured to avail the Geography Tutor's Guide for Teacher Training Colleges (TTCs) in SSE Option, Year two, which serves as official guide to teaching and learning of Geography.

The Rwandan education philosophy is to ensure that young people at every level of education achieve their full potential in terms of relevant knowledge, skills and appropriate attitudes that prepare them to be well integrated in society and exploit employment opportunities.

The ambition to develop a knowledge-based society and the growth of regional and global competition in the job market has necessitated the shift to a competence-based curriculum. After a successful shift from knowledge to a competence-based curriculum in general education, TTC curriculum also was revised to align it to the CBC in general education to prepare teachers who are competent and confident to implement CBC in pre-primary and primary education. The rationale of the changes is to ensure that TTC leavers are qualified for job opportunities and further studies in higher education in different programs under education career advancement.

I wish to sincerely express my appreciation to the people who contributed towards the development of this document, particularly, REB staff, lecturers, TTC Tutors, Teachers from general education and experts from Local and International Organizations for their technical support.

I take this opportunity to call upon all educational stakeholders to bring in their contribution for successful implementation of this textbook.

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I wish to sincerely express my special appreciation to the people who played a major role in development of Geography Tutor's guide for SSE Option, Year two. It would not have been successful without the support from different education stakeholders.

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ACRONYMS AND ABBREVIATIONS

DRC: Democratic Republic of Congo

IOM: International Organization for Migration

UK: United Kingdom

USA: United States of America

PRESENTATION OF THE TUTOR`S GUIDE

PART I. GENERAL INTRODUCTION

1.0. Introduction

The purpose of this tutor's guide is to help you implement the Geography syllabus in the option of SSE. It is designed to stimulate you to create exciting and meaningful lessons by enabling you to choose relevant and purposeful activities and teaching strategies. It will encourage you to research and look for new and challenging ways of facilitating students' learning. The tutor guide and the syllabus must be used side by side. The syllabus states the learning objectives for the subject and each unit, and outlines the content and skills that students will learn, and the assessment requirements.

The tutor's guide provides direction for you in using the outcomes approach in your classroom using a step by step approach. This tutor's guide provides examples of teaching and learning strategies for Geography in the option of SSE, elaboration of suggested activities and content, detailed information on how to make assessment tasks and the resources needed to teach Geography in the option of SSE.

1.1. The structure of the guide

This section presents the overall structure, the unit and sub-heading structure to help tutors to understand the different sections of this guide and what they will find in each section.

1.2. 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 student teachers with special educational needs, active methods and techniques of teaching Geography in SSE and guidance on assessment.

Part II: Sample lesson plan

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

Part III: Unit development

This is the core part of the tutor's 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 between different subjects. The tutor 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; Tutors are free to take another crosscutting issue taking into consideration the learning environment.

Guidance on the introductory activity

Each unit starts with an introductory activity in the student-teacher's book. This section of the tutor's guide provides guidance on how to conduct this activity and related answers.

Note that student-teachers may not be able to find the right solution but they are invited to predict possible solutions or answers. Solutions are provided by student-teachers gradually through discovery activities organized at the beginning of lessons or during the lesson.

List of lessons/sub-heading

This section presents in a table suggestion of 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 tutor's guide provides the following sections:

Summary of the unit which provides the key points of content developed in the student-teacher's book.

Additional information which provides additional content compared to the student-teacher's book for the tutor to have a deeper understanding of the topic.

End unit assessment which 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: remedial, consolidation and extended activities. The purpose of these activities is to accommodate each learner (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
- 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 to achieve the learning objectives.

Tutors are encouraged to replace the suggested teaching aids by the ones available in their respective TTCs 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

1.3. Methodological guidance

1.2.1. Developing competences

Since 2015, Rwanda shifted from a knowledge based to competence based curriculum for pre-primary, primary and general secondary education. This review comes as response to the needs of student teachers, society and the labour market. With a holistic learner-centered approach, it demands major changes in teaching methodology and the use of a wider range of assessment techniques focusing more on formative or on-going continuous assessment. This has implications for teacher education and the necessary provision of support and guidance provided to colleges to ensure effective implementation. Since 2016 up to 2018, TTC curriculum have been revised to be competence-based in line with the basic education curriculum. The review was to align the pre-service teacher education programs to the new National Basic Education competence-based curriculum.

This called for changing the way of learning by shifting from teacher centered to a learner-centered approach. Tutor are not only responsible for knowledge transfer but also for fostering student-teachers' learning achievement, and creating safe and supportive learning environment. It implies also that a student 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 learner can do rather than what

student teachers know. Student teachers develop basic competences through specific subject unit competences with specific 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, Student-teachers also develop generic competences which are transferable throughout a range of learning areas and situations in life.

Below are examples how generic competences can be developed in the subject of Geography in the option of SSE.

- **Critical Thinking:** Student teachers analyse their environment or community for problems or challenges faced and the causes. After, they suggest possible remedies to the identified problem.
- **Research and problem solving:** Student teachers collect data using interviews, questionnaires and any other tool, analyse the data gathered and suggest solutions to the problems identified.
- **Creativity and Innovation:** Student teachers analyse resources such as waste materials existing in the community or environment. They develop or come up with new ways of utilizing such resources or how they can be put to use.
- **Communication Skills:** Student teachers can present themselves and their abilities by writing application letters or CVs to potential employers. Can write different documents such Memos, Notices in a clear and understandable language to convey on information effectively during interpersonal communication.
- **Teamwork, Cooperation, Personal and Interpersonal management and life skills:** Student teachers in teams complete different tasks where each may take on a different role while complementing each other's strengths and weaknesses in team leadership.
- **Lifelong Learning:** Student teachers lead a problem solving and decision making process in a team. Does a self-evaluation to identify own areas of strengths, areas of weaknesses and propose strategies for enhancing and improving in a team leadership. Alternatively, student teachers analyse a scenario involving conflicts at a workplace, identify the causes, suggest solutions and propose how they will apply the learned lessons to similar situations in real situations.

1.2.2. Addressing cross-cutting issues

Among the changes in the competence-based curriculum is the integration of cross cutting issues as an integral part of the teaching learning process-as they relate to and must be considered within all subjects to be appropriately addressed. There are eight cross cutting issues identified in the national curriculum framework.

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

Below are examples on how crosscutting issues can be addressed in Geography subject in the option of SSE:

- **Gender education:** Remind student teachers that both males and females have similar opportunities, rights and obligations in the workplace, and therefore need to be treated fairly and equally when dealing with contracts or resolving conflicts. People's opinion of gender roles should not deny or hinder one's right or responsibilities to meet his or her contractual obligations while teaching Geography in SSE.
- **Environment and sustainability:** During the teaching of geography, student teachers need to acknowledge the importance of protecting the environment in which we live in. So, throughout the unit/lesson there is need to appreciate and take great care for environment as it is paramount.
- **Inclusive education:** Student teachers all need to realize that universal laws do not discriminate as they apply to all regardless of social, economic, political, physical background. Emphasis should be on how we all have the same rights. During the lessons of Geography, student teachers may discuss and appreciate the need to respect and advocate for employer's and worker's rights and responsibilities at workplace.
- **Peace and Values:** Right before the lesson begins; there are quite a lot of opportunities for tutors to promote peace and values among student teachers. Being punctual for activities (time management), involvement in various activities (teamwork), keeping their school environment clean (responsibility), greeting one another are among such opportunities (empathy).

In a lesson, encourage student teachers to greet one another, create a conducive learning environment, clean the chalkboard, arrange the classroom, books, class work, among others. Also in case of conflicts within a lesson, take time to address the conflicts and discuss with student teachers the need to resolve conflicts amicably. You may also give student teachers an opportunity to participate in conflict resolution and decision making.

- **Comprehensive sexuality education (HIV/AIDS, STI, Family planning, Gender equality and reproductive health):** During the lessons/activities, student teachers should be given an opportunity to discuss freely about the various changes they are undergoing, as they are adolescents. They should be aware of how to manage the changes in their bodies, discuss HIV/AIDS without stigmatization, STIs and how to control them, family planning, gender equality and reproductive health. Student-teachers should be encouraged to seek for appropriate help whenever needed. This may not directly fit or come in the lessons but utilize opportunities observed among the student-teachers both in and outside of the class.
- **Financial Education:** For example, in setting personal goals, student-teachers may be requested to make a plan of what they plan to save, how much and when they plan to achieve their saving goals. Student-teachers may describe strategies to reduce spending and increase savings to become financially fit. In every lesson, student-teachers can share briefly their progress towards their goals: how much, strategies that worked and what needs to improve on.
- **Standardization Culture:** In every lesson, take an opportunity to share with student-teachers that standards should be respected since they are part and parcel of our lives. From school uniform, to class size, to lesson duration, language of instruction and among others. So always create opportunities to have student-teachers discuss where standards apply and when they need to be cautious about standards during their everyday life. Throughout the unit, standardization will be the opportunity to learn all concepts related to standardization culture and to see how it can apply in different area.
- **Genocide Studies:** Student teachers need to become aware that all human beings are equal and have equal rights. At the work place they should avoid and denounce all instances that result into other's rights being violated. Give student teachers opportunities to share how Geography in the option of SSE can promote the fight against genocide ideologies. During rights and responsibilities session, student teachers relate the genocide of 1994 against the Tutsi and violation of human rights.

1.2.3 Attention to special educational needs and inclusive education

In the classroom, student-teachers learn in different way depending to their learning pace, needs or any other special problem they might have. However, a tutor has the responsibility to know how to adopt his/her methodologies and approaches in order to meet the learning need of each student in the classroom. Also tutors need to understand that student teachers with special needs; need to be taught differently or need some accommodations to enhance the learning environment. This will be done depending to the unit and the nature of the lesson.

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

- Remember that student teachers learn in different ways so they have to offer a variety of activities. For example role-play, music and singing, word games and quizzes, and outdoor activities;
- Maintain an organized classroom and limits distraction. This will help student teachers 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 student teachers process information and learn more slowly than others;
- Break down instructions into smaller, manageable tasks. Student teachers with special needs often have difficulty 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 and does not do everything. Both student teachers will benefit from this strategy;
- Use multi-sensory strategies. As all student teachers learn in different ways, it is important to make every lesson as multi-sensory as possible. Student teachers with learning disabilities might have difficulty in one area, while they might excel in another. For example, use both visual and auditory cues. 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 include:

- Use simple words and sentences when giving instructions;
- Use real objects that the learner 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 s/he can do already 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.

Strategy to help a learner with visual impairment

- Help student teachers to use their other senses (hearing, touch, smell and taste) to 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 difficulties, ask them what they can see;
- Make sure the learner has a group of friends who are helpful and who allow the child to be as independent as possible;
- Plan activities so that student teachers work in pairs or groups whenever possible.

Strategy to help a learner with hearing impairment

- Always get the learner's 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.

Strategies to help student teachers with physical disabilities or mobility difficulties

- Adapt activities so that student teachers who use wheelchairs or other mobility aids can participate;
- Ask parents/caregivers 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;
- Encourage peer support;
- Get advice from parents or a health professional about assistive devices.

Adaptation of assessment strategies

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

1.2.4. Guidance on assessment

Assessment is an ongoing process of identifying, gathering and interpreting information about students' achievement of the learning outcomes and can be integrated into the students' normal learning activities. Assessment is an important part of teaching and learning. It is used to:

- Evaluate and improve teaching and learning
- Report achievement
- Provide feedback to students on their progress.

Types of Assessment

- **Assessment for learning (Continuous/ formative assessment):** Assessment for learning is often called formative assessment and is assessment that gathers data and evidence about student learning during the learning process. It enables you to see where students are having problems and to give immediate feedback, which will help your students learn better. It also helps you plan your lessons to make student learning, and your teaching more effective. Often it is informal and students can mark their own work or their friends. An example is a quick class quiz to see if students remember the important points of the previous lesson.

- **Assessment of learning (Summative assessment):** Assessment of learning is often called summative assessment. It is used to obtain evidence and data that shows how much learning has occurred, usually at the end of the term or unit. End of year examinations are examples of summative assessment. It is usually done for formal recording and reporting purposes.

Assessing geography units

In the Geography syllabus, the key unit competences, which link to the broad learning outcomes, are assessed through specified assessment tasks using a range of assessment methods. Assessment criteria for each unit outcome provide clear indications of how, and to what extent, the achievement of the learning outcomes may be demonstrated. Performance standards, marking guides and assessment criterion help teachers with the marking process and this ensures that assessment is consistent across schools.

When you set a task, make sure that:

- The requirements of the task are made as clear as possible to the student
- The assessment criteria and performance standards or marking guides are provided to the student so that they know what it is that they have to do
- Any sources or stimulus material used are clear and appropriate to the task
- Instructions are clear and concise
- The language level is appropriate for the grade
- It does not contain gender, cultural or any other bias
- Materials and equipment needed are available to students
- Adequate time is allowed for completion of the task.

Feedback

- When you assess the task, remember that feedback will help the student understand why he/she received the result and how to do better next time.

Feedback should be:

- Constructive so that students feel encouraged and motivated to improve
- Timely so that students can use it for subsequent learning
- Prompt so that students can remember what they did and thought at the time

- Focused on achievement and effort of the student
- Specific to the unit learning outcomes so that assessment is clearly linked to learning.

Feedback can be:

Informal or indirect – such as verbal feedback in the classroom to the whole class, or person to person

- **Formal or direct** – In writing, such as checklists or written commentary to individual student either in written or verbal form.
- **Formative** – given during the topic with the purpose of helping the student know how to improve for example use of portfolios as a tool of assessment during, after or at end of the lesson.
- **Summative** – Given at the end of the unit with the purpose of letting the students know what they have achieved for example use of portfolios as a form of end of unit assessment.

Tests

A test is a formal and structured assessment of student achievement and progress which the tutor administers to the class. Tests are an important aspect of the teaching and learning process if they are integrated into the regular class routine and not treated merely as a summative strategy. They allow students to monitor their progress and provide valuable information for you in planning further teaching and learning activities.

Tests assist student learning if they are clearly linked to the outcomes. Evidence has shown that several short tests are more effective for student progress than one long test. It is extremely important that tests are marked and that students are given feedback on their performance.

There are many different types of tests. Tests should be designed to find out what students know and about the development of thinking processes and skills. Open questions provide more detailed information about achievement than a question to which there is only one answer.

Principles of designing classroom tests

Tests allow a wide variety of ways for students to demonstrate what they know and can do. Therefore:

- Students need to understand the purpose and value of the test
- The test must assess intended outcomes
- Clear directions must be given for each section of the test
- The questions should vary from simple to complex
- Marks should be awarded for each section
- The question types (true/false, full-in-the-blank, multiple choice, extended response, short answer, matching) should be varied.

Tests should:

- Be easy to read (and have space between questions to facilitate reading and writing)
- Reflect an appropriate reading level
- Involve a variety of tasks
- Make allowance for students with special needs
- Give students some choice in the questions they select
- Vary the levels of questions to include gathering, processing and applying information
- Provide sufficient time for all students to finish.

Tutor assessment

Assessment is a continuous process. You should:

- Always ask questions that are relevant to the outcomes and content
- Use frequent formative tests or quizzes
- Check understanding of the previous lesson at the beginning of the next lesson through questions or a short quiz
- Constantly mark/check the students' written exercises, class tests, homework activities
- Use appropriate assessment methods to assess the tasks.

Self-assessment and peer assessment

- Self and peer assessment helps students to understand more about how to learn.

- Students should be provided with opportunities to assess their own learning (self-assessment) and the learning of others (peer assessment) according to set criteria.
- Continues the learning cycle by making assessment part of learning
- Shows students their strengths and areas where they need to improve
- Engages students actively in the assessment process
- Enables students to be responsible for the learning .
- Helps students understand the assessment criteria and performance standards.

1.2.5 Students' learning styles and strategies to conduct teaching and learning process

How students learn:

- What I hear I forget.
 - What I hear and see I remember a little.
 - What I hear, see and discuss I begin to understand.
 - What I hear, see, discuss and do, I acquire knowledge and skills.
 - What I teach to another, I master.
- (Active Learning Credo statement by Silberman 1996)

In support of this are the findings that we remember:

- 20% of what we hear
- 40% of what we see
- 90% of what we see, hear, say and do or what we discover for ourselves.

A student-centered approach to learning

Different students learn in different ways. Some students learn best by writing, others by talking and discussing, others by reading and others by listening. Most students learn by using a combination of those. All students learn skills through practicing and repetition. You need to use a variety of teaching strategies to cater for the different ways your students learn. 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 particular learning objectives to be achieved; the allocated time to achieve the objective; instructional materials available; the physical/sitting arrangement of the classroom, individual students' needs, abilities and learning styles.

Teaching and learning strategies

In order to cater for different students' learning styles and to assist and encourage students to learn, teachers need to perform certain tasks. These are teaching strategies.

You need to engage students directly in learning but there are times when you have to take charge of the learning in the class and teach particular concepts or ideas

Teaching strategies include:

- Group work
- Skills lab
- Research/inquiry
- Class discussions/debates
- Problem-solving activities
- Teacher talk, instructions, explanations, lectures or reading aloud
- Directed question and answer sessions
- Audio-visual presentations
- Text books or worksheets
- Directed assignments
- Demonstration and modelling
- Guest speakers
- Classroom displays.



i) Use of present boards and portfolios during skills lab

Present boards are boards made by student teachers using locally available resources that contain student teachers' work/achievements. When student teachers finish their work from presentations as a group, it's hang on the present board. This can be used by both the tutor and student-teachers for reference.

The biggest sign of a successful skills lab is the activities students complete. And how do we know whether students completed their group activity? It's through **present boards**. Each team has their own board to display all the work they completed during the skills lab. At the end of each skill lab, each team makes a verbal presentation to the class and shows their present board.

	When?	How?	Where?
Present Boards	Last activity of each Skills Lab. Each lab team/group has their own 1 Present Board.	Made by students. Boards have cool designs to showcase the notes and work product of each lab	Boards are hung on the walls of classroom and kept there for others to see

ii) Relationship between portfolios and present boards

What is a Student Portfolio?

A portfolio is a collection of student work for individual assessment. Student teachers fill their portfolios by completing a series of assignments. These individual assignments are the evidence that students have mastered a learning objective. Each assignment requires student teachers to apply the skill they learned in that unit practically.

Portfolios are the basis for skills lab. First, teachers create the portfolio assessment for students to complete.

Skill lab is when students will work on group activities to prepare for completing the portfolio assessment individually. Skill lab is one of your teacher's normal lessons (no extra time is needed) that are especially designated for the purpose of students working in groups to complete their activities. Skills lab prepares students to complete portfolio assignments on their own after classes. So, the classroom activity should connect directly to the portfolio assignment.

For example, they set goals as a group in class, and set individual goals as portfolio assignment.

	Done by?	When?	Where?
Present boards	Groups	During Skills Lab	On Present Boards
Portfolios	An Individual	As an Assignment	In Portfolio Folder

1.2.6. Steps for a lesson in active learning approach

Generally, the lesson is divided into three main parts whereby each one is divided into smaller steps to make sure that student teachers are involved in the learning process. Below are those main parts and their small steps.

1) Introduction

Introduction is a part where the teacher makes connection between the previous and current lesson through appropriate techniques. The teacher opens short discussions to encourage student teachers 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 sequencings.

Development of the new lesson

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

- **Discovery activity/prediction**

Step 1

- The teacher discusses with students to take responsibility of their learning
- He/she distributes the task/activity, necessary resources 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 let the students work collaboratively on the task.
- During this period the teacher refrains to intervene directly in the working of activity or results/findings of the task

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

Presentation of student teachers' productions

- In this period, the teacher invites representatives of groups to share their 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 summarizes the learned knowledge and gives examples, which illustrate the learned content. Then links the activities to the learning objectives, and guide student teachers to make notes.

Exercises/Application activities

- Exercises of applying processes and products/objects related to learned unit/sub-unit
- Exercises in real life contexts
- Teacher guides student teachers to make the connection of what they learnt to real life situations. At this level, the role of teacher is to monitor the fixation of process and product/object being learned.

3) Assessment

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

1.2.7. Template of a lesson plan in active learning approach

LESSON PLAN

School Name: Teacher's name:

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
	... / ... / 20..... of
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category							
Unit title							
Key Unit Competence							
Title of the lesson							
Instructional Objective							
Plan for this Class (location: in / outside)							
Learning Materials (for all learners)							
References							

Timing for each step	Description of teaching and learning activity		Generic competences and Cross cutting issues to be addressed + a short explanation
	Teacher activities	Learner activities	
Introduction ... min			
Development of the lesson ... min			
Conclusion ... min			
Teacher self-evaluation			

PART II: SAMPLE LESSON PLAN

School Name: TTC MURURU

Tutor's name: BYUKUSENGE Dieudonne

Term	Date	Subject	Class	Unit No	Lesson N°	Duration	Class size
I	24/03/2020	Geography	Year 2 SSE	5	1/3	40 minutes	40 student teachers
Type of Special Educational Needs to be catered for in this lesson and number of student teachers in each category				2 students with hearing impairment 1 student with communication challenges.			
Unit title		The origin of the earth					
Key Unit Competence		Student-teachers should be able to discuss the theories of the origin of the Earth.					
Title of the lesson		Theories which explain the origin of the earth					
Instructional objective		Using the textbooks and internet, student-teachers should describe the theories advanced to account for the origin of the earth correctly.					
Plan for this Class (location: in / outside)		The lesson will take place in the classroom.					
Learning Materials (for all student teachers)		Globe, atlases, text books, photographs, illustrations, chart, flip charts, markers, and pencils.					
References		<p>Safari Sibò, 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, Comp solutions.</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	
Introduction (5min)	<p>-Organize the student teachers in groups.</p> <p>-Give student teachers the introductory activities:</p> <p>1. Discuss the origin of the earth.</p>	<p>-Discuss and share the ideas in relation to question asked by the tutor.</p> <p>Expected answers:</p> <ul style="list-style-type: none"> • God created the world (The creation theory) • Big bang theory 	<p>Cooperation: Cooperation and communication skills are addressed through working in groups.</p> <p>Critical thinking through finding the theories explaining the origin of the earth.</p> <p>Inclusive education: The student with hearing impairment can share their views by writing it on a piece of paper or talking. Also the tutor should encourage peers to give them a chance to express their opinions by valuing and paying more attention to what they are saying or writing.</p>

<p>Development of the lesson: 30 min</p>	<ul style="list-style-type: none"> -Introduce the lesson of the day regarding the theories of the origin of the earth. -Distribute to the student-teachers the print out of the learning activity 5.1 in the student-teacher’s book. -Guide and monitor the student-teachers’ discussion progress, organizational, and participatory of each student-teacher in the group. -Attend to individual needs of the SEN. (<i>Special Education needs</i>) -Assist the student-teachers to present their findings. -Ask questions in order to check the mastery of the research findings or discussion results in relation to the student-teachers presentation work. -Harmonize the main points presented by the student-teachers. 	<ul style="list-style-type: none"> -Listening and receiving the issued print put. -Discuss and share ideas about the activity 5.1 indicated in the student-teacher’s book. -Note down their findings/answers generated from the discussions. <p>Expected answers:</p> <p>Refer to the student-teacher’s book on the theories of the origin of the earth.</p> <ul style="list-style-type: none"> -Present their findings and write down the main points from the class discussion. -Answering questions from the tutor and or classmates. -Contributes to the presentations made by each pair/group. 	<p>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 hearing impairment problem should be helped by speaking in understandable way. And the one with communication challenges can be helped by using gestures and body languages.</p>
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<p>Summary and evaluation</p>	<ul style="list-style-type: none"> -Sums up the lesson by providing a summary of content that comes from activities. -Gives the important additional content that have not mentioned or discussed. -Complete the student-teachers findings and makes appropriate conclusive summary of the lesson. -Assess the achievement of objectives by using application activity 5.1 The possible answers refer to the student-teacher's book on the theories of the origin of the earth. 	<ul style="list-style-type: none"> -Following tutor's summary, answering. -Noting down the main points. -Supplement and giving comments. - Student-teachers do the evaluation activity given by the tutor to verify the achievement of the operational objectives 	<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>Teacher-self evaluation</p>	<p>The responses of the student teachers during the lesson and the positive answers that they provided, revealed that they achieved of pre-stated instructional objectives.</p>		

PART III: UNIT DEVELOPMENT

UNIT 1

STATISTICAL GRAPHS, DIAGRAMS AND MAPS

1.1 Key unit competence

The student-teachers should be able to interpret the statistical data, construct statistical graphs and diagrams.

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

The teacher should guide the student-teachers towards application of various knowledge, skills, attitudes and values, acquired and developed right way from senior one to year 2 of social studies education. It is vital to note that, student-teachers already have a handful of skills that can enable them to understand and master this unit.

Throughout the subject of geography, under the unit 8 of senior S1, students studied the curve graph as they dealt with the structure of the atmosphere. They further in unit 9 of senior 2, discussed the presentation of rainfall and temperatures, where a line and bar graph were used. In unit 10 titled Economic activities in Rwanda in the sub heading of Transport, Communication and Trade in Rwanda several tables were used. On a special note, students in ordinary level studied Venn Diagrams (divided circles) and other forms of graphs in unit 8 of Senior1 about weather and climate. All these form a basis upon which as a tutor can build on to take through the student teachers up to the end in this unit 1.

The student teachers should be helped to remember the primary elements of a good geographical diagram or graph or any illustration used. This is very important as the examinations are marked and rewarded. Therefore, as a tutor, it would be good to always draw examples from the previous classes to mark a clear connectivity displayed between what the student teachers 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 student teachers can draw and interpret the statistical methods and data especially those that fall under the simple methods category.

1. 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 1 year 2 of TTC. This implies that, the data which are the focal point in statistics can be collected from a given situation related to a specific cross-cutting.

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, Financial education, environment and sustainability. There are cross-cutting issues such as gender education, that can be integrated while dealing with the construction of population pyramids or 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 introductory activity, there is environment and sustainability, in Activity 1.1, there is peace and values education, where names that can remind the student teachers on values of society are used, for example; Micomyiza, Habinshuti and Twubahane village are used. These intend to start a spark thought on the peace and values cherished in the society. The teacher therefore, can use such 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 example 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, with financial education one can get the data and rephrase the questions that can evoke the student teachers' thought on how to save money and why we should spend money wisely.

