

ICT FOR TTCs YEAR ONE

TUTOR'S GUIDE

Options: SME, SSE, ECLPE, LE

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FOREWORD

Dear tutor,

Rwanda Basic Education Board is honored to present Year One Tutor's guide which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of the ICT subject. The Rwandan educational philosophy is to ensure that student teachers achieve full potential at every level of education which will prepare them to be well integrated in society and exploit employment opportunities.

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

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

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

- Plan your lessons and prepare appropriate teaching materials.
- Organize group discussions for student teachers considering the importance of social constructivism suggesting that learning occurs more effectively when the learner works collaboratively with more knowledgeable and experienced people.

- Engage student teachers through active learning methods such as inquiry methods, group discussions, research, investigative activity and individual work activity.
- Provide supervised opportunities for student teachers to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- Support and facilitate the learning process by valuing learners' contributions in the class activity.
- Guide student teachers towards the harmonization of their findings.
- Encourage individual, peer and group evaluation of the work done in the classroom and use appropriate competence-based assessment approaches and methods.

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

The part 1: Explains the structure of this book and gives you methodological guidance;

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

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

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

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

Dr. MBARUSHIMANA Nelson

Director General, REB

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I wish to express my appreciation to all the people who played a major role in the development of this ICT tutor's book for Year One in TTC options. It would not have been successful without active participation of different education stakeholders.

I owe gratitude to different universities and schools in Rwanda that allowed their staff to work with REB in the production of TTC textbooks. I wish to extend my sincere gratitude to lecturers from the University of Rwanda, teachers and tutors from schools and TTCs, and all other individuals whose efforts in one way or another contributed to the success of writing of this textbook.

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

Joan MURUNGI

Head of CTLR Department

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PART I. GENERAL INTRODUCTION

I.0. About the tutor's guide

This book is a tutor's guide for ICT Year One in TTC options. It is designed to help tutors in the implementation of competence based curriculum specifically ICT syllabus.

As suggested by its name, this is a guide that will help tutors in their daily preparations of lessons. Tutors will take advice provided for in this book but are advised to be more creative and consider their specific classes' contexts and prepare accordingly.

I.1. The structure of the guide

This section outlines the general structure whereby the content is organized in units and the subheading structure in order to provide to tutors more understanding of the different sections of this guide and what they should expect to find in each section.

Overall structure

This consists of three main parts:

- **Part I: General Introduction.**

This part provides general guidance on how to develop the generic competences, how to integrate cross cutting issues, how to take into consideration special educational needs, active methods and techniques of teaching ICT and guidance on assessment.

- **Part II: Sample lesson plan**

This provides to tutors a model lesson plan that they can learn from in devising their own lesson plans.

- **Part III: Unit development**

This is the main part of the guide in which each unit is thoroughly developed. The guide ends with references.

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)**

The section indicates knowledge, skills and attitudes required for the successful carrying out of the unit. The competence-based approach requires 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 gives guidance on how to integrate those issues. The suggested issues are indicative and tutors are free to take any other cross-cutting issue which is related to the learning environment.

- **Guidance on the introductory activity**

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

Learners are not expected to necessarily give right solutions but are invited to provide possible solutions or answers through discovery activities organized at the beginning of lessons or during the lesson.

- **List of lessons**

The section of "list of lessons" provides a suggestion on the list of lessons, lesson objectives copied or adapted from the syllabus and duration for each lesson. Each lesson /subheading is then developed.

- **End of each unit**

At the end of each unit the 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 (slow, average and gifted) based on end unit assessment results.

Structure of each sub heading

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

Lesson title 1:

- **Prerequisites/Revision/Introduction:**

The section provides clear instruction to tutors on how to begin the lesson

- **Teaching resources**

This section provides suggestions on the teaching aid or other resources needed with activities in order to achieve the learning objectives. Tutors have full ownership of which teaching aid they can use depending on those available in their working 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.

I.2. Methodological guidance

I.2.1. Developing competences

Since the introduction of the competency based curriculum for pre-primary, primary and general secondary education in 2015 Rwanda shifted from the knowledge based system to new ways of teaching and learning which puts the learner at the center. In this new approach tutors are not