1. 4. Guidance on the introductory activity

The introductory activity found in the student-teachers' book, is cardinal tool used as orientation activity, that enables the student-teachers 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 student teachers in understanding the diagrams and statistical, analytical skills and data representation competences.

Guidance on expected statistical methods:

- i. Simple and curve lines
- ii. Simple bar graphs
- iii. Grouped graphs (Line or bar)

1.5 List of lessons and end unit assessment

The following table indicates titles of lessons, learning objectives and number of periods:

#	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes).	Number of periods
1	1.1. Introduction to the statistics in Geography	<ul style="list-style-type: none">- Define the term statistics- Identify the importance of statistics in geography.- Appreciate the importance of statistics in geography and daily living activities	1
2	1.2. Line and curve graphs with advantages and disadvantages	<ul style="list-style-type: none">- State the advantages and disadvantages of statistical graphs and diagrams- Create statistical line graphs and diagrams to present various geographical data.	5
3	1.3. Bar graphs , age –sex graph, and dispersion graph with advantages and disadvantages	<ul style="list-style-type: none">- Outline different statistical bar graphs (methods).- Explain the advantages and disadvantages of each statistical method.	4
4	End unit assessment		1

Guidance on different lessons

Lesson 1: Introduction to the statistics in Geography

a) Learning objectives

The following are learning objectives of the lesson:

- Identify the importance of statistics in geography.
- Appreciate the importance of statistics in geography and in the daily life

b) Teaching resources

The following are some teaching resources to be used :

- Charts of statistical graphs
- Flip charts
- Manila papers
- Print out of activity
- Print out of application

c) Prerequisite/Revision/introduction

The teacher should use the student teachers past studies such as skills that were acquired in different subjects and introduce the lesson by letting students –teachers to deal deeply with definition of statistics. The teacher should guide the students to find the meaning of statistics and its importance by emphasizing the statistics’ role in daily lives.

d) Learning activities

Activity 1.1

- 1) Students are interested in using statistics by recording because it makes easy the interpretation of data that have been analyzed and get data in easy manner to be used later.
- 2) No, The passage doesn’t not represent statistics because there is description in statement way while the statistics use the numeric data, graphs and tables.
- 3) You may answer such question referring to the importance of statistical graphs and diagrams in geography in students- teachers’ book.

e) Application activity 1.1.

The answers for this application activity are embedded in the notes of importance of statistics in student-teachers’ book under the sub heading of

importance of statistical graphs and diagrams in geography...

Lesson 2: Line and curve graphs

a) Learning objectives

The following are learning objectives of the lesson:

- State the advantages and disadvantages of statistical graphs and diagrams.
- Create statistical line graphs and diagrams to present various geographical data.

b) Teaching resources

- Charts of statistical graphs
- Flip charts
- Manila papers
- Print out of activity
- Print out of application
- Coloured pencils or markers of varying colours.

c) Prerequisites/ Revision/ Introduction

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.

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

d) Learning activities

Activity 1.2.1

- 1) Guidance of tutor on how to draw simple line graph to student-teacher is needed. It is advisable to work on this in a group according to the class size to facilitate the learning.
- 2) Refer to the procedures of constructing a simple curve graph in student's book.
- 3) Commenting on the trend of land use; make sure that students are able to indicate progress, especially from the starting in 2015 the surface for cultivation was increasing considerably until 2017.

- 4) For answering the question on c, refer to the advantages and disadvantages as developed in student's book

Activity 1.2.2

- 1) There is a need to help student-teachers to observe these diagrams in order to identify the differences between them.

Some possible solutions are:

- On mean temperature graph, one line is used to portray the data while on enrollment of students graph two line were used to display the data.
 - On mean temperature graph, one dependent variable is given while on enrollment of students graph, two dependent variables which were given are females and males for one class.
- 2) Refer to students-teachers'book on comparative lines graph to answer the question.
- 3) Here, there is a need to give the advantages of using comparative lines graph. Refer to the student-teachers book on advantages and disadvantages of comparative lines graphs to answer the question.

Activity 1.2.4

- 1) The teacher should guide student teachers 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:

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

- 2) Guide student-teachers to construct the compound line by following the procedures described in student-teachers book on compound line graph.
- 3) For answering such question, refer to the advantages and disadvantages of compound line graphs described in student-teachers book.

Activity 1.2.5

- 1) 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.
- 2) Refer to the students' teachers on the advantages and disadvantages of divergence line graph.

e) Application activity 1.2

- 1) This part of the application activity needs the tutor to guide the student-teachers on how they will collect the data using the techniques of field work. It is advised to the tutor to help student-teachers to collect the data as it is their first time to handle such activity. 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.
- 2) The trend of performance will depend on data collected, and the curve constructed. This means the tutor should expect a wide range of answers.

Lesson 3: Bar graphs

1) Learning objectives

The following are learning objectives of the lesson:

- Outline different statistical bar graphs (methods).
- Explain the advantages and disadvantages of each statistical method.

2) Teaching resources

The following are teaching resources to be used in the lesson:

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

3) Prerequisite/revision/introduction

The tutor should use the activity 1.6 for introductory purpose. This is intended to introduce the lesson title to the students-teacher by using the activity which requires reading the passage and answer the questions related to the passage.

d) Learning activities

Activity 1.3.1

- 1) Refer to the student-teachers book for the construction of a simple bar graph under the same topic.
- 2) China has the highest levels of population totals. It is followed by India. Then, Euro area, United States and over left Indonesia have high population. Japan, Russia, Brazil have low population as few data are shown in the table.
- 3) Effects of high population on the physical environment are briefly described here down:
 - Deforestation caused by people in need of basic resources such as woods and timbers.
 - 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 through waste disposal, etc.
- 4) Refer to the learner's book on advantages and disadvantages of a simple bar graph.

Activity 1.3.2

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

Activity 1.3.3

- 1) 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 a given area, the bars are further divided into the segments.
- 2) Refer to the student teachers' book on the advantages and disadvantages of compound bar graphs.

Activity 1.3.4

- 1) Refer to the student teachers' book on construction of the divergence bar group
- 2) The answers for this question; refer to the learner's book under the construction of divergence bar graph.

Activity 1.3.5

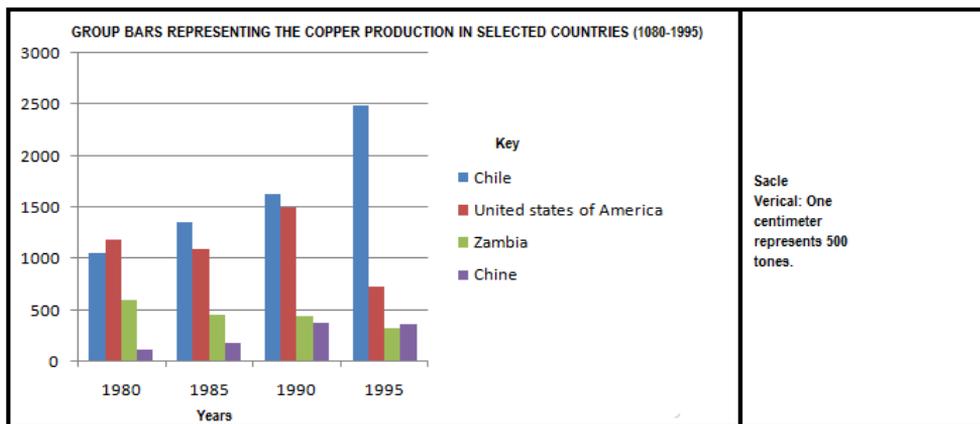
- 1) The diagrams are age-sex pyramid / Population pyramid
- 2) Graph A represents the population structure of a developed country while graph B is representing a population structure of a developing country.
- 3) Refer to the student teachers' book on advantages and disadvantages of population pyramid.

Activity 1.3.6

- 1) The first graph shows a simple line graph while the second one is a dispersion graph. For further details refer to the student teachers' book on dispersion graph.
- 2) Refer to the learner's book on the advantages and disadvantages of dispersion graph.

e) Application activity 3

- 1) Student-teachers are expected to use the graph that may not bring confusion for interpretation, the most suitable graph is comparative bar graph. Here down, there is a group bar representing the copper production in the selected countries (1980-1995)



- 2) For answering the question refer in student book on the content of the advantages and disadvantages of group bar graphs.

1. 6. Summary of the unit

The tutor 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, and bar graphs.

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

1.7. Additional information for the tutor

The tutor should provide student teachers with statistical data that are reflecting their real-world experiences or day to day encounters.

1.8. End unit assessment

The student-teachers are expected to extract the raw data as shown in the table.

- a) The table showing the number of people affected by landslides in some different areas of Rwanda in 2016

Area	Number of infected people
Gakenke	34
Muhanga	8
Rubavu	4
Ngororero	3

- b) The student teachers are expected to select the most suitable statistical method. Therefore, since the data are simple, they require the simple statistical methods such as: simple divided circles, simple bar graphs.
- c) Landslides and floods (the additional description on the phenomenon can be highlighted).
- d) Plant trees, use good farming practices, practice agro-forestry, mass education, terracing, slope stabilizing, rechanneling 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, rechanneling the run-off, intercropping, use of mulching, crop rotation, etc.

1.9. Additional activities

1.9.1 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 student teachers' book on the steps of constructing a divergence line graph.
- b) Refer to the student teachers' book on 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 student teachers on how to determine the percentage increase or decrease, since it is paramount in statistics.

2) Using the textbooks, internet and other resources; research on:

- i) Advantages of divergence line graph
- ii) Disadvantages of divergence line graph. Discuss the findings with the classmates in form of a class presentation.

Possible answers:

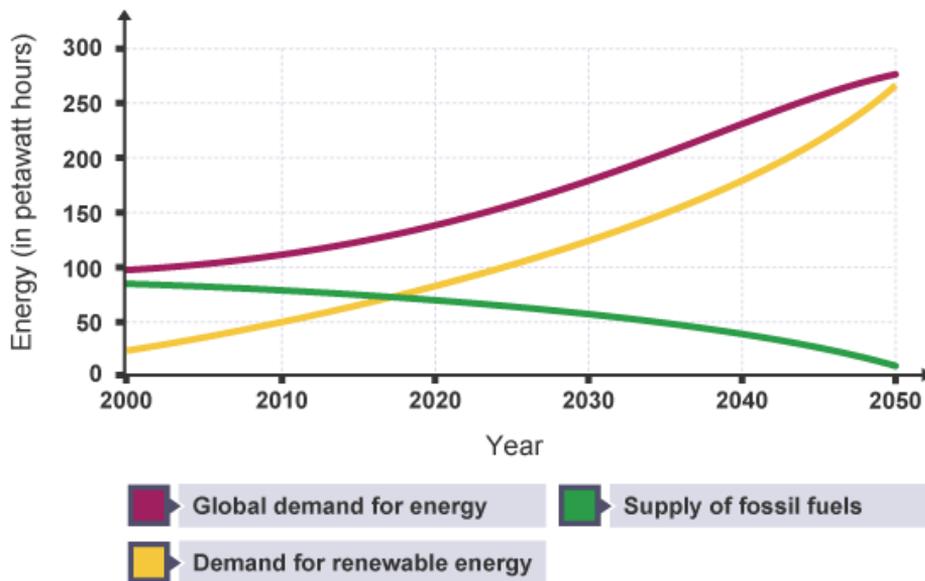
- i. Refer to the student teachers' book on advantages of line graph.
- ii. Refer to the student teachers' book on disadvantages of line graph.

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

1.9.2 Consolidation activities

The line graph below shows how energy consumption is expected to rise, while consumption of fossil fuels falls and the demand for renewable energy increases.

Observe it and answer the following questions:



- i. State the type of graph used to represent the above data.
- ii. There are many problems likely to happen on global energy uses. Describe them.
- iii. Suggest the measures to be taken to alleviate these problems.

Possible answers

- i) The graph used is comparative lines graph.
- ii) Some problems of reduction in fuel are the following:
 - Increasing in prices of fuel because the demand of energy increases while the production falls.
 - Over consumption for the energy because population is rapidly increasing as well as they use fuel energy.

This question is an open question, where students may bring several reasons; it is up to the tutor to make coherent such ideas.

- iii) Measures for alleviating the problems at (i) are the following:
 - Carrying out several researches to find out new fuel reserves.
 - Energy audits may be conducted to monitor usage for with the intention of increasing energy conservation may be initiated to reduce consumption.

- Control of rapid population growth in order to reduce the fuel energy users.

In this question, tutor is asked to allow all possible answers that respond to the problems of fuel energy in the world.

1.9.3 Extended activities

The following table indicates the number of population by male and female of country X in terms of age group.

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 method 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

- a) Construction of age-sex graph/population pyramid referring to the construction processes found in student teachers'book.
- b) Refer to the student teachers'book on the advantages and disadvantages of population pyramid.
- c) The population structure is described by a broad base and a narrow apex.
 - When the population pyramid is broad at the base it is an indication that they are many young people and most of the time it is in developing countries.
 - When the population pyramid has narrow apex, it is an indicator of few old people that happens in developing countries too.

Skills lab:

Student-Teachers have already studied the basic methods of collecting data and the ways for constructing the statistical graphs and diagrams followed by their interpretation. It is in this regard, student-teachers will ask the school leaders to help them about the number of students in last five years (for update) in order to construct a statistical graph, better will be the curve line graph to portray the population growth of the school.

UNIT 2

BEARINGS, DIRECTIONS, DISTANCES AND AREAS ON A MAP

2.1. Key unit competence

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

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

Student-teachers in year 2, should have knowledge, skills and attitudes and values what they acquire at school. Student-teachers are not studying this topic for the first time. They have mastered the content of in senior1, 2 and 3, 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.

What they have learnt in past studies will provides a strong foundation that student teachers can use to understand better the content of this unit 2 in year 2.

It is 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 student teachers'book is more detailed and goes beyond what the ordinary program demanded.

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

2.3. Cross-cutting issues to be addressed

There are many cross-cutting issues that can be applied in this lesson. In the student teachers' 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 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.

2.4 Guidance on the introductory activity

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

The way answers are provided for the introductory activity, some require reviewing the previous studies while others require student-teachers to think deeply and read geographical documents.

2.5. List of lessons and End unit assessment

#	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes).	Number of periods
1	2.1. Location of places using grid references.	<ul style="list-style-type: none"> - Identify the places on a topographic map using Easting and Northing. - Locate the places using the geographical coordinates/grid reference systems. - Appreciate the importance of using the topographic maps to interpret geographical phenomena. 	2

2	2.2. Stating directions and bearings on topographic maps	<ul style="list-style-type: none"> - locate the directions and bearings on the topographic maps. - Calculate the bearings and the directions on the topographic maps. - Appreciate the importance of using the geographical coordinates and the compass in locating places on the topographic maps. 	2
3	2.3. Measure distance on the Maps (straight line, curved line).	<ul style="list-style-type: none"> - Estimate the distances and areas on the topographic maps. - Measure the distances and the surface areas on the topographic maps. - Appreciate the relationship between the distance on the actual ground and on topographic map. 	2
4	2.4. Calculation of the area on topographic maps (regular and irregular shapes).	<ul style="list-style-type: none"> - Delimitate the area on the topographic maps. - Calculate the areas on the topographic maps. 	3
	End Unit assessment		1

Guidance on different lessons outlined above

The above table highlights all the lessons that have been created in relation to dividing the unit content into 4 lessons with different number of periods. Below is the guidance on 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 references and ways they are used. The teacher should be aware that the way the student teachers' book is written, under this sub heading, student teachers are supposed to be helped or guided on how to use grid references to locate features on a map.

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

a) **Learning objectives**

- Identify the places on a topographic map using Easting and Northing;
- Locate the places using the geographical coordinates/grid reference systems ;
- Appreciate the importance of using the topographic maps to interpret geographical phenomena.

b) **Prerequisites/Revision/Introduction:**

The introductory activity, 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 student teachers know about the grid reference.

c) **Teaching resources**

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

d) **Learning activities**

The activity 2.1 in the student teachers' book, it 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:

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

e) **Application activity 2.1**

1. The four- grid reference of the Geo farm is 0838.
2. The six-grid reference of Geo farm is 088387.

Lesson 2. Starting directions and bearings on topographic maps

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

a) **Learning objectives**

- Tell the directions and bearings on the topographic maps.
- Calculate the bearings and the directions on the topographic maps.
- Appreciate the importance of using the geographical coordinates and the compass in locating places on the topographic maps.

b) **Prerequisites/Revision/Introduction**

All activities used in this lesson are focusing on what student teachers 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 student teachers and check their level of achievement.

c) **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 student teachers to work in groups. This will assist in the acquisition of generic competences such as critical thinking, collaboration, communication skills and problem solving.

d) **Learning activities**

This part of learning activities will help the teacher to assist student teachers 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.

e) **Application activity 2.2**

- The bearing of the Beach from the Tower is 135°

- The Tower from the Church is $180^{\circ} + 90^{\circ} = 270^{\circ}$
- The Mine from the Tower is $180^{\circ} + 135^{\circ} = 315^{\circ}$
- 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 year 2. It deals with measuring distances on map.

a) Learning objectives

- Estimate the distances and areas on the topographic maps.
- Measure the distances and the surface areas on the topographic maps.
- Appreciate the relationship between the distance on the actual

b) Prerequisites/Revision/Introduction:

This lesson which deals with measuring of distance on the map is not a new topic for student-teacher in year 2 since it was studied in senior 1,2,3 in unit on 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.

c) Teaching resources

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

d) Learning activities

The tutor helps student teachers to form small groups and have access to books or print outs. Student teachers work in their groups and present their findings. The expected answers to this activity include the following:

- 1) The actual distance from Kabuga market to Gasabo district is $\frac{20 \text{ cm} \times 50.000 \text{ cm}}{1 \text{ cm}} = 1,000,000 \text{ cm}$ The answer got must be converted into appropriate unit, km. in this case it is 10 km.
- 2) Sophie and Eric cannot walk this distance because Gasabo district is far from Kabuga market. student teachers will suggest other responses to

this question, remember that Sophie and Eric are still young, it is difficult for them to travel such a long distance.

e) 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.

The distance between A and B on the map is 9.5cm. Thus the real distance on the ground is $\frac{9.5 \text{ cm} \times 50,000 \text{ cm}}{1 \text{ cm}} = 475,000 \text{ cm}$
= 4.75 km

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

a) Learning objectives

- Give the areas on the topographic maps.
- Calculate the areas on the topographic maps.

b) Prerequisites/Revision/Introduction

Calculating the areas on topographic maps is not new to student teachers in year 2. 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 year.

c) Teaching resources

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

- Recommended text books.
- Internet.
- Maps.

d) Learning activities:

Guide student teachers 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. 1 cm on a 1:50,000 map represents 0,5 km. therefore, $1\text{cm}^2 = 0,5\text{ km}$

$$\times 0,5\text{ km} = 0,25\text{km}^2$$

$$15\text{ squares of forest} \times 0.25\text{ km}^2 = 3,75\text{ km}^2$$

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 used 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.

e) Application activity 2.4

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

$$13\text{cm} = 13 \times 0,5\text{ km} = 6.5\text{ km}$$

$$8\text{cm} = 8 \times 0,5\text{ km} = 4\text{km}$$

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

2.6. Summary of the unit

This unit number 2: Bearings, directions, distances and areas on a map in year 2 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.

2.7. Additional Information

The student- teachers learnt many concepts of map work but not all. So, the teacher is advised to help student teachers on how they can construct a cross-section when they have finished mastering calculating the distance of places and areas on the maps.

2.8. End unit assessment

- 1) The grids reference of A, B, C on the picture are the following:

A=511291

B=495274

C=531262

- 2) To find the distance on the ground of places located between A and B, X and Y, student- teachers measure the distance on the map in centimetre, after that, multiply the distance with the scale of the map.

Convert the centimetre into Kilometres by multiplying by 0.5 km because the Scale of the map is

(1:50.000) to obtain the distance in Kilometres on the actual ground.

Use a ruler and measure the distance between two places in centimetres, in this case it is between A and B; X and Y.

- 3) **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'

- 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.
- 4) Within the group work, student teachers 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 Muhoza from Kigali is 135°
 - 2) The relative position of Muhoza from Kigali is NW.
 - 3) The teacher engages a brief discussion on what student teachers know about Musanze, its relief features and other human activities.

2.9. Additional activities

2.9.1. 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.

2.9.2. Consolidation activities

Question

What is the length in cm of 4 km on a 1:50,000 map?

Answer: 4-kilometre real distance = 4,000 metres = 400,000 centimetres

$$\text{The map distance in centimetres} = \frac{1 \text{ cm} \times 400,000 \text{ cm}}{50,000 \text{ cm}} = 8 \text{ cm}$$

2.9.3. Extended activities

The distance on the map between two points is 12,5cm, Calculate the distance on the ground between the two places. The scale of the map is 1:50,000

$$\begin{aligned} \text{Answer: is } 12.5\text{cm} \times 50.00 &= 625.000 \text{ cm} \\ &= 6.25 \text{ km} \end{aligned}$$

Skills Lab:

Use the knowledge acquired in classroom, to calculate the area of the school. This will help student-teachers to develop the skills on the calculation of area for any terrestrial portion.

UNIT 3

MAP WORK INTERPRETATION

3.1. Key unit competence:

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

3.2. Prerequisite (Knowledge, Skills, attitudes and values)

Ordinary level geography introduced the study of map work to the student teachers. It provided deeper understanding and meaning of the maps. This gave the insight on the definition of a map, elements of a good map and categories of the maps.

The unit 2 of year 2 provided the competences to the student teachers in relation to locating places on maps using the grid references, identifying directions and bearings on the topographic maps. The acquired competences in the above mentioned unit constitute a milestone to easily study this new Unit 3 of year 2, which is entitled “Map work interpretation”.

The introductory activity presented in the learner’s book intends to remind student teachers 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 student teachers 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.

3.3. Cross-cutting issues to be addressed

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.

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

Inclusive education: Through learning and teaching process of this unit, care will be given to all student teachers. At this time, all student teachers will be given equal consideration and more attention would be given to the student teachers 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.

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 student teachers should be taught to respect each other's properties, human rights and promote social values in order to avoid any conflict.

3.4. 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 student teachers 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 student teachers should use a photograph taken from the environment around their schools to identify all physical and human features shown on that photograph.

3.5. List of lessons (including assessment)

SN	Lesson title	Learning objectives (knowledge, skills and attitudes)	Number of periods
1	3.1. Interpretation of physical aspects from maps/ photographs	<ul style="list-style-type: none">- Use topographic map and key to identify the physical aspects.- Observe physical features critically and interpret them on a map.	2
2	3.2. Interpretation of human aspects on maps	<ul style="list-style-type: none">- Use maps of human activities and key to identify the physical aspects.- Observe human features critically and interpret them on a map.	3
3	3.3. Relationship between physical and human aspects on maps/ photograph	<ul style="list-style-type: none">- Record the observations and identify the links between the physical and human features	4
4	End unit assessment		1

Guidance on different lessons outlined above

Lesson 1. Interpretation of physical aspects from maps/photographs

a) Learning objectives

- The objectives of the lesson are the following:
- To identify the physical aspects on the ordinary survey map.
- To describe the physical aspects on the topographic map.
- To appreciate the importance of using the topographic maps to interpret the topographical phenomena and to understand the relationship between the relief and human activities.

b) Teaching resources:

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

- Students' book for Year 2.
- 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) Prerequisites/Revision/Introduction

The lesson on maps/photographs is not new to the student teachers in year 2 since maps; bearings, directions, distances and areas on a map were taught in Ordinary level. Hence, the new lesson on interpretation of physical aspects should be built on the content studied in previous units. Student teachers learnt how to measure and calculate distance and areas on the maps respectively. For that reason it will be necessary to provide to the student teachers the application activities aiming to review the above mentioned content studied.

After this review, student teachers 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.

d) Learning activities

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

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

Activity 3.1

- (i) Refer to the student teachers' book under the interpretation of physical aspects from maps and photographs.
- (ii) Refer to the student teachers' book under the interpretation of physical aspects from maps and photographs.

e) Application 3.1

- (i) Hills, drainage/river/lakes/streams/mountains swamps etc.
- (ii) Refer to the student teachers' book .
- (iii) The environmental conservation measures e.g. planting trees, strict laws against poaching, mass education, etc.

Lesson 2. Interpretation of human aspects on maps

a) Learning objectives

The following are the objectives of this lesson:

- To identify the human aspects on the ordinary survey map.
- To describe the human aspects on a topographic map.
- To appreciate the importance of human features.

b) Teaching resources

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

- Students' book for Year 2
- 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) Prerequisites/Revision/Introduction

The lesson on interpretation of features on maps/photographs is not new to student teachers in year 2 since interpretation of physical features on maps/photographs was taught in the previous lessons. 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 lessons, the student teachers will be guided to use geographical documents and internet to research on interpretation of human features on maps/photographs. The focus will be made especially on interpretation of agricultural activities, mining and quarrying, industrial areas, settlements on maps/photographs.

d) Learning activity

Activity 3.2

Guide student-teachers 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 lessons should be used. Then the student-teachers will make research on signs and symbols representing the agricultural activities, mining and quarrying, industrial areas, settlements on maps/photographs.

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

e) Application 3.2

1. Refer to the student teachers'book under the symbols used to represent mining.
2. Refer to the student teachers'book under the symbols used to represent mining.

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

a) Learning objectives

- To state the relationship between physical and human aspects on the topographic map.
- To describe the relationship among the physical and human aspects on the topographic map.

- To understand the interaction between the physical and human aspects.

b) Teaching resources

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

- Students' book for Year 2
- 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) 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 student teachers 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 student teachers will be engaged in activities like discussions, asking and answering questions by referring to the learner's book for year 2. Thereafter, student teachers may be asked to identify and describe the relationship which may exist between physical and human aspects on maps/photographs.

d) Learning activities 3.3

- i) Guide student teachers 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 Year 2 should be used. Then, the student teachers will make research on signs and symbols representing the physical features (geology, slope, drainage, landforms, and soils) and human features (agricultural activities, mining and quarrying, industrial areas, settlements) on maps/photographs.

ii) The student teachers will be in activities like sharing experiences, discussions, asking and answering questions by referring engaged to the learner's book.

e) **Application activity 3.3**

1. Refer to the key used under activity 3.3 in student teachers' book.
2. Refer to the student teachers' book on interpretation of both human and physical features.
3. The student-teachers will explain the relationship existing between communication networks and physical / human features in their villages.

3.6. 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 identified 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 identified 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 focused especially on drainage and settlement patterns, vegetation and communication networks.

3.7. 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 student teachers.

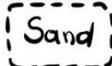
3.8. End unit assessment

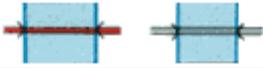
Question 1

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.
 - (c) Show different signs and symbols to be used in representing physical and human features existing in your district.

Attempted answers:

- (a) Student teachers 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.
- (b) Student teachers 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.
- (c) Student teachers 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		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	 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	
Aboveground oil or gas pipeline	
Underground oil or gas pipeline	
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 student teachers 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:

Student teachers 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.

3.9. Additional Activities

i) Consolidation activities:

- (a) Show the signs and symbols used to represent various physical and human features on maps/photographs.
- (b) 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 student teachers on how to answer the above questions using the learner's book and research.

ii) Remedial activities (for slow student teachers)

Such student teachers take time to understand what has been taught.

Teachers should not reprimand such student teachers 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.
- The activities will depend on the situation at hand.

iii) Extended activities (for gifted and talented student teachers)

This category of student teachers 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.

Skills lab orientation

The student-teachers use the knowledge acquired in both units 2 and 3 of the student's book year two and other skills acquired to draw and calculate the area of the school.

UNIT 4

THE UNIVERSE AND THE SOLAR SYSTEM

4.1. Key unit competence

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

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

The student teachers 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 student teachers can use to understand better the content of this unit 4 of year 2. It is 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 learners' 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 tutor to conduct diagnostic assessment as a way of measuring each learner's abilities.

4.3. Cross-cutting issues to be addressed

There are many cross-cutting issues that can be applied in this lesson. In the student teachers' 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, which 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 and Financial education. However, all these require planning in advance on how the tutor has to develop them.

Peace and values education can be integrated using the classroom situation where students themselves are taught to thank their peers whenever they respond to a given answer.

4.4. Guidance on the introductory activity

The answers for this introductory activity: some are embedded therein the passage and the student teachers are requesting to think out of the box. That is, they should relate the narrative and associated it with the studied topics in S1 under unit 3.

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

4.5. List of lessons

#	Lesson title	Learning objectives	Number of periods
1	4.1. Definition of the universe: components of the universe	<ul style="list-style-type: none"> - To identify the components of the universe - To describe the components of the universe - To appreciate the contribution of the universe. 	2
2	4.2. The solar system: sun and planets	<ul style="list-style-type: none"> - To identify the components of the solar system. - To describe the planets of the solar system. - To appreciate the contribution of each one of the planets. 	3

3	4.3. Earth: peculiar elements of the earth	<ul style="list-style-type: none"> - To identify the peculiar elements of the earth. - To describe the elements of the earth. - To conserve the earth's peculiar elements. 	2
4	4.4. Earth's movements	<ul style="list-style-type: none"> - To identify the movements of the earth. - Explain the movements of the earth. - To appreciate the importance of these peculiar elements. 	2
5	End unit assessment		1

Guidance on different lessons

The above table highlights all the lessons that have been created in relation to dividing the unit content into 4 lessons. This implies that under this lesson, the duration is composed of two periods or more. Below is the guidance on how to go about each lesson or sub heading.

Lesson 1: Definition of the universe and its components.

a) Learning objectives

- The student teacher will be able
- To identify the components of the universe
- To describe the components of the universe
- To appreciate the universe

b) Teaching resources

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

c) Prerequisites/Revision/Introduction

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

d) Learning activities

Activity 4.1

- (i) Universe or solar system
- (ii) Refer to the student teachers' book under the definition of the universe and components of the universe.
- (iii) Refer to the student-teachers' book under the definition of the universe and components of the universe.

e) Application Activity 4.1

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

- (i) The student teachers 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 breath, source of energy (the sun), etc.
- (ii) The illustration represents the universe where our planet earth and other planets belong. We should love it because of the reasons shown in (i) above.

Lesson 2: The solar system: Sun and Planets

a) Learning objective

- To identify the components of the solar system.
- To describe the planets of the solar system.
- To appreciate the contribution of each one of the planets.

b) Teaching resources

- Flip charts
- Manila papers

- Print outs for the activity
- Text books
- Internet

c) Prerequisites/Revision/Introduction

The student teachers should have completed properly the content of lesson one. The teacher should also use the past studies the student teachers had in senior one, to create more introductory activity.

d) Learning activities

Activity 4.2

1. Refer to the student teachers' book under solar system and its components.
2. Refer to the student teachers' book under the characteristics of the sun and planets.

e) Application Activity 4.2

1. The possible answers for the first part of the application activity: Refer to the content of solar system: Sun and Planets in student teachers' book.
2. 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) Learning objectives

- To identify the peculiar elements of the earth.
- To describe the elements of the earth.
- To conserve the earth's peculiar elements.

b) Teaching resources

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

c) Prerequisites/Revision/Introduction:

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

d) Learning activities

Activity 4.3

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

e) Application Activity 4.3

- (i) The students should look at the importance of the peculiar elements to mankind. E.g. provision of water, home for mankind, supports life etc.
- (ii) Emphasize environmental conservation measures, protection of the environment/utilization of the resources in a sustainable manner.

Lesson 4. Earth's movements

a) Learning objectives

- To identify the movements of the earth.
- Explain the movements of the earth.
- To appreciate the importance of these peculiar elements.

b) Teaching resources

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

c) Prerequisites/Revision/Introduction:

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

d) Learning activity

Activity 4.4

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

e) Application Activity 4.4

1. Determine the time at Greenwich first. And then the time difference both at the east and west of Greenwich .The possible answer for the question is **00:08 am**
2. Determine the time at Greenwich using the time given for a place located at 30 degree East:
30 degree = 2 hrs. Since it used to determine the time at Prime meridian, subtract 2 west words from the time at 30 degree. This gives you 12:00 O'clock. Then, find the time difference between GMT and place X. It will be $12h00-11h00= 1h$. The longitude therefore is **15^ow**
3. The student-teacher refers to the students 'book under the movements of the earth.

4.6. Summary of the unit

The unit 4 of year 2 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 peculiar elements of the earth and the earth's movements.

4.7. Additional Information

There is no much additional information the tutor needs. The tutor should take note of the following:

The curriculum requires the tutor to guide student teachers to study and master the concept of universe. At the beginning of the unit the components of the universe are dealt with and the last part of the unit, they come in form of other heavenly bodies. This should not create a spot of doubt and confusion. The text book clearly addresses this issue.

4.8. End unit assessment

The possible answers for the End unit assessment:

Question 1:

- 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.

- d) The programs: The tutor should guide student teachers 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.

Question 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.

4.9. 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 student teachers can also be assisted to raise their self-confidence and at the same time learn in the simplest way possible.

Questions	Possible answers
1. <i>Establish the difference between the universe and the solar system.</i>	Refer to pupils' book
2. <i>Explain the meaning of meteors.</i>	Refer to students' book
3. <i>List the components of the solar system.</i>	Refer to students' book
4. <i>State and explain the effects of the earth's rotation.</i>	Refer to students' book
5. <i>Explain the differences existing between earth's rotation and earth's revolution.</i>	Refer to students' book

b) Consolidation activities:

Questions	Possible answers
1. "With Cosmic distances, kilometres or miles are not appropriate unit of measure for distances" Explain why it is like that.	<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 that it can travel in a year.</p>
2. Name the biggest galaxy in the universe.	<p>The biggest galaxy is Andromeda and it is the nearest galaxy to the Milky way galaxy where our planet earth belongs.</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 student teachers' book under: 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, the student- teacher should be able to discuss the theories of the origin of the Earth

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

This is a crucial time to point out what student teachers should have in terms of knowledge, skills, attitudes and values. This will make a way through which student teachers in Year 2 are getting some new concepts 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, student teachers in Year 2 lack profound knowledge, skills, attitudes 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 deep about theories about the origin of the Earth and this will enable student teachers to get new and detailed knowledge, skills, attitudes and values that will be a foundation from which the tutor starts to assess student teachers.

5.3. 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 a use of few cross-cutting issues, but this does not mean that it is enough to use one cross-cutting issue. The tutor 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 scenarios that support the integration of other cross-cutting issues. This will be favourable to the tutor when he/she plans it in advance.

5.4. Guidance on the introductory activity

One way to hold 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 student teachers' possibilities of knowledge, skills and attitudes that they have acquired or expected to learn directly in their class.

All activities in this unit, aim at preparing and helping Year student teachers to get a deep understanding of origin of the Earth. Activities are prepared and organized in a way that all student teachers will be able to respond to them. They can be answered individually or in pairs. The role of the tutor 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.

5.5. List of lessons and End unit assessment

#	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes).	Number of periods
1.	5.1. Theories of the origin of the earth (The big bang theory, the creation, theory/biblical theory).	<ul style="list-style-type: none"> - 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. 	3

2	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.	<ul style="list-style-type: none"> - Outline the evidences to prove that the earth is spherical/geoid - Explain the evidences which prove that the earth's shape is spherical/geoid 	3
3	5.3. The internal structure of the earth. (Mineral composition)	<ul style="list-style-type: none"> - Explain the internal structure, mineral composition and the superficial configuration of the earth - Carry out a research to find the internal structure, mineral composition 	2
	End unit assessment		1

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 two or three periods depending on the extent of content.

Here below there are some details about 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 student teachers in full participation of the lesson. This sub heading clarifies two theories dealing with the origin of the Earth.

The author suggests to the tutor to go deep even beyond of what is in the student's book at the same time supporting student teachers in their activities.

a) Learning objectives

- 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.

b) Teaching resources

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

c) Prerequisites/Revision/Introduction:

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

d) Learning activities

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

Activity 5.1 was prepared for student teachers to introduce the lesson in the student's book. As the activity involves experiments, it is better to be done in a small group. The tutor will give instruction on how the activity is going to be done basing on the objective of the lesson. Student teachers 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 student teachers carry out an experiment, it will prove them how the universe works.

e) Application 5.1

- **Question 1:** on the difference between the Big bang theory and the Biblical theory about the origin of the earth: refer to the student's book, under the Big bang theory and the Biblical theory.
- **Question 2:** in groups, student-teachers will be guided to research on other theories of the origin of the earth.

Lesson 2. Characteristics of the Earth

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

In first lesson, student teachers 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 evidences to prove that the earth is spherical) .

Student teachers will gain more knowledge, skills and attitudes and values to build their capacity of thinking and create curiosity of travelling in the world to appreciate the beauty of the world.

a) Learning objectives

- Outline the evidences to prove that the earth is spherical/geoid
- Explain the evidences which prove that the earth's shape is spherical/geoid

b) Teaching resources

The tutor 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. The 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 a tutor remember 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 tutor to manage the time and all learning activities.

Student teachers should also be familiar with drawing by using manila papers or use of their note book.

c) Prerequisites/Revision/Introduction

In this lesson, the authors used many activities to check the understanding of student teachers 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 student teachers with more scientific experiments. All activities in this lesson contribute much as they work as a diagnostic assessment.

d) Learning activities

Activity 5.2

This activity is related with the shape and evidences to prove that the Earth is spherical. It is set to enable the tutor 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.
 - 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 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
- (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.

e) Application activity 5.2

This activity provides instructions to follow so that the student teachers 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 student teachers and provide them with materials to use in this activity.
- (c) The teacher also will help student teachers by forming small groups then the student teachers themselves will measure the lines drawn around the egg.
- (d) After getting the findings from measurements, student teachers will describe the shape of the Earth.
- (e) The parts of the egg not named are:
 - X** stands for North Pole.
 - E** stands for Equator.
 - Y** stands for South Pole.
- (f) The 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 Year 2; it is a sequence from lesson 5.2. It concerns with internal structure of the Earth and its mineral composition.

a) Learning objectives

- Explain the internal structure, mineral composition and the superficial configuration of the earth.
- Carry out a research to find the internal structure, mineral composition.

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 or a boiled egg that has a core at the centre. This will help student teachers to discover and share findings by simulating the structure of the Earth from known materials.

c) Prerequisites/Revision/Introduction

The present lesson has only one activity 5.3 and one application 5.3. These activities intend to assess the level of achievement. The learner has to use the knowledge and skills acquired in both O'level and year 1, to better understand and participate in this lesson.

d) Learning activities

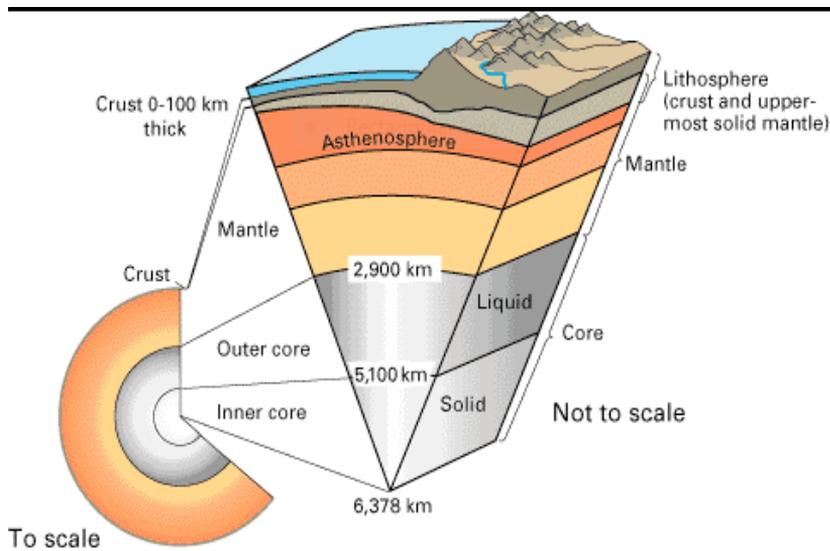
Activity 5.3 deals with the internal structure of the Earth.

The answer for question 1

In this activity, the interior structure of the Earth is layered in spherical shells, the outer part which is solid and visible where all human activities take place, 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.

The answer for question 2

- (i) Student teachers are asked to fill/complete the missing words within the illustration in student teachers' book and the gaps are now complete.



- (ii) Description of mentioned parts, refer to the student teachers' book.

The answer for question 3.

The teacher will guide student teachers to make research on the main mineral composition of the Earth, first by forming small groups, then student teachers

use their books and other geographical sources of information that can assist them to register a successful work.

e) Application activity 5.3

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

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

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 molten material erupts from the mantle and escapes up to the Earth's surface.

Question 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 %.

5.6. Summary of the unit

This unit discussed about the origin of the earth, whereby the authors describe two most accepted theories that discuss the existence of the earth namely; the big bang theory and the biblical theory, they went on to further describe the shape of the earth and its other characteristics.

5.7. Additional information

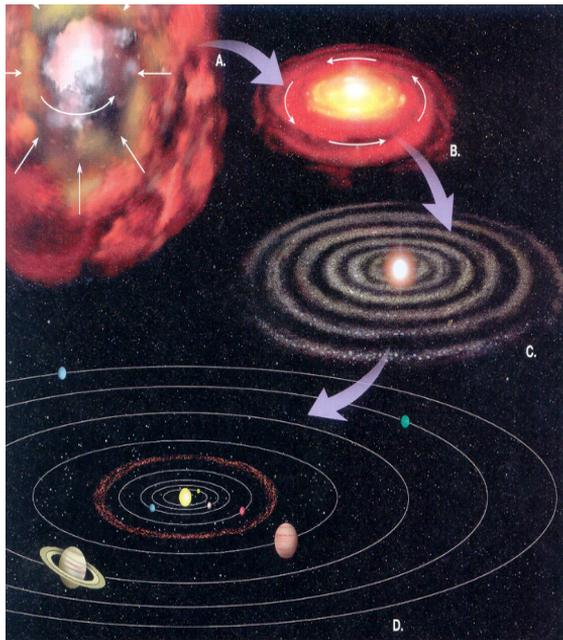
In student teachers' book, only two theories of origin of the Earth Big bang theory and Biblical/Creation theory were developed. In this teacher's guide additional theories are being described below:

1. The dust cloud theory

This theory was developed by three individuals between 1940 and 1955. They were Carl F. Von Weizsaccker, 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.



- A. Gravitational collapse of nebular causing its inward contraction.
- B. Nebula contracted into a rotating disk and heated up as gravitational energy converted into heat energy.
- C. Cooling nebula condenses to form tiny rocky and metallic solid particles.
- D. Collision of dust-size particles join to form asteroids and accrete to form the planets.

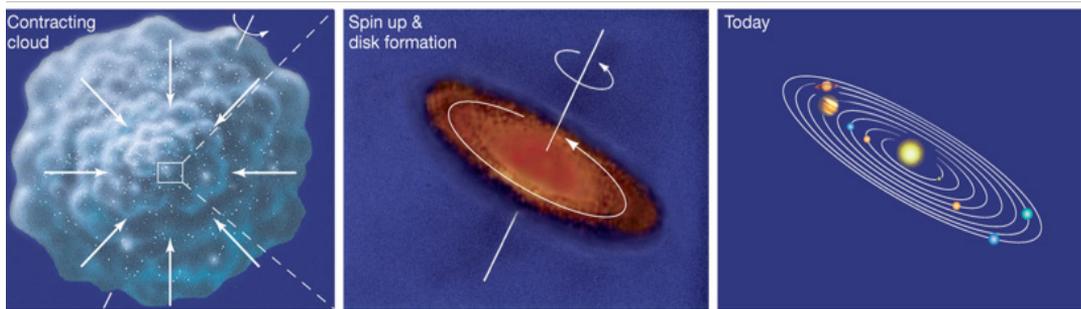
Photograph of clouds of gas and dust from which the solar system and the Earth were formed

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.



Collision between two planetary bodies

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.



A



B

The encounter and collision between the stars and the sun (A), and the broken fragments that formed the planets (B)

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.



Accretion of the gas and dust by the sun

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.

5.8. End unit assessment

1. a) Both students Mugisha and Uwamahoro are right because their discussions are based on truth of two most accepted theories that are Big bang and Biblical theory.
b) Refer to the student's book where the theories on the origin of the earth are provided.
2. The student teachers 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.
3. In groups, student-teachers will be guided in discussions on the ways in which humans should protect the environment for the sake of promoting such archeological research.

5.9. Additional activities

a) Remedial activities

1. 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.

2. How do minerals differ 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.

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 provide jobs to many people.

Mining sites owners pay tax to the government.

Minerals are exported abroad thus a country gain foreign exchange.

a) **Extended activities:**

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

Suggest measures that should be taken to avoid floods.

Answer:

- Population living near danger 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 flows freely.
- Put up more flood barriers as defence to the danger zones.

Skills lab

The tutor refers the student teachers to the introduction on the shape of the earth and the evidences of the shape of the earth, as areas that can help the student-teacher to convince his audience.

UNIT 6

INTERNAL LANDFORM PROCESSES

6.1. Key unit competence

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

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

The student teachers are expected to have mastered the content of unit 2 of year 1, where they studied the formation of relief features in Rwanda. That unit of year 1 greatly provides strong foundation that student teachers can use to understand better the content of this unit 6 of year 2. 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 year 1 content and year 2 content is that, at this level of year 2, 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 year 1, should be used by the tutor to conduct diagnostic assessment as a way of evaluating each learner's abilities.

6.3. Cross-cutting issues to be addressed

There are many cross-cutting issues that can be applied in this unit. In the student's book, the writers or authors used activities to integrate the cross-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 tutor 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 occasion: 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 classroom situation.

The following are brief description of the integration of cross-cutting issues:

- **Environment and sustainability:** The tutor is requested to give more explanations on the activities describing the importance of landforms produced by vulcanicity, warping, faulting and folding. The tutor should help student teachers to 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/ she should also help students to understand carefully the measures that should be taken to conserve and preserve, for example the tutor should guide student teachers on how planting trees on steep slopes and escarpments in order to control soil erosion and mass wasting. This will help students to be equipped with more knowledge and skills on environment and sustainability.
- **Peace and values education:** It could be addressed in the 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, shows positive attitudes of someone who has peace. In this activity the tutor should reinforce the need of peace in the society.
- **Inclusive education:** The tutor is advised to cater for special needs of student teachers with disabilities. For example; the tutor 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 tutor should select conducive environment to all students so that students with disabilities can participate in learning activity.

6.4. Guidance on the introductory activity:

In conducting the introductory activity, the tutor has to allow student-teachers to observe critically the diagrams provided related to 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.

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

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

Possible answers for introductory activity include:

- (a) Faulting, vulcanicity, folding and warping.
- (b) Possible answers are found in the student-teachers book on faulting.
- (c) The possible answers for question (c) may include:

The effects of the features resulting from internal processes on human activities are the following:

- 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.

6. 5. List of lessons

SN	Lesson title	Learning objectives (Knowledge, skills and Attitudes)	Number of periods
1	6.1. Faulting	<ul style="list-style-type: none"> - Recall the processes leading to the formation of different faulted features. - Explain the processes responsible for the formation of different faulted landforms. - Identify the major types of faults and impact of faulting on landscape and drainage. - Investigate the impact of different faulted landforms on landscape and drainage. - Identify the influence of faulting to man. 	

SN	Lesson title	Learning objectives (Knowledge, skills and Attitudes)	Number of periods
		<ul style="list-style-type: none"> - Appreciate the impact of internal processes on the landscape. - Describe the influence of faulting to man. - Identify other areas that are associated with faulting in the World. - Locate the different areas associated with faulting. 	2
2	6.2. Faulting & Warping	<ul style="list-style-type: none"> - Recall the processes of folding. - Explain the processes responsible for folding. - Recall the processes of the folding, types of folds and its influence on the landscape. - Identify the major landforms associated with the folding. - Define warping and the associated landforms. - State the influence of warping on the drainage. - Explain the processes responsible for the folding. - Explain the impact of the different folded landscapes. - Explain the impact of warping and associated landforms. - Describe the influence of warping on the drainage. - Appreciate the importance of folding on the landscape. - Understand other perspectives responsible for the formation of different folded landforms. 	2

SN	Lesson title	Learning objectives (Knowledge, skills and Attitudes)	Number of periods
3	6.3. Vulcanicity & Earthquakes	<ul style="list-style-type: none"> - Define vulcanicity, volcanicity and recall the volcanic processes. - Identify the major landforms associated with vulcanicity and volcanicity. - State the types of volcanoes and their characteristics. - State the impact of vulcanicity on drainage and man. - Identify the major volcanic regions in the world. - Define the concept of earthquakes - Explain the causes and effects of earthquakes. - Explain the processes responsible for the formation of different intrusive and extrusive landforms. - Describe the different relief landforms associated with the intrusive and extrusive processes. - Carry out a research on the types and characteristics of volcanoes. - Explain the impact of different volcanic landforms. - Appreciate the importance of vulcanicity in shaping the landscape. - Appreciate the perspectives responsible for the formation of different volcanic landforms. - Show concern for the causes and the consequences of earthquakes, and devise emergency and preparedness measures. 	4
4	End unit assessment		1

Guidance on different lessons outlined above

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

a) Learning objectives

The following are the learning objectives of the lesson:

- Recall the processes leading to the formation of different faulted features.
- Explain the processes responsible for the formation of different faulted landforms.
- Identify the major types of faults and impact of faulting on landscape and drainage.
- Investigate the impact of different faulted landforms on landscape and drainage.
- Identify the influence of faulting to man.
- Appreciate the impact of internal processes on the landscape.
- Describe the influence of faulting to man.
- Identify other areas that are associated with faulting in the World.
- Locate the different areas associated with faulting.

b) Teaching resources

The following are resources to be used in the lesson:

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

c) Prerequisite/Revision /introduction:

There is a direct link of activity 6.1, intended to introduce the lesson, with the lessons studied in year 1. The activity 6.1 requests student-teachers to recall the knowledge and skills gained from previous lessons of year 1 about relief formation in Rwanda, this will be through diagnostic assessment/ evaluation

by tutor. This will enable student-teachers to follow the lessons by linking it to Rwandan landforms formation processes.

d) Learning activities

Activity 6.1

In conducting this learning activity, the tutor will guide student-teachers to use available resources like textbooks and internet to answer the questions related to learning activity. Then the student-teachers try their best to give answers to the learning activity and try their best to answer them. The tutor 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) Meaning of faulting and fault: refer to student-teachers' book on faulting
- b) Processes of faulting include tensional, compressional and differential uplift. Refer to the student's book under Faulting.

Learning activity 6.2

In this activity the tutor should allow student-teachers to observe critically the diagrams provided and identify their names and their characteristics. Then, answer the questions related to the learning activity. The tutor 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 student teachers with special needs using gestures, tactile materials, sign language or video clips.

Possible answers to learning activity:

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

Learning activity 6.3

In this activity, the tutor should allow student-teachers read carefully the passage. For this activity, the tutor will give student teachers an opportunity to read attentively the passage and give them time to reflect on the provided questions and then give their answers. Student-teachers are expected to give answers that rotate on the influence of faulting on landscape.

Then answer the questions related to learning activity. The tutor 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. 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 student-teachers under guidance of the tutor.

Possible answers to learning activity

- 1) Refer to the student's book on influence of faulting on the landscape.
- 2) Refer to the student's book on influence of faulting on the landscape.
- 3) Refer to the student's book on influence of faulting on the landscape.

d) Application activities

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 formation of river Rusizi as fault guide valley in south western Rwanda.

Possible answers to application activity 6.2

- The student-teachers 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.

Possible answers to the application activity 6.3

- The student-teachers 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 2: Faulting and warping

a) Learning objectives

The following are the learning objectives of the lesson:

- Recall the processes of folding.
- Explain the processes responsible for folding.
- Recall the processes of the folding, types of folds and its influence on the landscape.
- Identify the major landforms associated with the folding.
- Define warping and the associated landforms.
- State the influence of warping on the drainage.
- Explain the processes responsible for the folding.
- Explain the impact of the different folded landscapes.
- Explain the impact of warping and associated landforms.
- Describe the influence of warping on the drainage.
- Appreciate the importance of folding on the landscape.
- Understand other perspectives responsible for the formation of different folded landforms.

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.

c) Pre-requisites/Revision/ Introduction

The activity 6.4 is intended to introduce the lesson 2 and it has a link with unit 3 studied in year 2 on formation of relief features in Rwanda.

d) Learning activities

Learning activity 6.4.

For this activity, the tutor will give student teachers 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 tutor 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:

1. a) For answering such question refer to the student's book on the folding process.
b) Folding is a process in which crustal rocks bend due to compression forces.
2. For answering such question refer to the student's book on impact of faulting.

e) Application activity

Possible answers to the application activities 6.4

1. Warping has led to formation of different landforms in East Africa including Rwanda. Lake Muhazi and Mugesera in eastern region of Rwanda, lake Kyoga and Victoria in Uganda and many plateaus in East Africa can prove that east African region has been affected by warping.
2. The student teachers have to draw a sketch map of Rwanda and label and marks the basin lakes (Lake Muhazi and Mugesera) and plateaus of eastern province of Rwanda.

Lesson 3: Vulcanicity and earthquakes

a) Learning objectives

The following are the learning objectives of the lesson:

- Define vulcanicity, volcanicity and recall the volcanic processes.
- Identify the major landforms associated with vulcanicity and volcanicity.
- State the types of volcanoes and their characteristics.
- State the impact of vulcanicity on drainage and man.
- Identify the major volcanic regions in the world.
- Define the concept of earthquakes
- Explain the causes and effects of earthquakes.
- Explain the processes responsible for the formation of different intrusive and extrusive landforms.
- Describe the different relief landforms associated with the intrusive and extrusive processes.
- Carry out a research on the types and characteristics.

b) Teaching resources

During this teaching and learning process, the tutor will refer to the following teaching resources where possible.

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

c) Prerequisites/Revision/ Introduction

The activity 6.5 intends to introduce the lesson 3 has a link with the content of unit 2 of year 1 on the formation of relief about the topic of the process of vulcanicity, earthquakes and the associated landforms features of Rwanda. There student-teachers should have gained knowledge and skills about the formation of North Western Rwanda relief, which has been formed through vulcanicity.

d) Learning activities

Activity 6.5

For this activity, the tutor will give student-teachers 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 tutor 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 6.5 are the following:

1. Intrusive and extrusive vulcanicity. More details: refer to student's book on the vulcanicity
2. Refer to student-teachers' book on intrusive and extrusive features.

Activity 6.6

In conducting this activity, the tutor will give student-teachers 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 tutor is requested to try 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 student-teachers should have understood the content from unit 2 of year 1

Possible answers are:

- Volcano
- Sill
- Lacolith
- Batholith
- Dyke.

Activity 6.7

For this activity, the tutor will give student-teachers an opportunity to read the questions attentively and give them time to reflect on them before giving answers. The tutor 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:

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

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

Activity 6.8

The tutor will give students-teachers an opportunity to observe critically the provided picture, allow them to reflect on the provided questions and then give their answers. The tutor 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. A crater lake is formed when a crater formed after volcanic eruption, is filled with water.

2. Refer to student-teacher's book on influence of volcanicity on drainage.
3. Make sure that student-teachers have shown the volcanic regions on the east Africa map.

Activity 6.9

For this activity, the tutor will give student-teachers an opportunity to read attentively the passage and give them time to reflect on the provided questions and then give answers. The tutor 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

- i. Refer to the student's book on meaning of earthquake and its related concepts.
- ii. Refer to the student's book on the meaning of earthquake and its related concepts.
- iii. Refer to the student's book on the meaning of earthquake and its related concepts.
- iv. Refer to the student's book on the meaning of earthquake and its related concepts.

Activity 6.10

For this activity, the tutor will give student teachers an opportunity to observe critically provided photograph, give them time to reflect on the provided questions and then give answers. The tutor 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

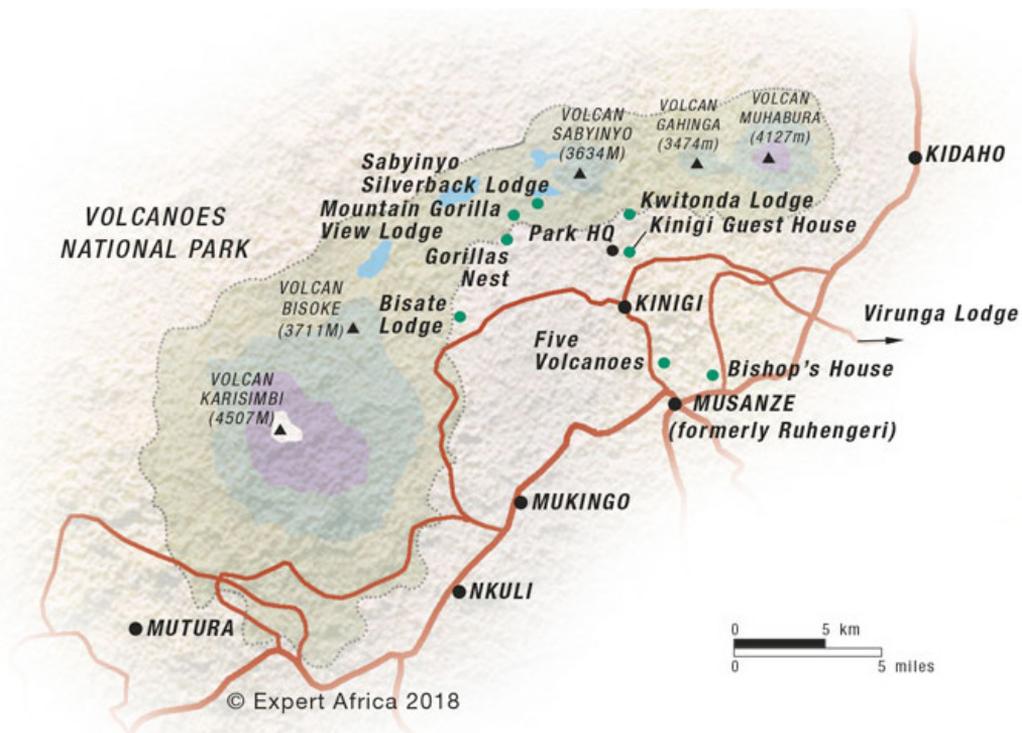
1. Destruction of buildings.
2. Refer to student's book on causes, consequences and measures of earthquakes.

e) Application activities

Application activity 6.5

Possible answers to the activity are the following:

- 1) Possible answers refer to the student-teacher's book on processes of vulcanicity and volcanic materials.
- 2) Location and name of volcanoes found in Rwanda are demonstrated on the following map (Make sure that student-teachers have given names and volcanoes in appropriate places.)



Location of volcanoes in Rwanda in Rwanda

Application activity 6.6

Possible answers to application activity

For answering such question, refer to the student-teacher's book on the extrusive and intrusive volcanic landform. And make sure student-teachers have indicated the following :

In extrusive landforms are:

- Volcanoe
- Acidic lava cone
- Basic lava cone
- Crater
- A caldera
- Ash and cinder cone
- Volcanic plateau
- Volcanic plug

In intrusive landforms are:

- Batholith
- Laccolith
- Phacolith
- Lapolith
- Sills
- Dykes

Application activity 6.7

Possible answers to the application activity

a) Volcanoes, lava plateaus, lava dammed lakes, craters, etc

b) **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 are quiet for along time. However, they still show signs of erupting again or at one given time in the future. Therefore, are 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.

Application activity 6.8

Possible answers are the following:

1. Refer to student's book on impact of volcanicity to the human.
2. Possible answers are:
 - (a) Volcanoes attract tourists due to its biodiversity (flora and fauna) .
 - (b) Volcanic soils are the most fertile soil in the Rwanda that favour crop growing.
 - (c) Lava dammed lakes and waterfalls formed are used in the generating of Hydro-electric power.
3. Refer to student-teacher's book on world distribution of volcanoes.

Application activity 6.9

Possible answers for the application activity 6.16

- (1) The epicenter of the earthquake of August 2015 was in Bukavu at 2.141°S and 28.897°E and that of February 2008. The magnitude intensity of the 2008 earthquake was 6.1 and 5.0, that of 2015 was 5.8 on Richter scale.
- (2) For answering this question refers to the student's book on the causes of earthquakes. Tutor makes sure that the causes described are likely to be observable in western part of Rwanda.

Application activity 6.10

Possible answers to the application

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

6.6. Summary of the unit

The unit 6 of year 2 deals with internal processes leading to 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.

6.7 Additional information

There is no much additional information the tutor needs. However, the writers wish to bring to the attention of the tutor 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 central plateaus as folded region for more clarification.

The tutor is requested to help and motivate student teachers to make more research via internet, field works to the areas affected by certain internal processes for instance visiting Nyamyumba hot spring, volcanoes, etc and library visiting.

6.8 End unit assessment

However the student-teachers 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 and Eduard are located.
 - Faulting in East Africa led to 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 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 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. 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 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. The student teachers 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.
5. Possible answers for measures that you should reinforce for conserving the basin lakes and wetlands found in Eastern province.
 - 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,...).

6.9 Additional activities

6.9.1 Remedial Activities

The following are questions that the tutor can use for remedial activities. They are rephrased in a way that the slow student teachers 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 the student's book on internal and external processes.
2. Identify the internal processes responsible for relief formation in Rwanda.	Refer to the student's book on internal processes.
3. Locate the area in Rwanda affected by faulting?	Refer to the student's book on faulting
4. Locate the area in Rwanda affected by volcanicity.	Refer to the student's book on volcanicity
5. Locate the area in Rwanda affected by folding	Refer the student's book on folding
6. Locate the area in Rwanda affected by warping.	Refer to the student's book on warping.
7. Locate the area in Rwanda affected by earthquakes.	Refer to the student's book on earthquakes
8. What are the impacts of faulted relief and drainage features to man.	Refer to the student's book on impacts of faulted relief and drainage features to man

6.9.2. Consolidation activities

Questions	Possible answers
1. Describe the negative and positive effects of faulting East Africa.	<p>Positive effects</p> <ul style="list-style-type: none"> • Rift valley lake attract tourists, favour fishing, favour transport , favour mining and provide water for domestic and industrial purposes. • Block mountains and rift valleys favour communication and agriculture. <p>Negative effects</p> <p>Rift valley lakes and fault guided valley are associated with accidents while block mountains hinder transport transport development.</p>

<p>2. Explain the measures that can be taken to control negative effects of earthquakes.</p>	<ul style="list-style-type: none"> • Construct strong resistant houses, live far away the area prone or subjected to earthquake such as volcanic regions. • Make a deep research on the prediction of earthquake occurrence.
<p>3. Identify the relationship between volcanicity and human activities.</p>	<ul style="list-style-type: none"> • 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. • Lava dammed lakes stimulate the development of fishing and water transport. • Some volcanic features are associated with minerals hence favouring mining. • Some volcanic features provide material for construction. • Some volcanic features are associated are homelands for animals that attract tourist. • On the other hand, volcanic features are associated with accidents, habitant of dangerous animals that are harmful to human being.
<p>4. On a sketch map of East Africa label and mark the areas affected by faulting with illustrated example.</p>	<ul style="list-style-type: none"> • The map should show the faulted features in Eastern arm lake Manyara, Eyasi, Turkana, and western arm (lake Kivu, Tanganyika, Eduard, George and Albert).

6.9.3 Extended activities

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

Possible answers:

After a research, the talented student teachers 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 M_w 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 that follow:

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

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 into 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 areas affected by that earthquake have been forced to move from their areas to neighbouring regions and countries to look for shelter and other primary needs.

Economic decline and poverty associated with the destruction of properties occurred after that 2010 earthquakes in Haiti. However, rehabilitation has been done by the Government, other partners, and international organization.

Skills lab

Through the learning of internal landform evolution and processes, Student-teachers have learnt the processes that may change the earth's surface and have knowledge of the surface on which they are by observation or research. Therefore, they will associate, justify and explain the type of landform process likely to occur in the region and change the landform.

UNIT 7

SOILS

7.1. Key unit competence:

Student- teachers should be able to investigate the different constituents and morphological properties of soil.

7.2 Prerequisite (knowledge, skills, attitudes and values)

The student teachers are expected to have mastered the content of unit 7 of S1, unit 8 of S2, unit 3 of S3 and unit 5 of year 1, where they studied the soils. These units of senior one, senior two, senior three and year 1, greatly provide strong foundation that student teachers can use to understand better the content of this unit 7 of year 2. 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.

7.3. Cross-cutting issues to be addressed:

There are many cross-cutting issues that can be applied in this lesson. In the Students' 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 student teachers with special needs such as student teachers with physical disabilities, hearing disabilities or communication difficulties and visual impairment.

For the student teachers with physical disabilities, the teacher will refer to video clip, or bringing some samples in classroom. For student teachers with hearing disabilities or communication difficulties, in different learning activities the teacher will use enough illustrations, diagrams and sign languages where possible. For student teachers 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.

7.4. 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 student teachers 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 student teachers to discover themselves the right answers through the learning and teaching process.

Possible answers to introductory activity

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.

7.5. List of lessons

#	Lesson title	Learning objectives	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.	6
3	End unit assessment		1

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) Learning objectives

- State the constituents of soil.
- Investigate the constituents of soil.
- Appreciate the importance of soil.

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) Prerequisites / Revision / Introduction:

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

d) Learning activity 7.1

- **Guidance**
- **Answers:**

For this activity, the teacher will give student teachers 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) Learning objectives

- 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.

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) Prerequisites/Revision/Introduction:

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

d) Learning activity 7.2

- Guidance
- Answers

For this activity, the teacher will give student-teachers 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 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

- (1) Soil structure = A, (ii) Soil texture = B, (iii) Soil colour = E, (iv) Soil profile = D (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 student teachers 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 student teachers 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.

7.6. Summary of the unit

The unit 7 of year 2 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.

7.7. Additional Information for teachers

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 student-teachers have got sufficient information related to soils in the previous classes (S1, 2, 3 and year 1). 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 environment.

The teacher is requested to help and motivate student teachers 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.

7.8. End unit assessment

Possible answers to End Unit Assessment

The student teachers 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 p^H*

7.9. Additional activities

7.9.1. Remedial activities.

The following are questions that the teacher can use for remedial activities (activities for slow student teachers). They are rephrased in a way that the slow student teachers 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.

7.9.2 Consolidation activities

The following are suggested questions for deep development of competences.

Question	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
2. 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.

7.9.3 Extended activities

The following question is suggested for gifted and talented students:
Establish the difference 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)

Skills lab: Soil is important; student-teachers can use it for cultivation.

UNIT 8

WEATHER AND CLIMATE OF THE WORLD

8.1. Key unit competence

The student-teachers 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.

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

The student-teachers are expected to have mastered the content of unit 8 in S1, unit 9 in S2, and unit 4 in S3, where they studied weather and climate. These units of senior one, senior two and senior three greatly provide strong foundation that student teachers can use to understand better the content of this unit 8 of Year 2. 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.

8.3. Cross-cutting issues to be addressed

There are many cross-cutting issues that can be applied in this lesson. In the student teachers' 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 student teachers with special needs such as student teachers with physical disabilities, hearing disabilities or communication difficulties and visual impairment. For the student teachers with physical disabilities, the teacher will refer to video clip, or bringing some samples in classroom. For student teachers with hearing disabilities or communication difficulties, in different learning activities the teacher will use enough illustrations, diagrams and sign languages where possible. For student teachers 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.

8.4. 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 student teachers 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 student teachers to discover the right answers on their own through the learning and teaching process.

8. 5. List of lessons and End Unit assessment

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. - Define the structure of the atmosphere. - Identify the importance of the atmosphere. - Infer the influence of the layers of the atmosphere to the changes in the atmosphere's conditions. - Explain the importance of the atmosphere. - Describe the composition of the atmosphere. - Show resilience for the changes in the atmosphere and the desire to protect it. 	3
2.	8.2. Elements of Weather and climate	<ul style="list-style-type: none"> - To define the concept of weather and climate - Identify the elements of weather and climate. - To appreciate the importance of the elements of weather to life on Earth. - Describe the elements of weather. 	7
3.	8.3. Factors that influence World climate	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	8.5.Influence of climate on human activities	<ul style="list-style-type: none"> - 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

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

a) Learning objectives

- Define the atmosphere.
- Identify the importance of the atmosphere.
- Infer the influence of the layers of the atmosphere to the changes in the atmosphere's conditions.

b) Teaching resources:

During the teaching and learning process, the tutor 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) Prerequisites/Introduction

The Activity 8.1 tends to introduce the lesson 1. The activity 8.1 also requests student teachers to recall the knowledge and skills gained from previous lessons of senior one, two, three and Year1. This will enable student teachers to follow the lesson by linking it to what they have learnt in previous classes.

d) Learning Activity 8.1

For this activity, the tutor will give student teachers 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.

e) Application Activity 8.1

Possible answers

Question 1: For answers related to question a, please refer to the students' book on atmosphere: its definition and structure.

Question 2: For answers related to question b, please refer to students' book on atmosphere: its definition and structure.

Question 3: 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) Learning objectives

- To define the concept of weather and climate
- To identify the elements of weather and climate.
- To appreciate the importance of the elements of weather to life on Earth.

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) Prerequisite/Introduction:

The teacher will be required to introduce lesson 2.

d) Learning Activity 8.2

For this activity, the tutor will give student teachers an opportunity to observe critically the figure and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to read critically the context/passage and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to read critically the figure and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to observe critically the photo and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to observe critically the given figure and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to read critically the given passage and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to observe critically the given figure and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor will give student teachers an opportunity to observe critically the given figure and give them time to reflect on the provided questions and then give answers. The tutor 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

e) Application Activity 8.2

Possible answers to application activity 8.2:

1.

July

April

Total annual rainfall = 1,101 mm.

Annual temperature mean = 28.8°C = 24°C

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 tutor 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) Learning objectives

To list the factors that influence the world climates.

To explain the factors influencing the climate of the world

To appreciate the importance of climate

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

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

c) Prerequisite/Introduction:

The Activity 8.3 tends to introduce the lesson 3. The activity 8.3 also requests student teachers to recall the knowledge and skills gained from previous lessons of senior one, two, three, and year1. This will enable student teachers to follow the lesson by linking it to what they have learnt in previous classes.

d) Learning activities

Learning activity 8.3

For this activity, the tutor will give student teachers an opportunity to read critically the given question and give them time to reflect on the provided questions and then give answers. The tutor 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.

e) 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) Learning objectives

- 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.

b) Teaching resources: During the teaching and learning process, the tutor 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) Prerequisite/Introduction:

The Activity 8.4 tends to introduce the lesson 4. The activity 8.4 also requests student teachers to recall the knowledge and skills gained from previous lessons of senior one, two, three and Year1. This will enable student teachers to follow the lesson by linking it to what they have learnt in previous classes.

d) Learning activity 8.4

For this activity, the tutor will give student teachers an opportunity to observe

critically the given maps and give them time to reflect on the provided questions and then give answers. The tutor 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.

e) Application Activity 8.4

Possible answers to application activity 8.4

The tutor 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 tutor 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) Learning objectives

- 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.

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) Prerequisite/Introduction:

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

d) Learning activities

Learning activity 8.5

For this activity, the tutor will give student teachers an opportunity to read critically the given passage and give them time to reflect on the provided questions and then give answers. The tutor 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 tutor 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.

e) Application Activity 8.5

Possible answers to learning activity 8.5

The tutor will guide the students on how to discuss about the given statement. Referring on the effects of climate on human activities

8.6. Summary of the unit

The unit 8 of Year 2 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.

8.7. End unit assessment

However the student teachers 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 tutor 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 tutor 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 tutor 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.

8.8. Additional Information

Concerning with additional content for the tutor to have a deeper understanding of the topic, there is no much additional information the tutor 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 Year1). However, the writers wish to bring to the attention of the tutor 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 tutor is requested to help and motivate student teachers 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.

8.9. Additional activities

a) Remedial Activities:

The following are questions that the teacher can use for remedial activities (activities for slow student teachers). They are rephrased in a way that the slow student teachers 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 instrument used to record the day temperature.	Refer to the learner's book on instruments of weather and climate.
2) Differentiate rain gauge from hygrometer.	Refer to the learner's book on instruments of weather and climate.
3) Differentiate weather and climate.	Refer to the learner's book on difference between weather and climate.
4) Identify the factors influencing the world climate.	Refer to the learner's book on factors influencing the world climate.
5) 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.

b) 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.

c) 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.

Skills lab:

The student will use the knowledge and skills gained from this unit to explain and convince the gathering. Referring to how the economic activities that develop an area are dependent on climate.

UNIT 9

NATURAL VEGETATION OF THE WORLD

9.1. Key unit competence

The student-teachers should be able to appreciate the distribution of different types of vegetation in the World.

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

The student-teachers are expected to have mastered the content of Unit 6 of year 1, where they studied the vegetation in Rwanda. This unit of year 2 greatly provides a strong foundation that students can use to understand better the content of this unit 9 of year 2. 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 as that in the learner's book 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 (Student teachers) 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 student teachers acquired from the previous classes with the aim of establishing connections between the new learning activities and the previous ones.

9.3. Cross-cutting issues to be addressed

There are some cross-cutting issues which can be applied in the lesson. In the student teachers' 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 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 student teachers with physical disabilities and react accordingly by choosing appropriate methodology, which may help those student teachers 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 go outside for fieldwork. For instance; student teachers with hearing disabilities or communication difficulties in different learning activities the teacher will help them by using providing enough illustrations, diagrams, sign languages, and gestures where possible.

For instance, student teachers 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 student teachers with visual impairment can carry out the designed learning activities using their hearing.

9.4. 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 student teachers will try to answer the questions linked to the given passage. Student teachers may not be able to get the right answer but they are requested to predict possible answers. When the student teachers 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 student teachers will associate this lesson with the content learnt in the previous lessons of year 1, on vegetation to answer the following questions:

Possible answers to introductory activity

1. Refer to the student's book indicating different types of natural vegetation on the World map.
2. Refer to the student's books on lesson 9.9: factors which influence the distribution of World vegetation.
3. Student teachers will brainstorm in group discussion on the importance of conserving natural vegetation and ways of preserving natural vegetation.

9.5. List of lessons

	Lesson Title	Learning objectives	Number of periods
1	Tropical forests & its characteristics	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - Recall the locations of different types of natural vegetation. - Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	2
2	Temperate vegetation & their characteristics.	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - Recall the locations of different types of natural vegetation. - Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	1

3	Grasslands & its characteristics.	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - State the characteristics of each type of natural vegetation. - Recall the locations of different types of natural vegetation. - Examine the classifications of the major types of natural vegetation. Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	1
4	Temperate grassland & their characteristics	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - State the characteristics of each type of natural vegetation. - Recall the locations of different types of natural vegetation. - Examine the classifications of the major types of natural vegetation. - Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	1
5	Desert vegetation & its characteristics	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - State the characteristics of each type of natural vegetation. - Recall the locations of different types of natural vegetation. - Examine the classifications of the major types of natural vegetation. - Describe the characteristics of each type of natural vegetation. 	1

		<ul style="list-style-type: none"> - Explain the location of the major vegetation zones of the world. 	
6	Tundra vegetation	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - State the characteristics of each type of natural vegetation. - Recall the locations of different types of natural vegetation. - Examine the classifications of the major types of natural vegetation. - Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	1
7	Mountain vegetation & its characteristics	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - State the characteristics of each type of natural vegetation. - Recall the locations of different types of natural vegetation. - Examine the classifications of the major types of natural vegetation. - Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	1
8	Aquatic/Marsh vegetation & its characteristics	<ul style="list-style-type: none"> - Identify the types of natural vegetation. - State the characteristics of each type of natural vegetation. - Recall the locations of different types of natural vegetation. - Examine the classifications of the major types of natural vegetation. 	1

		<ul style="list-style-type: none"> - Describe the characteristics of each type of natural vegetation. - Explain the location of the major vegetation zones of the world. 	
9	Factors influencing the vegetation distribution	<ul style="list-style-type: none"> - Explain the factors influencing the vegetation distribution. - Identify the factors influencing the vegetation distribution. 	1
10	Importance of the natural vegetation	<ul style="list-style-type: none"> - Outline the importance of the natural vegetation. - Explain the importance of natural vegetation. - Appreciate the importance of the various types of vegetation in the world. - Show resilience for the various types of vegetation and the desire to protect and manage the natural vegetation. 	1
	End unit assessment		1

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 period depending on its content.

Lesson 1: Tropical forests and their characteristics

a) Learning objectives

- Identify the types of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources

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

c) Prerequisite / introduction

There is a direct link of Activity 9.1, intended to introduce the lesson, with what the lessons studied. The activity in 9.1 requests student teachers to recall the knowledge and skills gained from previous lesson of year1 about vegetation in Rwanda, this will be through diagnostic assessment/ evaluation of teacher. This will enable student teachers to follow the lesson by linking it to world natural vegetation.

d) Learning activity 9.1

For this activity, the teacher will give student teachers 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 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 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 book.

e) 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 provides food stuffs.
- Provision of local herbals medicines.
- Tropical forests are source of tourisms potential.
- Tropical forests helps in process of climate modification.
- Provision of employment opportunities.
- Tropical forests improves natural beauty of region where they are found growing.

Lesson 2: Temperate forests and their characteristics

a) Learning Objectives

- Identify the types of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources

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

c) Prerequisites/Revision/introduction

This activity is intended to introduce the lesson two and link it with lesson 1 studied before. The activity 9.2 requests student teachers to recall the knowledge and skills gained from previous lesson about tropical forests. .

d) Learning activity

Learning activity 9.2

For this activity, the teacher will give student teachers 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 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 9.2

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.

e) Application activity 9.2

- Possible answers: Refer to student's book temperate forests and their characteristics.

Lesson 3: Grasslands in tropical zone and their characteristics.

a) Learning Objectives

- Identify the types of natural vegetation.
- State the characteristics of each type of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Examine the classifications of the major types of natural vegetation. Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources:

- Pictures.
- Flip charts.
- Print outs for the activity.
- Text books.
- Internet.
- Map
- Manila paper

c) Prerequisites/Introduction

The activity 9.3 that 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 student teachers to recall the previous knowledge and skills about grasslands.

d) Learning activity

For this activity, the teacher will give student teachers 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 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 for learning activity 9.3

1. Possible answers: Refer to the students' book on grasslands in tropical zone and their characteristics.
2. 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.
3. Possible answers: Refer to student 'book on conditions and characteristics for savannah humid and savannah dry vegetation.

e) Application activity 9.3:

1. Possible answer: student teachers 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.
- On the other hand, temperate grasslands have negative sides to the economy of any country.

Lesson 4: Grasslands in temperate zone

a) Learning Objectives

- Identify the types of natural vegetation.
- State the characteristics of each type of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Examine the classifications of the major types of natural vegetation.
- Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources

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

c) 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.

d) Learning activity

Learning activity 9.4

For this activity, the teacher will give student teachers 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 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 for Learning activity 9.4

1. Possible answer refer to learner's book on grasslands in temperate zone.
2. Argentina, USA, South Africa... More areas refer to learner's book on grasslands in temperate zone.

e) 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 peoples.
- 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 causes diseases.
- Temperate grasslands are associated with dangerous animals like snakes.

Lesson 5: Desert Vegetation

a) Learning objectives

- Identify the types of natural vegetation.
- State the characteristics of each type of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Examine the classifications of the major types of natural vegetation.
- Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources:

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

c) Prerequisite/introduction

The teacher has to introduce this lesson and linking it with the previous lessons.

d) Learning activity

Learning activities 9.5

For this activity, the teacher will give student teachers 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 student teachers' book on desert vegetation.
- Refer to the student teachers' book on desert vegetation.

e) 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 those that do are 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, climate, 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) Learning Objectives

- Identify the types of natural vegetation.
- State the characteristics of each type of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Examine the classifications of the major types of natural vegetation.
- Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources:

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

c) Prerequisites/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 student content of unit 9 of S1 about types of vegetation the teacher has to help student teachers to recall the previous knowledge and skills about vegetation

d) Learning activities

Learning activity 9.6

For this activity, the teacher will give student teachers 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. Refer to learner's book on tundra vegetation.

e) 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 and protection layer on the surface of the ground.

Lesson 7. Mountain vegetation.

a) Learning Objectives

- Identify the types of natural vegetation.
- State the characteristics of each type of natural vegetation.
- Recall the locations of different types of natural vegetation.
- Examine the classifications of the major types of natural vegetation.
- Describe the characteristics of each type of natural vegetation.
- Explain the location of the major vegetation zones of the world.

b) Teaching resources

- Flip charts.
- Manila papers.

- Print outs for the activity.
- Text books.
- Internet.
- Maps

c) Prerequisite/introduction:

There is direct link to vegetation should have enable the students to have enough knowledge, and skills about vegetation types that help them to describe the characteristics of mountain vegetation in previous year1.

d) Learning activity

Learning activity 9.7

For this activity, the teacher will give student teachers 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 (the higher you the type of vegetation varies on a slope of a mountain) 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 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, temperate forests containing coniferous trees like pine, deodar, silver fir, spruce and cedar.

e) Application Activity 9.7.

Possible answer to application activity 9.7:

1. The importance of mountainous vegetation with reference to Northern Rwanda: Tourism activity, gazettement 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 provide a wide range of economic and social benefits to humankind.
 - The temperate mountain vegetation provide 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.
- ❖ However, side temperate mountain vegetation area associate with:
- Excessive population encroachment on the vegetation.
 - Rapid population growth, which is created 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) Learning Objectives

- Explain the factors influencing the vegetation distribution

b) Teaching resources:

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

c) Prerequisite/introduction

The student teachers should have gained more knowledge and skills about other type of vegetation in the content of the previous lesson. The student teachers with the under guidance of the teacher have to examine critically the relationship between aquatic/mangrove vegetation with other types of vegetation.

d) Learning activities

Learning activity 9.8

For this activity, the teacher will give student teachers 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

1. The type of vegetation shown on the photograph: mangrove or swampy vegetation.
2. The environmental conditions that influence the location and growth of the identified

e) Application activity 9.8

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 for with deep soils such should be salty in nature.
- Mangrove vegetation require high temperature necessary for chlorophyll making

Lesson 9: The factors which influence natural vegetation

a) Learning Objectives

- Outline the importance of the natural vegetation.
- Appreciate the importance of the various types of vegetation in the world.
- Show resilience for the various types of vegetation and the desire to protect and manage the natural vegetation.

b) Teaching resources

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

c) Prerequisites/Introduction:

The student teachers should have gained more knowledge and skills about other factors influence vegetation in the content of S1 in previous lesson. The student teachers will enable the student teachers to understand content.

d) Learning activities 9.9

For this activity, the teacher will give student teachers 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 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) Learning objectives

- Outline the importance of the natural vegetation.
- Explain the importance of natural vegetation.
- Appreciate the importance of the various types of vegetation in the world.
- Show resilience for the various types of vegetation and the desire to protect and manage the natural vegetation.

b) Prerequisites/Revision/Introduction:

The student teachers should have gained more knowledge and skills about importance of vegetation in the content of S1 and year 1, in previous lesson. The student teachers will enable the student teachers to understand the content.

c) Teaching resources

- Manila papers.
- Print outs for the activities.

- Text books.
- Internet.
- Maps.

d) Learning activities 9.10

For this activity, the teacher will give student teachers 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 importance of natural vegetation.

e) 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.

9.6. Summary of the unit

The unit 9 of year 2, 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.

9.7. 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 student teachers to make additional research via internet, field works to other vegetation in Rwanda and visiting libraries.

Skills Lab: The student-teachers can create an economic activity which is friendly to the nature and productive to the people.

9.8. End unit assessment

However, the student teachers should give his or her opinion/view or self-constructed answers, their answer will rotate to the content in reference with 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?
- i) **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.
- ii) **Variation in relief:** Relief affects natural vegetation in varying ways. This especially a long the slope influences the vegetation zonation. Whereby, differing types of vegetation exist along the slope.

Skills Lab: The student-teacher can create an economic activity which is friendly to the nature and productive to the people.

9.9. Additional activities

9.9.1 Remedial Activities:

The following are questions that the teacher can use for remedial activities. They are rephrased in a way that the slow student teachers 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 types of forests mentioned in the passage above.	Refer to learner's book: Desert vegetation.
2. Distinguish savannah humid and savannah dry grasslands.	Refer to learner's book: Under Grasslands in tropical zone and their characteristics, page ...
3. Identify the type of vegetation shown on the photograph above.	Refer to learner's book: Under temperate forests and their characteristics.
4. Identify zonation mountain vegetation as shown by the above diagram	Refer to learner's book under: Tropical mountain vegetation.

9.9.2. Consolidation activities:

Questions	Possible answers
1. Examine the value of natural vegetation for sustainable development of the country.	Positive contribution of vegetation:
	<ul style="list-style-type: none">- Vegetation provides food for some domestic and wild animals. Human beings also get food from some plants.- 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.

	<ul style="list-style-type: none"> - Vegetation provides timber for furniture. Such items as beds, chairs and tables are made. Timber is also used to build houses - Vegetation also affects soil formation, including soil volume, chemistry, texture and structure, which in turn affect various vegetation characteristics, including productivity and structure. <p>Negative contribution of vegetation</p> <ul style="list-style-type: none"> - Vegetation are associated with some pests such as tsetse flies and ticks, such pests transmit animal and human diseases. - Some plants are thorny – leafed and they harmful for human beings and animals.
<p>2. Critically examine the role of temperate vegetation to the economy of Switzerland.</p>	<ul style="list-style-type: none"> - The temperate mountain vegetation provides a wide range of economic and social benefits to humankind. - The temperate mountain vegetation provide 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 protect soil against soil erosion. - Improves natural beauty of the area. - Provision of raw material to use in industries. - Provides natural habitat for wild animals and birds.

However, temperate mountain vegetation area associate with:

- Inhabit dangerous wild animals that kill people.
- They occupy large land that would be used for other activities such as agriculture.
- They are associated with wild-fire out break that degrades the environment.
- Some trees fall and block the transport net work especially during stormy conditions.

9.9.3. Extended activities:

1. Critically assess significance of natural vegetation to the economic development of your country.

Possible answer:

1. The talented student teachers are requested to explain with facts for this task.
 - Forests are important because they remove Carbon Dioxide (CO₂) (a greenhouse gas causing global warming) from the atmosphere as part of the carbon cycle.
 - Preventing erosion by reducing the force of rainfall at the soil.
 - Forest provide raw materials that help us build our furniture.
 - Forest shelters for wild animals. houses and
 - Acting as wind breakers.
 - Providing us with shade and beauty on a largely agricultural and urban landscape.
 - Harboring a diversity of wildlife.
 - Forests are vitally important for preserving adequate water supplies.
 - Always evergreen all season and provide a vital source of food and medicine.
 - Forests provide us with a wide range of industrial wood products that we use in daily life -- lumber, panels, posts, poles, pulp, and paper.

- Forests regulate stream flows by intercepting rainfall, absorbing the water into the underlying soil, and gradually releasing it into the streams and rivers of its watershed.
- Forests are also very important economically for plant-improvement breeding. For example, a species of wild maize has been found in Mexican woodlands.
- Traditional medicines. Forests are often important sources of foodstuffs, particularly in times of drought and famine when conventional agricultural crops have failed. For example, in the state of Madhya Pradesh in India.
- Forests are also important sources of new pharmaceuticals used to fight cancer, AIDS, and other serious human diseases.
- The periwinkle plant from the Madagascar forests provides a drug that has proven very successful in treating lymphocytic leukaemia.
- The bark of *Prunusafricanum* is now an important commodity in world trade as a pharmaceutical for the treatment of prostate disorders.

However on the other side:

- Forests inhabit dangerous wild animals that kill people.
- They occupy large land that would be used for other activities such as agriculture.
- They are associated with wild-fire out break that degrades the environment.
- Some trees fall and block the transport net work especially during stormy conditions.

Skills lab:

The student- teacher can create an economic activity which is based on plants and productive for the local community.

UNIT 10

POPULATION GROWTH IN THE WORLD

10.1 Key unit competence

The student-teacher should be able to discuss the problem of the population growth and the ways of controlling the population growth in the world.

10.2 Prerequisite (Knowledge, skills, attitudes and values)

The student-teachers are anticipated to have mastered the content of unit 12 of senior 1, where they studied the population and settlement, unit 13 of senior 2 about population in Rwanda and unit 8 of population in Africa. All units of senior one greatly provides strong foundation that students can use to understand better the content of this unit 10 of year 2. 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 student-teacher's is more detailed and goes beyond Rwanda to the population distribution of the World.

10.3. Cross-cutting issues to be addressed

There are some cross-cutting issues, which can be applied in the lesson. In the student-teacher's 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 as one the causes of rapid population growth in the World is designed.

b) Inclusive education can be introduced during the class situation for example, if the tutor wants her/his students to make a field study outside classroom. With the purpose of observe natural vegetation, the tutor will consider the student teachers with physical disabilities and react accordingly by choosing appropriate methodology, which may help those student-teachers with special disabilities to cope with the situation. Nevertheless, the tutor can use a video containing different images or photographs of rapid population growth.

The tutor can even bring different types of photographs demonstrating different issues of rapid population growth in classroom for those who are not able to go outside for fieldwork. For instance, student teachers with hearing disabilities or communication difficulties in different learning activities; the totur will try his/her best and help them by using illustrations, diagrams, sign languages, and guest speakers where possible.

For instance, student-teachers with visual impairment, the tutor 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 tutor will be able to provide sufficient explanations related to different content or lesson and the student-teachers with visual impairment can carry out the designed learning activities using their hearing. However, all these require the tutor to plan in advance on how the teacher should conduct the lesson.

10.4 Guidance on the introductory activity

The tutor will ask students to read carefully the passage and to observe the photographs related to introductory activity. The students-teacher will try to answer the questions linked to the given passage. Student-teachers may not be able to get the right answers, but then are requested to predict possible answers. When the student-teachers 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 student-teachers get the real answers through the course of learning and teaching process.

10.5 List of lessons and end unit assessment

S.N	Lesson title	Learning objectives	Number of periods
1	Human diversities	<ul style="list-style-type: none"> - Mention the population diversity. - Explain the population diversity. - Appreciate the importance of human diversity in development. - Show resilience for the diversities in human population. 	2
2	Population concepts and their related effects.	<ul style="list-style-type: none"> - Define population concepts. - Differentiate among the concepts of population (optimum population, under population, over population) . - Compare the concepts of under population and over population. 	2
3	World population distribution	<ul style="list-style-type: none"> - Locate the population distribution. - Explain the factors influencing the population distribution. 	1
4	Rapid population growth	<ul style="list-style-type: none"> - Outline the factors for a rapid population growth. - List the causes and the effects of a rapid growth, and suggest the control measures. - State the policies of controlling population growth. - Compare the concepts of under population and over population. - Describe the problems of population in both developed and developing countries. - Explain the factors associated with the birth and death rates. 	4

		<ul style="list-style-type: none"> - Describe the factors responsible for a rapid population growth. - Explain the effects of a rapid population growth and the control measures. - Apply the knowledge acquired to minimise the rapid population growth. 	
5	Migration	<ul style="list-style-type: none"> - Identify the causes and the effects of international migration. - Relate the population concepts of different countries. - Explain the causes and the effects of the international migration. 	3
6	End unit assessment		1

Guidance on lessons

Lesson 1: Human diversities

a) Learning objectives

- The following are the learning activities for the lesson:
- Mention the population diversity.
- Explain the population diversity.
- Appreciate the importance of human diversity in development.
- Show resilience for the diversities in human population.

b) Teaching resources

The following are resources to be used when teaching –learning the lesson:

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

- Text books.
- Internet.

c) Prerequisite/Revision/introduction

The activity 10.1 tends to introduce the lesson 1. The activity 10.1 also requests student-teachers to recall the knowledge and skills gained from previous lessons of lower secondary. This will enable student-teachers to follow the lesson by linking it to what they have learnt in previous levels.

d) Learning activities

Activity 10.1

For this activity, the tutor will give student-teachers an opportunity to read the passage provided and give them time to reflect on the provided questions, thereafter, give answers. The tutor 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-teacher's book on human diversity.

e) 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-teacher's book on human diversity.

Lesson 2: Population Concepts and its related effects.

a) Learning objectives

The following are the learning objectives of the lesson:

- Define population concepts.
- Differentiate among the concepts of population (optimum population, under population, over population)
- Compare the concepts of under population and over population.

b) Teaching resources

The following are teaching resources during teaching and learning the lesson:

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

c) Prerequisite/Revision/Introduction

There is a direct link of activity 10.2, intended to introduce the lesson, with what the student-teacher's studied in lower secondary. The activity 10.2 requests student-teacher to recall the knowledge and skills gained from previous lesson of lower secondary about population and settlement in Rwanda. This will be through diagnostic assessment/evaluation.

This will enable student teachers to follow the new lesson.

d) Learning activities

Learning activity 10.2

For this activity, the tutor will give student-teachers an opportunity to read carefully the passage that is given and the student-teachers are given time to reflect and answer the questions. The tutor 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

- The possible answers to the learning activity 10.2 are found in the student-teachers' book on population concepts and their related effects.

e) Application activity 10.2

1. The possible answers to the application activity 10.2 are found in the student-teacher's book on population concepts and their related effects.

2. The possible answers to the application activity 10.2 are found in the student-teacher's book on population concepts and their related effects.

Lesson 3: Population distribution in the World

a) Learning objectives

- The following are the learning objectives of the lesson:
- Locate the population distribution.
- Explain the factors influencing the population distribution.

b) Teaching resources

The following are teaching resources during teaching and learning the lesson:

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

c) Prerequisite /Revision /introduction

There is a direct link of activity 10.3, intended to introduce the lesson, with what the student teachers studied in lower secondary. The activity 10.3 requests student teachers to recall the knowledge and skills gained from previous lesson of lower secondary about population and settlement in Rwanda, this will be through diagnostic assessment/ evaluation.

This will enable student teachers to follow the new lesson.

d) Learning activity

Learning activity 10.3

For this activity, the tutor will give student teachers an opportunity to observe the given map critically and give them time to reflect and answer the questions. The tutor 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

- Possible answers to the learning activity is found in the student-teacher's book on population distribution in the world.

e) Application activity

Application activity 10.3

The following are 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 4: Rapid population growth

a) Learning objectives

The following are the learning objectives of the lesson:

- Outline the factors for a rapid population growth.
- List the causes and the effects of a rapid growth, and suggest the control measures.
- State the policies of controlling population growth.
- Compare the concepts of under population and over population.
- Describe the problems of population in both developed and developing countries.
- Explain the factors associated with the birth and death rates.
- Describe the factors responsible for a rapid population growth.
- Explain the effects of a rapid population growth and the control measures.

- Apply the knowledge acquired to minimise the rapid population growth.

b) Teaching resources

The following are teaching resources during teaching and learning the lesson:

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

c) Prerequisites/ Revision/ Introduction

There is a direct link of activity 10.4, intended to introduce the lesson, with what the student teachers studied in lower secondary. The activity 10.4 requests student teachers to recall the knowledge and skills gained from previous lesson of lower secondary about population growth in Rwanda, this will be through diagnostic assessment/ evaluation.

This will enable student teachers to follow the new lesson.

d) Learning activities

Learning activity 10.4

For this activity, the tutor will give student teachers an opportunity to observe the given graph critically and give them time to reflect and answer the questions. The tutor 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 activity 10.4

The following are proposed answers to the activity:

- Population growth in 1970-1980s on the graph indicates that population was increasing at low rate compared to the population of growth in 1990-2018s where the population was increasing at high level.
- For answering the question, refer to the student-teacher's book on the causes of rapid population growth.

- For answering the question, refer to the student-teacher's book on the ways of controlling rapid population growth.

e) Application activity

The following are possible answers to the application activity:

Possible answers to the application activity 10.4

1. For answering such question, refer to the student-teacher's book on causes of rapid population growth in developing countries.
2. The impacts of population growth on the environment: The answers are found in the student-teacher's book on effects of population growth.
3. The appropriate population control measures to be used in Rwanda: The student teachers 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 5: Migration

a) Learning objectives

The following are learning objectives of the lesson:

- Identify the causes and the effects of international migration.
- Relate the population concepts of different countries.
- Explain the causes and the effects of the international migration.

b) Teaching resources

The following are teaching resources to be used during teaching and learning the lesson:

- Maps
- Pictures
- Flip charts
- Manila papers
- Print outs for the activity

c) Pre requisites/ Revision/ Introduction

There is link between activity 10.5 and the previous lesson. Therefore, the tutor should introduce a new lesson related to the passage on migration.

The activity 10.5 requires student-teachers to read carefully and understand it. Through this lesson the tutor must incorporate different cross-cutting issues during the course of teaching and learning process. This will enable student teachers to follow the new lesson.

d) Learning activity 10.5

For this activity, the tutor will give student-teachers an opportunity to read carefully the passage and questions related to it and give them time to give answers to questions. The tutor 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

- The possible answers for 10.5 questions (1) – (2) are found in the student-teacher’s book on migration.

e) Application activity

Possible answers to the application activity 10.5

- Possible answers for 10.5 questions (1) – (2) are found in the student-teacher’s book on migration on sub-topic of causes and effects of migration.

10.6. Summary of the unit

The unit 10 of year 2 deals with population growth in the world. This unit describes/gives more details on population concepts, population distribution in world , causes and effects rapid population growth in the world. And the topics related to migration.

10.7. Additional information

There is no considerable additional information the tutor requires. Nevertheless, the writers wish to convey the attention of the tutor teaching this unit to focus on use of maps and video related to the population growth to facilitate the

student-teachers to be familiar with population distribution, migration its causes, consequences and measures to control migration. The tutor is requested to support and stimulate student-teachers to make additional research via internet, field works and visiting libraries.

10.8. End unit assessment

The student-teacher 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-teacher's book on rapid population growth.
2. Refer to the student-teacher's book on over population and under population growth
3. Refer to the student-teacher's book on population concepts and related effects .
4. Refer to the student-teacher's book on measures for controlling migration.

10.9 Additional activities

10.9.1 Remedial Activities:

The following are questions that the tutor can use for remedial activities. They are rephrased in a way that the slow student teachers 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-teacher's book on human diversity.
2. With typical examples from Rwanda, differentiate the religions operating on Rwandan territory.	Refer to the student-teacher's book on human diversity.
3. Explain the following population concepts: (i) Optimum Population, Under population and Overpopulation	Refer to the student-teacher 's book on population concepts

10.9.2 Consolidation activities

Questions	Possible answers
1. With the aid of a drawn sketch of population map of the world, identify the densely and sparsely populated areas.	Refer to the student-teacher's book on population distribution.
2. 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.

10.9.3 Extended activities

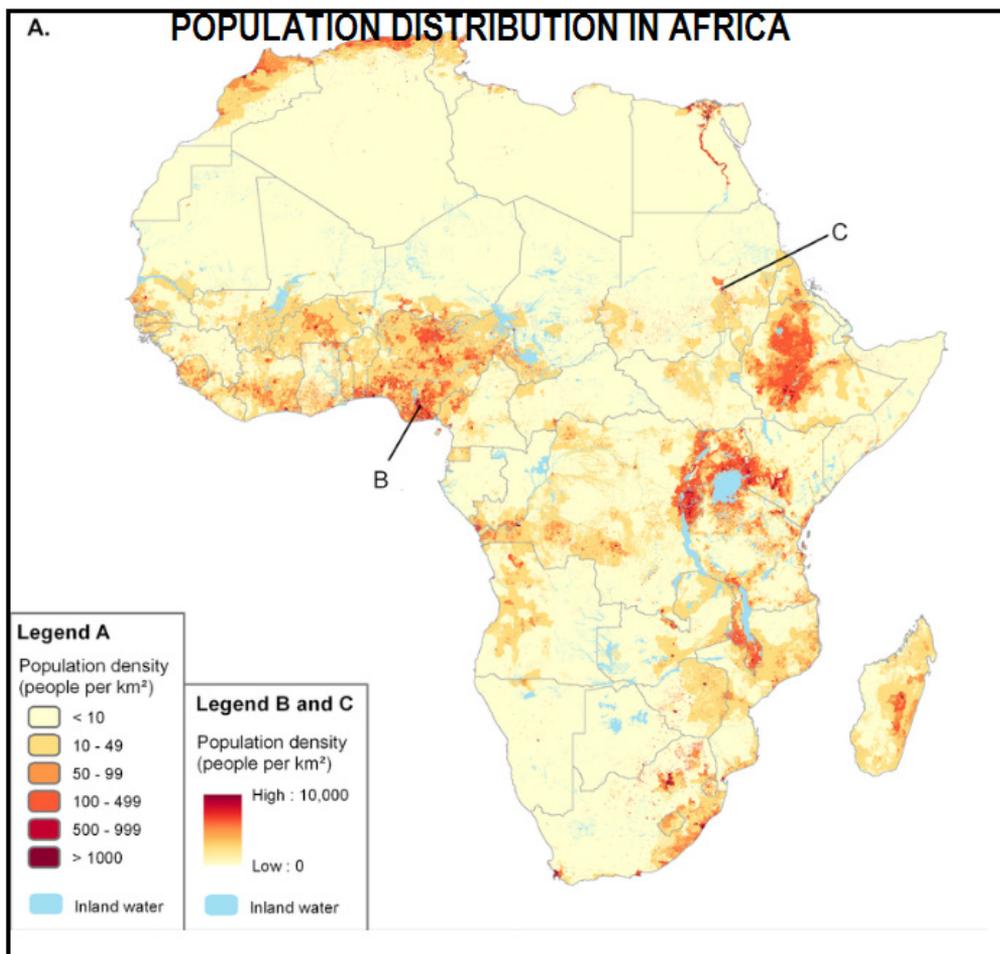
Using different geography resources carry out a deep research on population distribution and in Africa.

Possible answers to the question of extended activities:

The population of Africa has grown rapidly over the past century and consequently shows a large youth bulge, further reinforced by a low life expectancy of below 50 years in some African countries. Total population as of 2017 is estimated at more than 1.25 billion, with a growth rate of more than 2.5% .The most populous African country is Nigeria with 191 million inhabitants as of 2017 and a growth rate of 2.6%.

The spatial distribution of populations and settlements across a country and their interconnectivity and accessibility from urban areas are important for delivering healthcare, distributing resources and economic development. However, existing spatially explicit population data across Africa are generally based on outdated, low resolution input demographic data, and provide insufficient detail to quantify rural settlement patterns and, thus, accurately measure population concentration and accessibility. Here we outline approaches to developing a new high resolution population distribution dataset for Africa and analyse rural accessibility to population centers. Contemporary population count data were combined with detailed satellite-derived settlement extents to map population distributions across Africa at a finer spatial resolution than ever before. Substantial heterogeneity in settlement patterns, population concentration and spatial accessibility to major population centres is exhibited

across the continent. In Africa, 90% of the population is concentrated in less than 21% of the land surface and the average per-person travel time to settlements of more than 50,000 inhabitants is around 3.5 hours, with Central and East Africa displaying the longest average travel times. The analyses highlight large inequities in access, the isolation of many rural populations and the challenges that exist between countries and regions in providing access to services.



Map for population distribution in Africa

As of 2016, the total population of Africa is estimated at 1.225 billion, representing 17% of the world's population. According to UN estimates, the population of Africa may reach 2.5 billion by 2050 (about 26% of the world's total) and nearly 4.5 billion by 2100 (about 40% of the world's total).

The population of Africa first surpassed one billion in 2009, with a doubling time of 27 years (growth rate 2.6%)

Population growth has continued at almost the same pace, and total population is expected to surpass 2 billion by 2038 (doubling time 29 years, 2.4%).

The reason for the uncontrolled population growth since the mid 20th century is the decrease of infant mortality and general increase of life expectancy without a corresponding reduction in fertility rate, due to a very limited use of contraceptives. Uncontrolled population growth threatens to overwhelm infrastructure development and crippling economic development. Kenya and Zambia are pursuing programs to promote family planning in an attempt to curb growth rates.

The extreme population growth in Africa is driven by East Africa, Middle Africa and West Africa, which regions are projected to more than quintuple their populations over the 21st century. The most extreme of these is Middle Africa, with an estimated population increase by 680 %, from less than 100 million in 2000 to more than 750 million in 2100 (more than half of this figure is driven by the Democratic Republic of the Congo, projected to increase from 47 million in 2000 to 379 million in 2100). Projected population growth is less extreme in Southern Africa and North Africa, which are expected, respectively, to not quite double and triple their populations over the same period.

Skills lab

In this unit, student-teachers are aware of that there is reduction or increase of population in given area by either natural or artificial causes. For carrying this activity, students-teacher will be required to visit their local areas and identify if there is increase or reduction and come up with the problems of population in their local area.

UNIT 11

SETTLEMENT AND URBANIZATION IN THE WORLD

11.1. Key unit competence

The student-teachers should be able to discuss the impact of settlement and urbanization on the sustainable development of different countries.

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

The teacher should be aware that student teachers have a wide range of information concerning this unit 11 of urbanization in the world. This is based on the past studies that student teachers were subjected to in their educational levels. The enriched prerequisite knowledge acquired obviously, equips the student-teachers, with skills and values and attitudes towards understanding the concept of urbanization.

Therefore, student teachers should have understood the content of unit 12 of population and settlement in S1, unit 9 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 year 2, after studied urbanization in Rwanda in the previous year 1.

This is a clear manifestation that student teachers have all the required knowledge, skills, values and attitudes that the teacher should build on to successfully handle this unit 11 of year 2.

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.

11.3. 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. There following are some of the cross-cutting issues that the

teacher can drill on as he or she takes and guides the student teachers 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. Student teachers 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 student teachers.

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.

11.4. Guidance on introductory activity

The introductory activity of this unit contains three photographs that represent both rural and urban settlements. They depict what actual student teachers 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 student teachers 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 11.2.
2. The one with grass-roofed houses which is the second photograph to the left.
3. Rural settlement influence: Refer to the learner's book under 11.2.1: 11.2.3: Impact of world urbanization on the environment.

11.5. List of lessons (including assessment)

	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes):	Number of periods
1	11.1. Rural settlement	<ul style="list-style-type: none"> - Identify the major types of settlements. - Outline the factors influencing rural settlements. - Explain the major types of settlements. - Explain the factors influencing rural settlements. - Show concern for the factors influencing rural settlement. 	4
2	11.2. Urbanization in the world	<ul style="list-style-type: none"> - Define the terms related to urbanization. - Identify the factors influencing urban development in the world. - Describe the major urban centres and the factors influencing the urban development in the world. - Describe the impact of world urbanization on the environment. - Explain the terms related to urbanization. 	6

		<ul style="list-style-type: none"> - Explain the functions of the world's major cities and ports. - Evaluate the impact of the world' urban centres on the environment. - Show concern for the problems caused by urbanisation on the environment. 	
3	End of Unit assessment		1

Guidance on different lessons outlined above

The above table highlights all lessons relating to the Unit content. There two lessons developed from the content of unit 11 with unevenly number of periods.

Lesson 1. Rural settlement

a) Learning Objectives

- Identify the major types of settlements.
- Outline the factors influencing rural settlements.
- Explain the major types of settlements.
- Explain the factors influencing rural settlements.
- Show concern for the factors influencing rural settlement.

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 rural settlements.
- Manila papers for group drawing.

c) Prerequisites/ Revision /Introduction

The lesson tittle involves most of concepts that are directly related to what the student teachers studied in their previous educational levels (S1, S2, S3 and

year 1). 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 student teachers to remember what was learnt previously and display their skills at connecting their past studies with the lesson at hand.

d) 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.

e) Application activities

Application Activity 11.1

Possible answers:

- i) 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.
- ii) Refer to the learner's book under 11.1.1: Types of Rural settlement.

Lesson 2. Urbanization in the world

a) Learning objectives.

- Define the terms related to urbanization.
- Identify the factors influencing urban development in the world.
- Describe the major urban centres and the factors influencing the urban development in the world.
- Describe the impact of world urbanization on the environment.
- Explain the terms related to urbanization.
- Explain the functions of the world's major cities and ports.
- Evaluate the impact of the world' urban centres on the environment.
- Show concern for the problems caused by urbanisation on the environment.

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.

c) Prerequisites / Revision / Introduction

The teacher should ask student teachers to talk about the urbanization in the world using the past studies.

d) Learning activities:**Learning Activity 11.2**

1. The teacher should guide student teachers 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 11.2.2: Factors influencing urban settlement in the world
3. The teacher should guide the student teachers to associate the functions of urban centres to find out the answers for this question. Refer to the learner's book under 11.2.4: Functions of urban centers and ports.

e) Application activities

1. Refer to the learner's book under 11.2.3: Impact of world urbanization on the environment.
2. Isolated farm lands -Hamlet -Village-Town-city-metropolis- conurbation -megalopolis.
3. The teacher should guide student teachers to use their past studies in year 1, under the function of urban centers in Rwanda and use the general functions studied under 11.2.4 in the learner's book in year 2: Functions of urban centers in the world.

11.6. 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.

11.7. 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.

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 pipe 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. 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.
 - Creation of employment through construction of more industries
 - Resettling people in better houses at affordable price
 - Police and security agencies should be established
 - Discouraging rural-urban migration

3. Possible answers

- pollution of Air, water and soil
- Poor disposal of garbage from domestic wastes
- Noise pollution from industrial machineries, vehicles, and other means of transport.
- Poor sanitation,
- traffic congestion.
- Deforestation
- Destruction of the ecosystem through urban operations.
- Slum development, overcrowding
- High crime rate, drug abuse, prostitution, spread of disease, moral decay
- High cost of living, etc.
- Shortage accommodation

4. Refer to learner's book, 11.2.2, factors influencing urban development.

11.8. Additional information for teachers

The teacher should guide the student teachers to relate the content of this unit to what they studied in year 1, in relation to Rwanda.

11.9. 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 urban center in Rwanda.

Refer to 11.2.5 in the student's book.

b) Consolidation activities

Discuss the factors influencing rural settlements in Rwanda.

Possible answers

Refer to 11.1.4 in the learner's book.

c) Extended activities

Explain the meaning of the following:

- (a) Trading centres.
- (b) Municipality.
- (c) Green city.

Possible answers for all the above refer to the learner's book under 11.2.1. Definition of basic terms.

Skills Lab:

Refer to the problem of high congestion in urban areas; student-teacher should stimulate people settling in rural area and to benefit from advantages of rural settlement.

UNIT 12

AGRICULTURE IN THE WORLD

12.1. Key unit competence

The student-teachers should be able to explain the impact of agricultural activities on the sustainable development of different countries in the world.

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

The tutor should guide the student teachers towards application of various knowledge, skills, attitudes and values, acquired and developed right way from senior one to Year 2. It is vital to note that, student teachers 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 Year 2, senior one, two and Year 1. The difference is that, at this level of Year 2, 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 tutor to conduct diagnostic assessment as a way of evaluating each learner's abilities

12.3. Cross-cutting issues to be addressed

There is a wide range of the cross-cutting issues that can be integrated into the teaching of this Unit 12 of Year 2. In the student teachers' book, the writers or authors used activities to integrate the crossing-cutting issues. The most highlighted are those 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 tutor. Most of activities used are models.

Peace and values, gender and financial education can be integrated using the class room situation

Environment and sustainability: the role of a tutor is to clarify the lesson, through all activities related to the topic. The tutor is requested to explain more on relationship between agricultural activities and the environment. Besides, tutor is an adviser to the student teachers. He/she should help student teachers to understand and have knowledge and skills on good farming methods which are friendly to the environment.

Peace and values education could be addressed in any activity that involves student teachers to work in group. In any case, working in groups develops positive attitudes of someone who has peace. In any activity where the tutor gives 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 student teachers. 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 tutor 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 tutor is advised to cater for special needs of student teachers with disabilities. For example; the tutor has to use audio materials for students visual impairments, audio-visual materials to those who have physical impairments so that they can see and hear the samples brought. The tutor should select conducive environment to all students so that students with disabilities can participate in learning activity

12.4. Guidance on the introductory activity

The introductory activity in this unit is provided to warm up learner so that they can actively involve in the lesson. The tutor has to conduct and allow student teachers to observe critically the photographs provided. Student teachers are supposed to answer all questions. In case they fail to find out correct answers to the questions, tutor intervene immediately to provide possible right answers, but he/she should allow student teachers 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.

12.5. List of lessons and End Unit assessment

S/N	Lesson title	Learning objectives (knowledge, skills and knowledge)	Number of periods
1	Crop cultivation 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) .	<ul style="list-style-type: none"> - Name the diverse types of crop cultivation methods. - Describe the characteristics of the different crop cultivation methods. - Show continual desire to grow different crops using different methods of farming. - State the diverse types of farming in China. - Describe the farming methods in China and Russia. - Appreciate the reasons for increasing the agriculture production. 	4

2	Factors for increasing the agricultural production Problems affecting the agriculture in the developing countries	<ul style="list-style-type: none"> - Outline the factors responsible for increasing the agricultural production. - Explain the factors influencing the agricultural activities. - Evaluate the problems affecting the agricultural system in the developing countries. 	2
3	Livestock Farming Types of livestock farming: Pastoralism: pure nomadism, free Range and transhumance, factory farming. Ranching, dairy farming.	<ul style="list-style-type: none"> - 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. 	4
4	Factors and problems affecting the livestock farming and ways of improving the livestock farming.	<ul style="list-style-type: none"> - Outline the factors and problems affecting the livestock farming. - Explain the ways of improving the livestock farming. 	2
5	End unit assessment		1

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) learning objectives

The student-teacher will be able to:

- Name the diverse types of crop cultivation methods.
- Describe the characteristics of the different crop cultivation methods.
- Show continual desire to grow different crops using different methods of farming.
- State the diverse types of farming in China.
- Describe the farming methods in China and Russia.
- Appreciate the reasons for increasing the agriculture production.

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) Prerequisite/introduction

There is a direct link of Activity 12.1, intended to introduce the lesson, with the lessons studied in Year 1. The activity 12.1 requests student teachers to recall the knowledge and skills gained from previous lesson of Year 1 about Agriculture systems in Rwanda, this will be through diagnostic assessment/evaluation by tutor. This will enable student teachers to follow the lessons by linking it to Rwandan agricultural systems.

d) Learning activity 12.1.1

Guide and facilitate student teachers to work in groups and discuss a set of questions in relation with agriculture, especially crop cultivation. Student teachers should use the knowledge, skills acquired in their past studies in their discussion to answer questions.

The student teachers 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 that covers 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 Cooperative farming.
2. Refer to the learner's book under Cooperative farming.
3. Refer to the learner's book under Plantation farming.

Learning Activity 12.1.3

Possible answers

1. Refer to the learner's book under Market gardening and Horticulture.
2. Refer to the learner's book under Truck farming.

Learning activity 12.1.4

Possible answers

1. Refers to the student teachers' 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.

e) 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.

Possible answers

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.

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. Possible answers:

a) Cocoa:

- Used in making cocoa butter.
- Chocolate.
- Lotions/cosmetics.
- Beverage.
- Used in Bakery.
- Creams.
- Tea/or cake toppings.
- Cocoa drinks.
- Used medicine.

b) **Rubber:** it is used in manufacturing of materials like books, rope, tyres and seats.

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) Learning objectives

Student-teachers should be able to:

- Outline the factors responsible for increasing the agricultural production.
- Explain the factors influencing the agricultural activities.
- Evaluate the problems affecting the agricultural system in the developing countries.

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) 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 Year 2 student teachers since it was studied from senior 1 up to Year 1. Introducing the lesson will start by activity 12.5 to check the prerequisites knowledge, skills, attitudes and values in relation to the topic.

d) Learning activities 12.2

The tutor helps student teachers to form small groups and provide books or print out to the student teachers. Student teachers work in their groups and present their findings. The expected answers to this activity **12.2** include the following.

1. Refer to the student teachers' Book under factors for increasing the agricultural production.
2. Refer to the student teachers' Book under problems affecting the agriculture in the developing countries.

e) 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: Livestock Farming

a) Learning objectives

Student-teachers should be able to:

- 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.

b) Teaching resources

Map - Print outs for the activities -Text books - Internet, Etc.

c) 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.

d) Learning activity 12.3.1. on Pastoralism, possible answers:

1. Refer to the student teachers' book on livestock farming.

2. Refer to the student teachers' book under characteristics of nomadic pastoralism.
3. Refer to the student teachers' book under challenges of nomadic pastoralism.

Learning activity 12.3.2. possible answers:

1. Refer to the student teachers' book under factory farming.
2. Refer to the student teachers' book on ways of improving livestock farming.

e) Application activity 12.3

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 student teachers 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 of 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 4: Factors and problems affecting the livestock farming and ways of improving the livestock farming

a) Learning objectives

- Outline the factors and problems affecting the livestock farming.
- Explain the ways of improving the livestock farming.

b) Teaching resources

This lesson can be easily understood by conducting a field work, watching video related with livestock farming. As a tutor 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) Prerequisite/Revision/introduction

In this lesson, the authors used activities to check the understanding of student teachers in comparison with objectives set. The application activity 12.4 integrates student teachers with real experience in our environment. All activities in this lesson contribute much as they work as a diagnostic assessment.

d) Learning activities 12.4

Possible answers for Activity 12.4:

Both learning activity and application activity are all indicated in the learner's book and are purposely to help student teachers and teachers.

Possible answers for learning activity:

1. Refer to the learner's Book on factors influencing livestock farming.
2. Refer to the learner's Book under problems facing livestock farming.

3. Refer to the learner's Book on ways of improving livestock farming.

e) Application 12.4

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 student teachers' discussion on importance of livestock farming.

3. Refer to the learner's book under ways to improve livestock farming.

12.6. Summary of the unit

The unit 12 of Year 2 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.

12.7. 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.

12.8. End unit assessment

The teacher guides student teachers to read the passage provided. Student teachers 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 triggers 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 of the number of 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 in order to land they possess
- 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.

12.9. Additional activities

a) Remedial Activities

1. Define the word agriculture

Answer: Refers to the learner's book on introduction of agriculture.

2. Distinguish large scale farming from small scale farming.

Answer: Refers to the learner's book under introduction of agriculture.

3. Identify at least 3 advantages and disadvantages of cooperative farming

Answer: Refers 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 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 be introduced under recommended standards.

Skills lab:

The tutor refers the student-teacher to the ways of improving both livestock and cultivation and the factors influencing agriculture. To explain how the individuals and the village can rely on agriculture for development.

UNIT 13

MINING IN THE WORLD

13.1. Key unit competence

The student-teacher should be able to explain the impact of Mining on sustainable development of different countries in the world.

13.2 Prerequisite knowledge and skills/ Introduction

Unit 13 of Mining of Year 2 requires the students to have at least successfully covered the content under Senior 2, unit 18 and senior 3 unit 13. Therefore, the tutor should realize that these units provide the prerequisite knowledge to the students. This implies that student teachers can participate conveniently in the teaching and learning of this unit.

13.3 Cross-cutting issues to be addressed

Unit 13 of mining in the world is directly connected to the cross-cutting issue of environment and sustainability. The tutor should therefore; enable the student teachers 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 tutor 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 tutor 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 Cross-cutting issues.

13.4. 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 student-teachers 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 13.2: Methods of mining.
- c) Refer to Table 13.1: World minerals and their location under 13.1
- d) Refer to the learner's book under 13.3: Factors affecting mineral exploitation.

13.5. List of lessons (including assessment)

	Lesson title	Learning objectives (knowledge, skills and attitudes):	Number of periods
1	13.1. World distribution of major minerals.	<ul style="list-style-type: none"> - Identify the distribution of minerals in the world. - Locate the major minerals of the world on a map. 	1
2	13.2. Methods used for mining.	<ul style="list-style-type: none"> - List the methods used for mining in the world. - Explain the methods used for mining. 	2
3	13.3. Factors affecting mineral exploitation.	<ul style="list-style-type: none"> - State the factors affecting the mineral exploitation. - Describe the factors affecting the mineral exploitation. 	1
4	13.4. The effects of mining to the economies of the world.	<ul style="list-style-type: none"> - Outline the effects of mining to the economies of the world. - Explain the effects of mining to the economy of a country. 	1

4	13.4. The effects of mining to the economies of the world.	- Appreciate the importance of minerals for the sustainable development of different areas of the world.	1
5	13.5. Case study: - Russia - China - South Africa	- Explain mining in relation to the selected countries. - Explain the impact of mining on the sustainable development of different countries of the world.	2
6	13.6. End of Unit Assessment		1

Guidance on the lessons outlined above

Lesson 1: World distribution of major minerals.

a) Learning objectives

- Appreciate the role played by nature in the distribution of minerals in different areas of the world
- Identify the distribution of minerals in the world.
- Locate the major minerals of the world on a map.

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 of the world.
- Manila papers for group work drawing.

c) Prerequisites/ Revision /Introduction

The tutor should take note of the skills the student teachers must have acquired from the two levels (Senior 2, unit 18 and senior 3 unit 13) where they covered a lot in relation to the mining sector. The only difference is that, in Year 2, they

will look at mining in a broader manner covering the entire world.

This provides the tutor the chance of creating various activities, where the student teachers can be engaged in the introductory session, using the past studies. Here the tutor 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 tutor introduces the actual content of the lesson. This will have enabled the student-teachers to review and remember the information about mining. Therefore, when well executed the instructional objectives of the lesson are achieved.

The tutor should be observant to identify students that may have not covered the appropriate information concerning mining in their previous school/levels.

d) Learning activities 13.1:

1. The student teachers will use an atlas book to know the countries where minerals indicated on the map of the world provided in the learner's book are located.
2. The answers can be in line with the table under world distribution of minerals in the learner's book.
3. Refer to the learner's book on how some minerals can be exploited without affecting the environment.
 - Use of appropriate and recommended methods of mining.
 - Emphasizing underground mining methods.
 - Planting trees where or around the mining centres.
 - 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.

e) Application activities 13.1

The appropriate answers include:

1. **Tin** is found in the following areas outside Rwanda: China, Malaysia, Indonesia and Thailand.

Coltan: This mineral can be found in the following countries: Egypt, Ethiopia, Nigeria and Ghana, etc.

2. Other major world minerals: refer to the table showing a list of minerals in the learner's book.
3. A sketch of Rwanda showing the major areas where minerals are exploited or extracted:
refer to year 1 geography book.
4. Refer to the learner's book under the figure: The world map showing the distribution of major minerals.

Lesson 2: Methods used for mining.

a) Learning objectives

- List the methods used for mining in the world.
- Explain the methods used for mining.

b) Teaching resources:

- Photographs of mining methods.
- Text books.
- Video clip.
- Charts.

c) Prerequisites/ Revision /Introduction

The tutor should ask student teachers to talk about the methods of mining in relation to the topic of mining they studied in senior 2, 3 and year 1. The tutor can use various techniques of enabling or evoking student teachers to think harder about the methods of mining.

d) Learning activity 13.2

The student teachers are expected to answer the learning activity 13.2 using the following

1. Refer to the learner's book under 13.2 methods of mining.
2. The answers of this number may include:
 - Deforestation.
 - Soil erosion.

- Mass wasting.
- Removal of fertile soils that would support vegetation.
- Reduction of biodiversity.
- Off balancing the ecosystem.
- Environmental degradation.

e) Application activities 13.2

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 13.2. Methods of mining.
3. Refer the student's book under effects of mining.

Lesson 3: Factors affecting mineral exploitation.

a) Learning objectives

- State the factors affecting the mineral exploitation.
- Describe the factors affecting the mineral exploitation.

b) Teaching resources:

- Text books.
- Video clip.
- Charts.
- Manila papers.
- Etc.

c) Prerequisites/ Revision /Introduction

The tutor should make preview of the previous lesson using/asking student teachers to give a recap of what was covered. Then, he or she introduces the lesson with a short activity that can enable student teachers 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 tutor uses the learning activity provided in the learner's book (Activity 13.3).

d) Learning activities:

Possible answers for learning activity 13.3:

- 1) Refer to the learner's book under 13.3 factors affecting mineral exploitation.
- 2) Refer to the teacher's guide under the answers for question 2 of learning Activity 13.2.

e) Application activity: 13.3

Possible answers and guideline:

1. This question calls for the student teachers 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 , 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, on the other side, the student teachers are expected to look at other factors that influence the exploitation of mineral ores. Refer to the learner's book under 13.3: Factors affecting mineral exploitation.

Lesson 4: The effects of mining to the economies of the world

a) learning objectives

- 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.

b) Teaching resources:

- To achieve learning objectives, the following resources should be used.
- Text books.
- Video clip.
- Charts.
- Manila papers.
- Photographs of mining products.
- Etc.

c) Prerequisites/ Revision /Introduction

The tutor 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 tutor, the lesson is introduced. The tutor should use the learning activity 13.4 contained therein the learner's book.

d) Learning activity 13.4

The possible answers for learning activity 13.4:

1. The research findings expected from student teachers, rotate around what is indicated in the learner's book: 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 13.2.

e) Application activities 13.4

Possible answers:

1. Refer to geographical sources of information specifically Year 1 textbook and the possible answers include: - it contribute to the development of industries, it generates income (generation of government revenue), there is promotion of infrastructure and other answers of students that the tutor will judges to be correct.
2. The question requires to tackle the negative effects of mining in reference to Rwanda. For the answer, refer to the learner's book and some of the answers may include: - pollution of land, water and air, deforestation, land degradation and other answers that the tutor judges to be correct depending on the answers given by the student teachers.

Lesson 5: Case study (Russia, China and South Africa).

a) Learning objectives

- Explain mining in relation to the selected countries.
- Explain the impact of mining on the sustainable development of different countries of the world.

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 mining.
- Etc.

c) Prerequisites / Revision / Introduction

The tutor should task the student teachers with a short exercise of throwing the ball game, where each learner once he/she receives the ball mentions something about mining in either china, South Africa and Russia. The tutor therefore, introduces the lesson using learning activity 13.5 indicated in the learner's book.

d) Learning activity 13.5

1. Refer to the learner's book under 13.5 case studies.
2. Refer to the learner's book under 13.5 case studies. Answers like:
The value of the minerals, the size of the ore, the presence of enough capital, the presence of technology etc. The tutor has to consider any other relevant answer from the students.
3. Refer to the learner's book under 13.4.1.

e) Application activities 13.5

Possible answers:

1. Refer to the learner's book under 13.5.1 and 13.5.2 under Mining in Russia and Mining in China, the factors that contributed to the development of mining in these countries.
2. The teacher should guide student teachers on how developed countries are using sustainable methods of mining without greatly affecting the environment. Therefore, this calls for a proper research on what developed countries do in relation to mining. Thereafter, the student teachers should be assisted to see what can be of good help to the country of Rwanda.

13.6. Summary of the unit

This unit 13, 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 (Russia, China, South Africa).

13.7. Additional information

The tutor is supposed to guide the student teachers 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 student teachers 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.

13.8. End of Unit Assessment

1. Refer to the learner's book under 13.4.1: 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 of all mining companies.
 - Afforestation and reforestation of areas around the mines.
 - Mass education.
 - Environmental impact assessment reports 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.

13.9. Additional activities

a) Remedial activities:

1. Describe the distribution of minerals in the world.
Possible answers refer to the student's book under location of minerals.
2. Give the suitable methods of mining 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 South Africa's economy?

Possible answers:

Refer to the learner's book under 13.4.

- 2. Give five factors that favour the development of mining in Russia.

Possible answers:

Refer to the learner's book under 13.5: Case studies.

c) Extended activities

- 1. Evaluate the effects of the overdependence of 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 13.4.1: Positive effects of mining to the economies of the world and 13.4.2: The negative effects of mining to the economic development of the countries of the world.

Skills lab orientation

The student- teacher should approach this using the knowledge and skills gain in this unit under the effects of mining to the economic development of countries in the world.

UNIT 14

POWER AND ENERGY PRODUCTION IN THE WORLD

14.1 Key unit competence

The student-teacher should be able to evaluate the success of the sustainable development projects in the power and energy production in different parts of the world.

14.2 Pre-requisite (knowledge, Skills, attitudes and values)

Unit 19 of senior two and unit 14 of senior three introduced the study of power and energy in in Rwanda and in Africa respectively and discusses about major sources and forms energy sources, different problems associated with the physical, human and economic environment and suggest solutions in Rwanda. This unit greatly constitutes a strong prerequisite that student teachers can use to understand better the content of this unit 14 of year 2. 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 student-teacher's 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 tutor to conduct diagnostic assessment as a way of evaluating each student-teacher's abilities. The teacher should refer to knowledge, skills, attitudes and values associated with power and energy that student teachers acquired from the previous classes with the purpose of establishing connections between the new learning activities and the previous ones.

In unit 14 of year 2 entitled the "**Power and Energy Production in the world**", the introductory activity presented in the student-teacher's book intends to remind student-teachers that the power and energy sources are used and exploited in different countries of the world. This enables student-teachers evaluate the success of the sustainable development projects in the power and energy production in different parts of the world. It was compulsory to

integrate in this unit a cross-cutting issue of environment and sustainability, inclusive education, peace and values which are briefly developed in the following paragraphs.

14. 3. Addressing Cross-cutting issues

There are many cross-cutting issues that can be highlighted in this lesson. The following list of cross-cutting issues can be applied where possible depending on occasion, for example:

a) Environment and sustainability

The issue of environment and sustainability will be integrated through all learning activities to address the problems related to the power and energy. Thus, the tutor is required to explain to students about the alternative sources of power and energy that are friendly to the environment, for the use of natural gas for cooking and heating purposes in their local environment.

b) Peace and Values Education

Education on peace and values will constitute a component that addressed during the class situation whereby a tutor can refer to learning activities like the public lighting which strengthens security.

c) Financial Education

On one side it can be addressed during the class situation whereby a tutor explains to the student teachers the most appropriate use of power and energy either at school or at home. For instance, student teachers should not waste power and energy. They should remember to switch off lights especially during the day or other power tunnels when they are not in use.

d) Inclusive education

The tutor should ensure that the student-teachers with impairments or special needs like physical disability to cope with the situation. In this context the tutor can use a video or film containing different power and energy samples collected from outside of school compound or the tutor can even bring different power and energy samples in classroom setting for those who will not be able to reach the place. For students-teachers with hearing disabilities or communication difficulties, in different learning activities the tutor will help them using enough illustrations, diagrams and sign languages where possible.

For students with visual impairment, the tutor helps 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. In this context the tutor will be supposed to provide sufficient explanations related to different learning activities so that student-teachers with visual impairment can carry out the designed learning activities using their hearing.

14.4. Guidance on the introductory activity

The tutor should let his /her students read carefully the introductory activity and answer the questions linked to the given activity.

When the student-teachers fail to come up with right answers to the questions related to introductory activity, the tutor will not immediately provide the required answers rather he /she should let students get the real answers through the whole learning and teaching process.

Some answers for the introductory activities are set in the form of statement and diagrams and the student-teachers are required to think out of the box. This implies that they must associate with other lessons studied in previous lessons of S1, S2 and S3 in lower secondary.

14.5. List of lessons

The table below highlights all the lessons that have been prepared in relation to the content of unit 14, as well as the period allocated to each of them.

s/n	Lesson title	Learning objectives (knowledge, skills and attitudes):	Number of Periods
1	14.1. Sources and forms of Energy used in the world	<ul style="list-style-type: none"> - Identify the major world's sources of energy. - Carry out a research to find out the alternative environmental friendly power and energy sources. - Show concern for the low levels of power and energy production in the world and the desire to develop the alternative sources of the power and energy. 	2

2	<p>14.2. Factors and importance of power and energy production in the world.</p> <ul style="list-style-type: none"> • Factors favoring power and energy production in the World. • Importance of power and energy in the development of the world. 	<ul style="list-style-type: none"> - Explain the factors affecting power production. - Explain the importance of the power and energy in the world. - Describe the factors affecting the power production in the world. - Evaluate the importance of the power and energy. - Appreciate the importance of the power and energy on the sustainable development of the world's economy. 	3
3	<p>14.3. Problems and possible solutions for power and energy</p> <ul style="list-style-type: none"> • Problems hindering the development of power and energy production in the world. • Possible solutions for power and energy in the World. 	<ul style="list-style-type: none"> - State the problems hindering the development of the power and energy and suggest the solutions. - Show respect for the efforts in the development of power and energy in the world. 	3
	End unit assessment		1

Guidance on different lessons

Lesson 1: Sources and forms of energy used in the world

a) Learning objectives

- Identify the major world's sources of energy.
- Carry out a research to find out the alternative environmental friendly power and energy sources.
- Show concern for the low levels of power and energy production in the world and the desire to develop the alternative sources of the power and energy.

b) Teaching resources

During the teaching and learning process, the teacher should refer to the following teaching resources where possible.

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

c) Pre requisites /revision/ Introduction

There is link between activity 14.1 and the previous lesson, especially in lower secondary. Therefore, the tutor should introduce a new lesson related to the form of energy and power at school level. The activity 14.1 requires students

-teachers to go around the school, observe the activities that are being done in the school environment , thereafter , identify the forms of energy and power being used at their school. Through this lesson the tutor must incorporate different cross-cutting issues during the course of teaching and learning process. This will enable student teachers to follow the new lesson.

d) Learning activity

Activity 14.1

Let student-teachers read carefully the questions related to learning activity and answer them. Let students-teacher predict possible solutions or answers by moving around around in their school environment, discuss and come up with answers. Let student-teachers get the real answers through the whole learning and teaching process. They should use the content in the student-teacher's book on sources and forms of energy used in the world. They should discuss and present the findings in class. Their answers should develop competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student-teachers (including those with learning impairments) in activities like discussion, asking and answering questions. For more answers refer to the student-teachers's book on sources and forms of energy used in the world.

1. i) For the activities that require power and energy at your school, we can list transport and communication, ICT, industrial products and development, education, banking, cooking, etc.

ii) The forms of power and energy needed include: coal, charcoal, petroleum, hydroelectric power, biomass, etc. Refer to student-teacher's book on sources and forms of energy used in the world.

2. Sources of power and energy exploited in Rwanda include: biomass; hydropower, solar energy, thermal energy, etc. Refer to student-teacher's book on sources and forms of energy used in the world.

Sources of power and energy non-exploited in Rwanda include are uranium energy, tidal energy, wind energy, etc. refer to student-teacher's book on sources and forms of energy used in the world.

e) Application activities

Application activity 14.1

The following is the guidance to the application activity, student-teachers should use the content given in the student-teacher's book on sources and forms of energy used in the world.

Student-teachers should be asked to discuss the sources and forms of energy used in the world. They should use the content given in the student-teacher's book on sources and forms of energy used in the world.

1. The forms of power and energy used in Rwanda are the following: coal, charcoal, petroleum, hydroelectric power, biomass, etc.

2. The following page lists all power stations. The country is in the midst of a rapid expansion of its electrical grid and many new plants are proposed or under construction. Rwanda is planning to expand from 45 MW of grid power in 2006 to 563 MW in 2018 and may import up to an additional 450 MW from neighboring countries. As of February 2015, national generation capacity totaled 153 megawatts. By December 2015, national generation capacity stood at 186 MW with peak demand of 105 MW. As of January 2017 national generation capacity had increased to 208 MW.

S.N	Hydroelectric station	Year of completion	Capacity	River
1	Ntaruka power station	1959	11.5MW	Ntaruka
2	Mukungwa power station	1982	12 MW	Mukungwa
3	Mukungwa II power station	2010	2,5MW	Nyabarongo
4	Nyabarongo I power station	2014	28MW	Nyabarongo
5	Rukarara power station	2010	9.5MW	Rukarara
6	Rusizi I power station	1958	30MW	Rusizi
7	Rusizi II power station	1989	44MW	Rusizi

3. to answer to this question refers to the student-teacher's book, chapter 14: power and energy

Lesson 2: Factors and importance of power and energy production in the world

a) Learning objectives

The following are the learning objectives for the lesson:

- Explain the factors affecting power production.
- Explain the importance of the power and energy in the world.
- Describe the factors affecting the power production in the world.
- Evaluate the importance of the power and energy.
- Appreciate the importance of the power and energy on the sustainable development of the world's economy.

b) Teaching resources

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

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

- Text books
- Internet
- Maps

c) Prerequisites/ Revision/ Introduction

There is link between activity 14.2 and the previous lesson, especially in lower secondary. Therefore, the tutor should introduce a new lesson related to the factors and importance of energy and power in the world. The activity 14.2 requires student-teachers to search in references, , thereafter , identify the factors for establishment of power stations in Rwanda. Through this lesson the tutor must incorporate different cross-cutting issues during the course of teaching and learning process. This will enable student teachers to follow the new lesson.

d) Learning Activities

Here down there is a guidance to answer learning activities 14.2

Guide student-teachers to describe the areas of power and energy production in Rwanda. Let them discuss the challenges faced by using power and energy. Present the findings in classrooms.

They should use the content in the student-teacher's book on factors and importance of power and energy production in the world. They should discuss and present the findings in class. Their answers should develop competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student-teachers (including those with learning impairments) in activities like discussion, asking and answering questions.

1. The areas of power and energy production in Rwanda, showing the reasons of their geographical location. - Western Province we have hydropower dams like Rusizi I & Rusizi II because of the presence of enough water from Lake Kivu, waterfalls and rapids. There is also solar energy because the climate allows it with high solar radiation. – Ntaruka hydropower in Northern Province between lakes Burera and Ruhondo due to favourable river (Ntaruka), relief favouring conditions for the construction of dam, water fall and rapids.

For more information, refer to the student-teacher's book (Unit 14 of year 2) on factors and importance of power and energy production in the world.

2. Challenges that Rwandans would face if those areas had not been identified: shortage of power and energy in different forms, delay in development of industries, etc. For more information ; refer to the student-teachers's book on factors and importance of power and energy production in the world.

e) Application activity

Guidance to answer application activity 14.2

1. The students-teachers are expected to give a wide range of answers. But all should rotate around the requirements for Rwanda to fully exploit its available power and energy sources. The student-teachers are expected first of all to provide some requirements like availability of power and energy sources, enough capital, skilled manpower, encourage experts to do a scientific research, improved technology, etc.
2. For this question the students will visit the local industrial areas and identify the role of power energy in daily activities of such an industry. Here, the local industrial areas can include Masoro Industrial Free zone, CIMERWA Plant Ltd, BRALIRWA Ltd, Inyange Industries Ltd, etc. The role of power and energy in daily activity can be the following: enable production process, enable packaging process, work day and night, infrastructure development, etc. For more details please refer to student-teacher's book on factors and importance of power and energy production in the world.

Lesson 3: Problems and possible solutions for power and energy

a) Learning objectives

The following are learning objectives for the lesson:

- State the problems hindering the development of the power and energy
- Suggest the solutions to the problems hindering the development of power and energy.
- Show respect for the efforts in the development of power and energy in the world.

b) Teaching resources

During the teaching and learning process, the tutor will refer to the following teaching resources where possible.

- Pictures

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

c) Prerequisites / Revision/ Introduction

There is link between activity 14.3 and the previous lesson, especially in lower secondary. Therefore, the tutor should introduce a new lesson related to the problems and possible solutions fro power and energy. The activity 14.3 requires student-teachers to search in references, thereafter , identify State the problems hindering the development of the power and energy, suggest the solutions to the problems hindering the development of power and energy, show respect for the efforts in the development of power and energy in the world.

Through this lesson the tutor must incorporate different cross-cutting issues during the course of teaching and learning process.This will enable student teachers to follow the new lesson.

d) Learning activities

Refer to the learning activities 14.3 in the student-teacher’s book, the following are key activities to be done during the teaching and learning processes.

- Guide student-teachers identify the problems of power production and suggest solutions to them.
- Let student-teachers discuss the problems and solution of power production.
- Student-teachers should present their findings in class.
- They should use the content in the student-teacher’s book on problems and possible solutions for power and energy.
- Their answers should develop competences such as critical thinking, cooperation, communication, research and problem-solving skills.
- Engage student-teachers (including those with learning impairments) in activities like discussion, asking and answering questions.

Guidance to answers for learning activities

i. Problems of power production sector include the following:

- Biomass energy source remains dominant for cooking and other household uses.
- The supply side must be more productively managed, and charcoal more efficiently produced and used.
- The country requires funding for the development of the energy sector. There are unfavorable conditions associated to the loans and grants from suppliers of funding.
- There is an urgent need of developing adequate local expertise to management the energy sector.
- The high cost of transport of imported oil products to produce power. The transport is higher than in the neighboring countries.
- The challenge of ensuring efficient and safe use of oil products especially in the transport sector.
- There is insufficient standardization and quality control of petroleum products and inadequate enforcement and uncoordinated safety measures.
- There is need for awareness by both consumers and producers of the renewable energy alternatives and technology availability.
- There is low consumption of commercial energy as people still rely on wood fuel.
- Low generation capacity to meet the increasing demand and low access to electricity.
- Lack of sufficient institutional, legal & regulatory framework and human capacity.
- Ineffective modalities for implementation and management of shared generation resources in case Rwanda was to partner with other neighbouring countries.

For more information, refer to the student-teacher's book (unit 14 of year 2) on problems and solutions for power and energy.

ii. The possible solutions to the identified problems

Refer to the student-teacher's book on problems and solutions for power and energy.

a) Application activities

Refer to the application activities 10.3 in the student-teacher's book

Student-teachers are expected to provide a wide range of answers that rotate on the power and energy.

Possible answers:

1. The student-teachers are expected to give a wide range of answers. But all should rotate around the energy status of Rwanda and its importance to national development. The present electricity supply in Rwanda is derived principally from thermal and hydropower sources. Rwanda has variety of potential energy resources from biomass, hydro, solar, petroleum, methane gas, wind and geothermal. For more details please refer to student's book on problems and possible solutions for power and energy.
2. Description of the problems highlighted in the interview. For more details please refer to student-teacher's book on problems and possible solutions for power and energy.
3. Basing on East African Community countries experience, explanation of the importance of power distribution between can be the following:
 - Participating in development of a country members.
 - The power energy can be exported in neighboring country and in that way, it is contributing in earning the foreign money. The economy of many countries is depending on the production of petroleum which is the most used worldwide as source of energy.
 - The engine that moves the industrial sector is energy and without it the whole sector would ground to a standstill. Most industries use petroleum and its by-products to run the machines. Electricity is also used to run machines while wood fuel is used in various processing industries such as tea processing.
 - Petroleum is used in road transport, water transport and air transport meaning that it is the basic element in transport.
 - The generation of electricity is offering employment to a good number of people.
 - Solar energy is used to dry grains and other produce such as tobacco, cocoa and coffee. Petroleum and its by-products are used to run water pumps and other agricultural machinery. Wind power is used in dry regions to pump water for irrigation.

- Various forms of energy are used for various purposes such as cooking, lighting and heating. In the rural areas, the main sources of energy are firewood, charcoal and liquid petroleum. In Urban sector, charcoal, kerosene, liquid petroleum, gas and electricity are used.
- For more details please refer to student's book on problems and possible solutions for power and energy.

14.6. Summary of the unit

Unit 14 of year 2 deals with power and energy. The key points of content to be highlighted in the unit are sources and forms, types of power and energy, importance of power and energy, problems and possible solutions to power and energy. This unit have been summarized to fit with the planned teaching and learning periods.

14.7. Additional Information

List of countries by electricity production from renewable sources

This article is a list of countries by electricity generation from renewable sources every year. Note that most countries import and/or export electricity, so the percentage figures do not reflect the percentage of consumption that is renewable based.

Based on REN21's 2016 report, renewables contributed 19.2% to humans' global energy consumption and 23.7% to their generation of electricity in 2014 and 2015, respectively. This energy consumption is divided as; 8.9% coming from traditional biomass, 4.2% as heat energy (modern biomass, geothermal and solar heat), 3.9% hydro-electricity and 2.2% is electricity from wind, solar, geothermal, and biomass. Worldwide investments in renewable technologies amounted to more than US\$286 billion in 2015, with countries like China and the United States heavily investing in wind, hydro, solar and biofuels. Globally, there are an estimated 7.7 million jobs associated with the renewable energy industries, with solar photovoltaic being the largest renewable employer. As of 2015 worldwide, more than half of all new electricity capacity installed was renewable.

14.8. End unit assessment

However, the students-teacher should give their own opinion/view or self-constructed answers, their answers will rotate to the content in reference with the following possible answers for end unit assessment:

- 1) Even if it is known that the district infrastructures are not the same and therefore they can not use the same means in terms of sources and forms of power and energy used. For further information, refer to student-teacher's book on power and energy production in the world.
- 2) Refer to student-teacher's book on power and energy production in the world and highlight the solution to the problems of energy and power production in the world.
- 3) Refer to student-teacher's book on power and energy production in the world.

The following is the additional information to that given in the student-teacher textbook

It is clear that high energy production includes commercially-traded fuels (coal, oil and gas), nuclear, and modern renewables. This means traditional biofuels are not included; as a result, figures are likely to be a small underestimate for regions (predominantly Africa and developing Asia) where populations still strongly rely on traditional biomass as a primary fuel source.

In 1965 the bulk of total energy was consumed North America, Europe and Eurasia- collectively, they accounted for more than 80 percent of global energy consumption. Although energy consumption has increased in these regions since the 1960s, their relative share of the total has declined significantly. Consumption across the rest of the world has been increasing, most dramatically in the Asia Pacific where the total consumption increased more than 12-fold over this period.

As a result, in 2015 Asia Pacific was by far the largest regional consumer with 42 percent- this was about the same as North America, Europe and Eurasia combined (at 43 percent). The Middle East, Latin America and Africa account for around seven, five and three percent, respectively.

As well as comparing the total quantity of primary energy consumed, we can also breakdown the contribution of different sources across the regions.

The studied problems in this unit are the reasons for the slow and marginal progress we have made in the transition to modern renewables, and is a challenge we must acknowledge if we are to achieve a large-scale shift in our global energy systems.

- 4) Refer to student-teacher's book on power and energy production in the world.
- 5) Refer to student-teacher's book on power and energy production in the world and some key highlight may be the following:

When analyses the graph, it is obvious that nuclear energy is used at low level world wide and they are almost at low level, from 1965-2015.

On the other hand, it is clear that the oil has been using form 1965 at low level compared as in 1980 where it reached its maximum uses. However, it continues to goes again until 2015 and it is clear that it will be continues to be used in coming years.

14.9. Additional activities

14.9.1 Remedial Activities

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

1. Identify the main sources of power and energy in Rwanda

Answer: Hydropower, Solar energy, Thermal energy

2. Give 2 examples of renewable energy sources

Answer:, Hydroelectricity, solar energy

3. Give the importance of power and energy.

Answer: For cooking, lighting and heating.

14.9.2 Consolidation activities

The following is the activity designed for consolidation activities:

Establish the link between power and energy

Answer: Power is the capacity of energy, which is being used, while energy is 'joules', power is 'joules per second'. In other words, Power is 'watt' and Energy is 'watt-hour'. Another difference is that energy can be stored whereas power cannot be stored.

14.9.3 Extended activities

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

1. Describe the following energy sources.
 - (i) Non-renewable energy sources;
 - (ii) Renewable energy sources
2. Brainstorm a project of power and energy production in your district basing on the availability opportunities.

Possible answers:

1. Before coming up with answers to this question, student-teachers should first define each sources of energy. The definitions associated with the key terms are very important. The student-teacher may say that Non-renewable resources are those when exhausted they cannot be re-used, whereas renewable resources are inexhaustible.
2. The project that student-teacher should come up with depends on the location in which they are living. For example, the student-teachers in Eastern part of Rwanda would design a project related to the solar energy because the presence of flat area which favour the establishment of photovoltaic panels and hydroelectric power due to the presence of waterfalls and rapids on Rusumo river. While students in the Weast and Northern will come up with hydro-electric power generation because of presence of many strong rivers with good waterfalls and rapids.

Skills lab:

Let student-teacher think deeply on a source of energy that will provide light or heat but at the same time not deteriorating the environment.

UNIT 15

INDUSTRIALISATION IN THE WORLD

15.1. Key unit competence

The student-teachers should be able to evaluate the success of the sustainable development projects in the industry in different parts of the world.

15.2. Pre-requisite (knowledge, skills, attitudes and values)

Unit10.6 in year 1, introduced the study of industry in Rwanda. They studied types of industries, factors, importance, problems of industrial development in Rwanda. They also studied solutions to mitigate the problems of industries as well as case studies related to industries in Rwanda.

In the learner's book there is an introductory activity, it is intended to identify categories of industry in the world, factors for location of industries and industrialized regions. This will help student teachers to understand appropriate measures to be taken in conserving the environment. Therefore, a teacher emphasizes the cross cutting issue of environment and sustainability.

15.3. Cross-cutting issues to be addressed

A citizen has to conserve his environment, by using it appropriately. The management of the environment must be emphasized and various methods should be adopted.

In this unit, emphasis must be put on the need for environment sustainability based on knowledge to mitigate the problems caused by industry; the student teachers should know how to protect their environment.

Financial education is another cross-cutting issue that is linked to the study of the economic importance of industries. This economic activity has helped people to earn a living and national income for sustainable development.

Standardization culture is another cross-cutting issue that is linked to the study of various industrial products produced by major industries indicated in different case studies. These products must have a measurable standard for people's health.

15.4. Guidance on introductory activity

In this unit, the key inquiry questions that will be the guide to the introductory activity are:

1. According to you, in which category of industry does Mr.Gatete belong to?
2. Explain the factors on which Amahoro Cooperative Society base on to establish the factory which transforms Gatete's products and the problems that may be associated to the factory.
3. Make research on internet and find out five examples of more industrialized countries in the world and describe the factors for their industrial development.

15.5. List of lessons (including assessment)

	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes)	Number of periods
1	Definition, classification of industries, factors influencing location of industries, major world industrial regions. (developed countries and developing countries.)	<ul style="list-style-type: none"> - Identify different types of industries - Classify different types of industries - State the factors influencing the location of industries. - Evaluate the factors influencing the location and the localisation of industries. 	1
2	Major world industrial regions (developed countries and developing countries)	<ul style="list-style-type: none"> - Locate the major industrial regions of the world. - Name the major industrial regions of the world. 	1

		- Appreciate the distribution of the industries and their impact on the sustainable development	
3	Importance of the industrial development and problems affecting industrial development	- Identify and evaluate the importance of industrial development in world and problems affecting industries in the world.	1
4	Problems resulting from industrial development and ways to mitigate them	<ul style="list-style-type: none"> - Identify the problems affecting the industries and the effects of industrial development. - Evaluate the problems affecting the industries and the effects of the industrial development in the world and suggest the solutions. - Show concern for the effects of industrialisation and the desire to protect the environment. 	1
5	Case studies on major world industrial regions: Developed countries: Japan , Developing countries: Koreas.	- State the major industrial areas and describe the major factors influencing industrial development in different regions.	2
6	Assessment		1

Guidance on different lessons outlined above

The above table highlights all lessons relating to the Unit content. There are five lessons developed.

From the unit 15 with different number of periods. Below is the guidance on the how to go about each lesson.

Lesson 1 Definition, classification of industries, factors influencing location of industries and major world industrial regions.

a) Learning Objectives

- Identify different types of industries
- Classify different types of industries
- State the factors influencing the location of industries.
- Evaluate the factors influencing the location of industries.

b) Teaching resources:

For effective delivery of the lesson, you should ensure that you have the following resources and other appropriate teaching aids:

- Text books
- Sample of Maps
- Internet

c) Pre-requisites/ Revision /Introduction

This topic on industrialization was discussed in year 1. It is important to link the content studied with what is going to be learnt in year 2. In year 1, student teachers learnt industry in Rwanda.

Facilitate the student teachers to review year1contents by asking them to explain the types and factors influencing industrial development in Rwanda. After this review, using the passage provided in the learner's book, student teachers should be able to explain types, factors and problems related to industrialization.

d) Learning activities:

Refer to the learning activities 15.1 in the learner's book

Help student teachers to work in groups, they should be able to identify categories of industries and describe the factors that influence their location. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book.

e) Application activities

Refer to the application activities 15.1 in the learner's book

Student teachers are asked to give examples of each categories of industries in Rwanda and explore factors influencing location of industries in their area. They will use the content given in the learner's book on definition, types and factors for the location of industries and internet.

Lesson 2: Major world industrial regions (developed countries and developing countries)

a) Learning objectives

- Locate the major industrial regions of the world.
- Name the major industrial regions of the world.
- Appreciate the distribution of the industries and their impact on the sustainable development.

b) Teaching resources

- Text books
- Internet
- Other geographical documents.

c) Pre-requisites/ Revision /Introduction.

This topic on industrialization was discussed in senior 3 and year 1. It is important to link the content studied with what is going to be learnt in year 2. In year 1, student teachers learnt industry in Rwanda, in senior 3, student teachers learnt industry in Germany and other countries.

Facilitate the student teachers to review in year1, and senior 3 contents and asking them to explain the factors influencing industrial development in the world, using the passage provided in the learner's book year 2.

d) Learning activities

Refer to the learning activities 15.2 in the learner's book

Help student teachers to work in groups, to make research, they should be able to identify the major world industrial regions and to describe the factors that are responsible for their location in USA, Russia, China, Egypt, and South Africa. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book

e) Application activities

Refer to the application activities 15.2 in the learner's book

Student teachers are asked to draw a sketch map of USA and on it, locate the major industrial regions and explore how the following factors, high level of technology, improved transport, a wide range of raw materials have contributed to the development of industries in China, in Egypt, in South Africa. They will use the content given in the learner's book on the major world industrial regions and factors for the location of industries and internet.

Lesson 3: Importance of industries and problems affecting industrial development

a) Learning Objectives

- Give the importance of the industrial development in the world.
- Evaluate the importance of industrial development in the world and problem affecting industries in the world.

b) Teaching resources:

- Text books
- Internet
- Other geographical document

c) Pre-requisites/ Revision /Introduction.

This topic on industrialization was discussed in year 1. It is important to link the content studied with what is going to be learnt in year 2.

After this review, using the passage provided in the learner's book, student teachers should be able to explain importance and problems related to industrialization in year 2. In year 1, student teachers learnt industry in Rwanda.

Facilitate the student teachers to review year 1 contents by asking them to explain the importance and problems of industrial development in the world.

d) Learning activities

Student teachers should briefly explain factors for industrial development in the major industrial regions of the world. Briefly supplement the answers given by student teachers.

Refer to the learning activities 15.3 in the learner's book

In groups, student teachers are asked to explain the importance of industries in a country. Guide them to get the answers in the learner's book. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book.

e) Application activities

Refer to the application activities 15.3 in the learner's book

Student teachers are asked to explain why industries in developed countries are highly developed than the ones in developing countries and to suggest strategies for industrial development in Rwanda. They will use the content given in the learner's book and other geographical documents on the importance and problems affecting industrial development.

Lesson: 4 Problems resulting from industrial development and ways to mitigate them

a) Learning Objectives

- Identify the problems affecting the industries and the effects of industrial development.
- Evaluate the problems affecting the industries and the effects of the industrial development in the world and suggest the solutions.
- Show concern for the effects of industrialisation and the desire to protect the environment.

b) Teaching resources:

- Text books
- Internet
- Other geographical documents

c) Pre-requisites/ Revision /Introduction

Student teachers are asked to briefly explain the role of industries in economic development. Supplement the answers given by student teachers and introduce the content related to problems resulting from industrial development and ways to mitigate them.

d) Learning activities

Refer to the learning activities 15.4 in the learner's book

Put student teachers in groups; guide them in discussing about the problems resulting from industrial development and ways to mitigate them. Afterwards refer them to the learner's book for problems resulting from industrial development and ways to mitigate them. They should present their findings in class. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book.

e) Application activities

Refer to the learning activities 15.4 in the learner's book

Student teachers are asked to examine the ways of reducing problems caused by industries. They will use the content given in the learner's book and other geographical documents to explain ways to mitigate problems resulting from industrial development.

Lesson 15.5. Case studies on major world industrial regions

a) Learning objectives

- State the major industrial areas in the world.
- describe the major factors influencing industrial development in different regions

b) Teaching resources:

To achieve learning objectives, the following resources should be used:

- Text books
- World map
- Internet
- Other geographical documents

c) Pre-requisites/ Revision /Introduction

Let student teachers highlight the types and factors for location of industries previously studied. Then put student teachers in groups and guide them to make research on the major world industrial regions.

d) Learning activities

Refer to the learning activities 15.5 in the learner's book

Guide student teachers to work in pairs, they will be able to name and locate major industrial regions of the world and explain factors for their industrial development. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book.

e) Application activities

Refer to the application activities 15.5 in the learner's book

Student teachers are asked to compare the factors that led to the development of industrialization in Japan with those of South Africa and analyse the importance of industrialization in USA, Egypt, Russia. They will use the content given in the learner's book on the major world industrial regions.

15.6. Summary of the unit

This unit covers classification of industries and factors influencing location of industries, major world industrial regions, importance of industries and problems affecting industrial development, problems resulting from industrial development and ways to mitigate them.

This unit intends to help student teachers to classify industries, explain various factors influencing their location and analyse their importance in relation to sustainable development. This helps the student teachers to internalize financial education as a cross cutting issue and know how man has utilized the available resources for industrial development. The common phenomena like industrial pollution which requires control measures creates awareness for environmental protection hence integration of environment and sustainability as a cross cutting issue.

15.7. Additional Information

This unit is linked to unit 10.6. in year 1 on industry in Rwanda. It is very important for student teachers to link the prior knowledge acquired in year 1 to what is contained in this unit. When you are teaching this unit, you should use

local examples of industries in Rwanda. Make comparison between different continents in relation to industrial development.

The learner's book has some activities where group discussion is emphasized.

It is therefore necessary that where possible methodology can be changed and activities adjusted to achieve learning objectives.

15.8. End unit assessment

Questions

Make a field trip in any industrialized area around your school and answer the following questions:

- 1) Discuss the physical and human factors influencing location of industries in an area.
- 2) Describe the role of industries in sustainable development.
- 3) Analyse the ways of improving the level of industrialization in developing countries.

Guidance to answers

1. Discuss the physical and human factors influencing the location of industries in an area.

Facilitate student teachers in groups to share the answers by using experience in their community; and refer to the student teachers' book on factors influencing industrial location.

2. Describe the role of industries in sustainable development.

Guide student teachers to describe the role of industries in economic development. Their answers must have local examples.

3. Analyse the ways of improving the level of industrialization in developing countries.

In groups let student teachers brainstorm on how to improve the level of industrialization. They should use local examples developing countries and get references in learner's book.

15.9. Additional activities

15.9.1 Remedial activities (for slow student teachers)

- i) Define an industry.
- ii) Outline five examples of industries in Rwanda.
- iii) Explain the meaning of the industrialization.

These are questions that require low order thinking and are answered as follows:

- i) An industry is an establishment that involves production of goods and offering of services or an industry is commonly used to describe factories that process or transform raw materials into finished goods.
- ii) Example of industries in Rwanda are: Tolirwa, Cimerwa, Azam, Sulfo, Rwandafoam.
- iii) Industrialization refers to the concentration of industries within an area. It is a process whereby countries increasingly get involved in the production of manufactured goods.

15.9.2. Consolidation activities

- i) Evaluate the effects of industrial pollution in your area.
- ii) Give an example of an industry in your area and describe the factors for its location.

Guide student teachers how to answer the above questions using local examples.

- i) For example, the effects of industrial pollution include: destruction of Ozone layer, Acidic rain, creation of barren land, global warming, etc.
- ii) Example of industries are agro-based industries such as Inyange industry, Utexrwa. The factors for their location include: availability of power, availability of raw materials, market, land, favourable climate, etc.

15.9.3. Extended activities (for gifted and talented student teachers)

Account for the high level of industrialization in developed countries

Answer: Guide student teachers to make research on the factors for industrial development in developed countries. Their findings should be presented in class.

Skills lab:

Student-teachers should create a small scale industry using local raw materials.

UNIT 16

TRANSPORT AND COMMUNICATION IN THE WORLD

16.1. Key unit competence

The student-teacher should be able to analyse the impact of transport and communication projects on the sustainable development of the different countries in the world.

16.2. Pre-requisite (knowledge, skills, attitudes and values)

Year 1 introduced the study of transport and communication in Rwanda. Student teachers studied the types of transport, their advantages and disadvantages, factors, importance, problems and solutions of transport. Different means of communication, factors, importance problems and solutions of communication were also learned.

In the learner's book there is an introductory activity; it is intended to read the passage and answer the questions related to it. Therefore, a tutor should emphasize the cross cutting issue of financial education.

16.3. Cross-cutting issues to be addressed

A citizen must understand the importance of transport as a source of income and government revenue and to know how that income should be used appropriately to enhance economic sustainability. Financial education therefore should be emphasized.

16.4. Guidance on introductory activity

In this unit the tutor will have to take advantage of what the student teachers have studied in their previous academic years, and ask them to mention the types of transport, the economic importance of transport, the ways of communication and the importance of communication. The tutor will be

playing a role of a guide as he helps the student teachers to recall all of this knowledge they acquired and linking them with the current unit at hand.

16.5. List of lessons (including assessment)

	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes):	Number of periods
1	16.1. Transport Meaning and types of transport.	<ul style="list-style-type: none"> - Understand the term “Transport” - Identify the major types of transport. - Explain the advantages and disadvantages of the different types of transport. 	1
2	Factors influencing the development of transport and importance of transport	<ul style="list-style-type: none"> - Identify the factors influencing the development of different types of transport. - Appreciate the importance of different types of transport. 	1
3	Problems/challenges affecting transport and strategies of improving transport.	<ul style="list-style-type: none"> - Show concern for the challenge encountered in transport and the desire to improve it. 	1
4	Case studies on transport	<ul style="list-style-type: none"> - Appreciate the importance and challenges of transport in different countries. 	1
5	Meaning and Types of communication	<ul style="list-style-type: none"> - Understand the difference between communication and transport - State the different types of communication. 	1
6	Importance of communication, problems and possible solutions to the problems affecting communication	<ul style="list-style-type: none"> - Evaluate the importance of communication. - Show concern for the challenges encountered in communication and desire to improve it. 	1
7	Assessment		1

Guidance on different lessons outlined above

Lesson 16.1.1. Meaning and types of transport

a) Learning objectives

- Understand the meaning of transport
- Identify the major types of transport.
- Explain the advantages and disadvantages of the different types of transport.
- Appreciate the importance of different types of transport.

b) Teaching resources

For effective delivery of the lesson, you should ensure that you have the following resources and other appropriate teaching aids:

- Text books
- Photographs
- Internet
- Other geographical documents

c) Pre-requisites/ Revision /Introduction

This topic on meaning of transport and types of transport was discussed in Year 1. It is important to link the content studied with what is going to be learnt in Year 2.

Guide the student teachers to review Year 1 content by asking them to give the meaning of transport and types of transport in Rwanda. After this review, student teachers should be able to analyse the means of transport and types of transport in the world.

d) Learning activities

Refer to the learning activities 16.1 in the learner's book

Guide student teachers to work in groups using photographs in learner's book to identify the means of transport. They should be able to identify the type of transport common in their areas. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book.

Student teachers are asked to explain the different types of transport. They should use the content given in the learner's book on the means and types of transport.

e) Application activities

Refer to the application activities 16.1 in the learner's book

Student teachers are asked to explain why road transport is commonly used in Rwanda and describe its challenges. They will use the content given in the learner's book on the meaning and types of transport and other geographical documents to answer these questions.

Lesson 16.1.2. Factors influencing the development of transport and importance of transport

a) Learning objectives

- Identify the factors influencing the development of different types of transport.
- Explain the factors influencing the development of different types of transport
- Appreciate the importance of different types of transport.

b) Teaching resources

To achieve learning objectives, the following resources should be used:

- Text books
- Internet.
- Other geographical documents

c) Pre-requisites/ Revision /Introduction

Briefly review the previous lesson by asking student teachers to differentiate the types of transport. Thereafter guide student teachers to make research and analyse the physical and human factors that influence the development of transport in their area.

d) Learning activities

Refer to the learning activities 16.2 in the learner's book

Facilitate student teachers to work in groups using text books and local environment. They should be able to explain why Rwanda air is improving its business worldwide and analyse the factors influencing the development of transport in their district. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book.

e) Application activities

Refer to the application activities 16.2 in the learner's book

Student teachers are asked to analyse the economic impacts of transport on the taxi park visited. They should use the content given in the learner's book on the importance of transport.

Lesson 16.1.3. Problems/challenges affecting of transport and strategies of improving transport.

a) Learning objectives

- Show concern for the challenge encountered in transport and the desire to improve it.
- Appreciate the importance and challenges of transport in different countries.

b) Teaching resources:

For learning to be successful, the following resources are required:

- Text books
- Sample of photographs
- Internet

c) Pre-requisites/ Revision /Introduction

Review the previous lesson by asking student teachers to explain the importance of transport. Later the teacher should introduce the new lesson on challenges and solutions of transport.

d) Learning activities

Refer to the learning activities 16.3 in the learner's book

Help student teachers to work in pairs and observe the challenges related to the transport sector with reference to Nyabugogo photograph. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication and research skills.

Let student teachers discuss, ask and answer questions and refer them to the learner's book for more information about problems affecting types of transport and ways to mitigate them.

e) Application activities

Refer to the application activities 16.3 in the learner's book

Student teachers are asked to explain the challenges affecting transport in Rwanda and suggest ways used by Rwanda to improve international transport system for sustainable development. They should use the content given in the learner's book on ways to improve transport and other geographical documents to answer this question.

Lesson 16.1.4: Case studies on transport

a) Learning objectives

- Appreciate the importance of saint Laurence sea way.
- Explain the challenges faced by saint Laurence sea way.

b) Teaching resources:

To achieve learning objectives, the following resources should be used.

- Text books
- Pencils
- Internet
- Sample Maps

c) Pre-requisites/ Revision /Introduction

Review the previous work covered on problems and ways to improve transport. Later guide student teachers in exploring the new content to be studied.

d) Learning activities

Refer to the learning activities 16.4 in the learner's book

Help student teachers to work in groups and show them the map of the St Lawrence Sea way. Guide them in their discussions about transport. Their

findings should be presented in class. Their answers should involve the integration of generic competences such as critical thinking, sketch drawing, creativity, cooperation and communication skills.

e) Application activities

Refer to the application activities 16.4 in the learner's book

Student teachers are asked to suggest problems that were met during the construction of St. Lawrence sea way and the problems it caused during and after construction. They also asked to describe the importance of St. Lawrence Seaway on the development of both the USA and Canada. They should use the learner's book about case studies on transport.

Lesson 16.2.1. Meaning and types of communication

a) Learning objectives

- Establish the difference between transport and communication
- State the different types of communication.
- Explain the different types of communication.
- Appreciate the importance of communication.

b) Teaching resources:

- Text books
- Photographs
- Internet.etc

c) Pre-requisites / Revision / Introduction

Review the previous content learnt in Year 1 by asking student teachers to highlight the means of communication used in Rwanda. Later the facilitator will supplement the student teachers' ideas.

d) Learning activities

Refer to the learning activities 16.5 in the learner's book

Help student teachers to work in groups and observe the photographs. They should identify and explain how devices of communication observed are used. Their answers should involve the integration of generic competences such as critical thinking, creativity, cooperation, communication and problem-solving skills.

Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book about types of communication.

e) Application activities

Refer to the application activities 16.5 in the learner's book

Student teachers are asked to explain the most forms of communication used in Rwanda and explain why. They should use the content given in the learner's book on types of communication and other geographical documents.

Lesson 16.2.2. Importance of communication, problems affecting communication and possible solutions

a) Student teachers objectives

- Evaluate the importance of communication.
- Show concern for the challenges encountered in communication and desire to improve it.

b) Teaching resources:

- Text books
- Internet
- Other geographical documents

c) Pre-requisites/ Revision /Introduction

Review the previous lesson on different means of communication. Thereafter the tutor should introduce the new lesson to be studied.

d) Learning activities

Refer to the learning activities 16.6 in the learner's book

1. Let student teachers work in pairs on consequences and importance of communication. Their answers should involve the integration of generic competences such as critical thinking, creativity, cooperation, communication and problem-solving skills.
2. Engage student teachers in activities like discussion, asking and answering questions and for more answers they are referred to the learner's book on the importance of communication.

e) Application activity

Refer to the application activities 16.6 in the learner's book

Ask the student teachers to identify the factors hindering effective communication in their area and what is being done by Rwandan government to improve communication. They should use the content given in the learner's book on the challenges of communication and other geographical documents.

16.6. Summary of the Unit

This unit covers types of transport, their advantages and disadvantages, factors influencing transport, importance, challenges and ways of improving transport. It also covers case studies regarding transport. It also covers forms of communication, importance, problems and ways to improve communication.

16.7. Additional Information

This unit is linked year 1 unit on transport and communication in Rwanda. It is therefore necessary for student teachers to link the prior knowledge acquired in year 1 to what is covered in this unit. When teaching this content, you should use local examples on forms of transport and communication in Rwanda. Analysis of case studies outside Rwanda is very important when you are teaching this Unit.

The learner's book has some activities where group discussion is emphasized. Therefore, it is important to adjust teaching methods where possible for successful learning.

16.8. End unit assessment

Questions:

- I. Examine the relationship between communication and transport.
- II. Explain the role of the government in ensuring effective communication in Rwanda.
- III. Referring to MTN and AIRTEL-TIGO, explain the importance of telecommunication companies in the development of the country.
- IV. Explain the factors that have contributed to the development of transport in developed countries than developing countries.

- V. Analyse the level of transport and the improvement of technology in communication in Rwanda and describe how this process can support the sustainable development of the country.

Guidance to answers:

a) Examine the relationship between communication and transport.

Facilitate student teachers in groups to share the answers by using experience in their community; and refer to the student teachers' book on transport and communication.

b) Explain the role of the government in ensuring effective communication in Rwanda.

Guide student teachers to work in pairs to show how the government has tried to ensure effective communication in different parts of the country.

c) Referring to MTN and AIRTEL-TIGO, explain the importance of telecommunication companies in the development of the country.

Ask student teachers to use the local experience to explain the extent to which telecommunication companies have played a big role on improvement of communication in the country.

d) Explain the factors that have contributed to the development of transport in developed countries than developing countries.

Refer to the learner's book on factors influencing the development of transport in developed countries than developing countries. Where necessary use other geographical documents to get the answers.

e) Analyze the level of transport and the improvement of technology in communication in Rwanda and describe how this process can support the sustainable development of the country.

Make a comment on the level of technological development in Rwanda by using group discussions and class presentations.

16.9. Additional activities

a) Consolidation activities:

- i) Explain the advantages of road transport.
- ii) Describe how the following factors influence transport:
 - Relief
 - Capital
 - Government policy

Guide student teachers on how to answer the above questions using the learner's book and research and group discussion to brainstorm on how relief, capital and government policy have influenced the development of transport.

b) Remedial activities (for slow student teachers)

- i) Define the term transport.
- ii) Define the term communication.
- iii) Mention any three types of transport used in your country.

These questions require low order thinking and they are answered as follows:

- i) The term transport means the process whereby passenger and goods move from one place to another.
- ii) The term communication is the transmission of information in form of news and messages.
- iii) Types of transport used in Rwanda are: Land transport, Air transport and Water transport.

c) Extended activities (for gifted and talented student teachers)

Discuss the advantages and disadvantages of air transport.

Guidance to answer:

Facilitate student teachers to answer the above question using the learner's book by discussion about the advantages and disadvantages of air transport.

Skills lab:

The student-teacher will use the knowledge and skills acquired in this unit under the title; interrelation between transport and communication and economic development.

UNIT 17

TRADE AND COMMERCE IN THE WORLD

17.1 Key unit competence

The student-teacher should be able to evaluate the impact of trade and commerce on the sustainable development of different countries in the world.

17.2 Pre-requisite (knowledge, skills, attitudes and values)

Unit 10 of year 2, sub –heading of transport, communication and trade in Rwanda, the student-teachers have learnt. Student teachers studied the types of trade, factors, importance, problems and solutions of trade. Trade Internal and external trade in Rwanda. Factors affecting the trade in Rwanda. Importance of trade in Rwanda. Importation and exportation of the products (balance of trade and balance of payment). Problems affecting the trade in Rwanda, possible solutions and prospects.

In the student-teacher 's book there is an introductory activity; it is intended to identify different regional integration blocs and highlight their advantages. Therefore, a tutor emphasizes the cross cutting issue of financial education, standardization culture, peace and value,

17.3 Cross-cutting issues to be addressed

A citizen has to understand the importance of trade as a source of income and government revenue and to know how that income should be used appropriately enhancing economic sustainability, financial education therefore should be emphasized. Commodities involved in trade must be to the standard (not expired), there is a need therefore to highlight standardization culture as a cross-cutting issue. Furthermore, both home trade and foreign trade requires stability and peace for their smooth running. It is therefore necessary emphasize peace and value as a cross- cutting issue in this unit.

17.4 Guidance on introductory activity

In this unit, the following are the key inquiry questions that will be the guiding student-teachers to be involved in the lesson:

- a) Identify different regional integrations operating with Rwanda.
- b) What advantages does a country benefit from being in a trading bloc?

The tutor should let his/her students read carefully the introductory activity and answer the questions linked to the given activity. When the student-teachers fail to come up with right answers to the questions related to introductory activity, the tutor will not immediately provide the required answers rather he /she should let students get the real answers through the whole learning and teaching process. Some answers for the introductory activities are set in the form of statement and in abbreviated ways and the student-teachers are required to think out in large ways in stating them in full. This implies that they must associate with other lessons studied in previous lessons of S1, S2 and S3 in lower secondary and in year 1 of TTC.

17.5. List of lessons (including assessment)

	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes):	Number of periods
1	17.1. Meaning, types of trade and factors influencing international trade.	<ul style="list-style-type: none">- Define trade and commerce.- Identify the different types of trade and commerce.- Outline the factors influencing the international trade.- Explain the meaning of trade and commerce.- Discuss the different types of trade and commerce.- Describe the factors influencing the trade and commerce.	1

2	17.2. Causes of low levels of international trade in Developing Countries and importance of international trade in development.	<ul style="list-style-type: none"> - Appreciate the importance of trade and commerce. - Appreciate the importance of trade and commerce. - Show the continual desire to improve trade and commerce 	1
3	17.3. Major financial centers and trading blocs of the world.	<ul style="list-style-type: none"> - state the major financial centers of the world. - Explain the financial centres of the world. - Appreciate the importance of the major financial centres and trading blocks. 	1
4	17.4. Case studies on regional integration and trading blocs.	<ul style="list-style-type: none"> - Identify the major trading patterns and the world trading blocs. - Appreciate the importance of the regional integration. 	1
6	Assessment		1

Lesson 1: Definition, types of trade and factors influencing international trade

a) Learning objectives

- The following are learning objectives of the lesson:
- Define trade and commerce
- Identify the different types of trade and commerce
- Outline the factors influencing the international trade
- Explain the meaning of trade and commerce
- Discuss the different types of trade and commerce
- Describe the factors influencing the trade and commerce

b) Teaching resources

During the teaching and learning process, the teacher should refer to the following teaching resources where possible.

- Text books
- Photographs
- Internet
- Other geographical documents.

c) Prerequisite/Revision/ Introduction

This topic on definition, types of trade and factors influencing international trade is related to internal and external trade in Rwanda, factors affecting the trade in Rwanda, importance of trade in Rwanda, importation and exportation of the products (balance of trade and balance of payment, problems affecting the trade in Rwanda, possible solutions and prospects were discussed in year 1. It is important to link the content studied with what is going to be learnt in year 1. The tutor is requested to help the student-teachers to review year 1 contents by asking them to give the meaning of trade, types of trade in Rwanda. After this review, student-teachers will be able to discuss about the meaning, types and factors influencing international trade.

d) Learning activities

Learning activities 17.1

Guide student-teachers to work in groups to identify the major imports of Rwanda, mention types of trade and explain the factors influencing trade between Inyange industry and overseas countries. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication, research and problem-solving skills.

Engage student-teachers in activities like discussion, asking and answering questions and for more answers they are referred to the student-teacher's book.

e) Application activities

The application activities 17.1

Student-teachers are asked to brainstorm how regional integration; government policy and population have influenced international trade in Rwanda. They should use the content given in the student-teacher's book on the meaning and types of trade, factors influencing international trade and other geographical documents to answer this question.

Lesson 2: Causes of low levels of international trade in Developing Countries and importance of international trade in development

a) Learning objectives

- The following are learning objectives of the lesson:
- Appreciate the importance of trade and commerce
- Appreciate the importance of trade and commerce
- Show the continual desire to improve trade and commerce

b) Teaching resources

The following resources are required:

- Text books
- Internet
- Other geographical documents

c) Prerequisites/ Revision/ introduction

Briefly review the previous lesson by asking student teachers to differentiate the types of trade. Thereafter guide student teachers and introduce the new lesson.

d) Learning activity

Learning activity 17.2

Guide student-teachers to work in pairs using passage in the student-teacher's book, they will be able to identify the products exported by European countries, outline the major exports of Rwanda and explain the causes of inequality between exports and imports. Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication and problem-solving skills.

Engage student-teachers in activities like discussion, asking and answering questions and for more answers they are referred to the student-teachers book.

e) Application activities

In the application activities 17.2, student-teachers are asked to assess the role of international trade in the economic development of their country and suggest ways of reducing the gap between low exports and high imports in developing

countries. They should use the content given in the student-teachers book on the causes of low level and importance of international trade.

Lesson 3: The major financial centers and trading blocs of the world

a) Learning objectives

- The following are learning objectives of the lesson:
- state the major financial centers of the world
- Explain the financial centres of the world
- Appreciate the importance of the major financial centres and trading blocks

b) Teaching resources

For learning to be successful the following resources are necessary:

- Text books
- Sample of maps
- Internet

c) Pre-requisites/ Revision /Introduction

Review the previous lesson by asking student-teachers to describe the importance of trade. Later the teacher introduces the new lesson on the major financial centers and trading blocs of the world.

d) Learning activities

During learning activities **17.3**, tutor is requested to facilitate student teachers to work in pairs and make research on state the major financial centers and explain the financial centres of the world.

Their answers should involve the integration of generic competences such as critical thinking, cooperation, communication and research skills.

Let student-teachers discuss, ask and answer questions and refer them to the learner's book for more information about major financial centres.

e) Application activities

The application activities 17.3 obliged student-teachers to discuss the reasons why Rwanda should trade with other countries, challenges faced by Rwanda in trading with other countries, explain why rich countries benefit more from international trade than developing countries and suggest what the city of

Kigali can do to become an international financial center. They should use the content given in the student-teacher's book on major trading blocs and other geographical documents to answer this question.

Lesson 4: Case studies

a) Learning objectives

The following are learning objectives of the lesson:

- Identify the major trading patterns and the world trading blocs
- Appreciate the importance of the regional integration

b) Teaching resources:

To achieve learning objectives, the following resources should be used.

- Text books
- Internet
- Pencils
- Sample Maps

c) Pre-requisites/ Revision /Introduction

Review the previous work covered on problems and ways to improve international trade. Thereafter guide student-teachers in exploring the new content to be studied on different case studies related to regional integration.

d) Learning activities

using learning activities 17.4 in student-teacher's, help student-teachers to work in pairs and describe the major objectives of East African Community and challenges faced by ECOWAS member states in implementing its objectives. Their answers should involve the integration of generic competences such as critical thinking, creativity, cooperation and communication skills.

e) Application activities

The application activities 17.4

Student teachers are asked to explain how ECOWAS member states have benefited from this integration and to describe the major objectives of OPEC. They should use the content in the student-teacher book on regional integration.

17.6 . Summary of the unit

This unit covers types of trade, factors influencing international trade, importance, challenges and ways of improving trade. This unit also covers case studies related to trading blocs and regional integration.

17.7 Additional information

This unit is linked to unit 10 in year 1 on transport, communication and trade in Rwanda. It is therefore necessary for student-teachers to link the prior knowledge acquired in year 1 to what is covered in this unit. When teaching this content, you should use local examples on forms of trade in Rwanda. Analysis of case studies outside Rwanda are very important when you are teaching this unit.

The student-teacher's book has some activities where group discussion is emphasized. Therefore, it is important to formulate teaching methods to achieve learning objectives.

17.8. End unit assessment

Questions:

- 1) Draw a map showing the member states of EAC
- 2) Conduct your own research to identify different regional integration operating with Rwanda and show their main objectives.
- 3) Examine the role of regional integration in the social, economic development of Rwanda for sustainable development.
- 4) Analyse the reasons for low levels of international trade in developing countries.

Guidance to answers:

1) Draw a map and locate the member states of EAC.

Guide student-teachers to draw a sketch map showing the EAC member states (Rwanda, Burundi, Uganda, Tanzania and Kenya). For the map refers to the student-teacher's book on the case studies: East African Community

2) Conduct your own research to identify different regional integration operating with Rwanda and show their main objectives.

Guide student-Teachers in groups to share the answers by using experience in their communities; and refer to the student-teacher's book on regional integration.

3) Examine the role of regional integration in the social, economic development of Rwanda for sustainable development.

Allow student-teachers to work in pairs to discuss on the role of regional integration towards the sustainable development of Rwanda.

4) Analyse the reasons for low levels of international trade in developing countries.

Use the student-teacher's book on the content related to international trade. Where necessary, use other geographical documents to explain the reasons for low level of international trade in developing countries.

17.9 Additional activities

17.9.1 Consolidation activities:

1) Explain the meaning of the following terms:

- Bilateral trade
- Multi lateral trade
- Wholesale trade

2) Describe how the following factors influence trade:

- Transport
- Capital
- Government policy

Let student-teachers answer the above questions using the student-teacher's book, research and group discussions to brainstorm on how transport, capital and government policy have influenced the development of trade and explain the meaning of bilateral trade, multi-lateral trade and wholesale trade.

17.9.2. Remedial activities

- 1) Define the term trade.
- 2) Define the term international trade.
- 3) Write in full EAC.

These are questions that require low order thinking and are answered as follows:

- 1) The term trade refers to the act of selling and buying goods and services for money.
- 2) The term international trade is a type of trade between many countries.
- 3) EAC: East African Community

17.9.3. Extended activities

Analyse the challenges faced by regional integration blocs in developing countries.

Guidance to answer:

Facilitate student-teachers to answer the above question using the student-teacher's by discussing about the challenges faced by regional integration blocs in developing countries.

Skills lab:

Let student-teachers to carry out a deep research on the impact of EAC in Africa and east Africa particularly and come up with all possible impact of EAC on sustainable development.

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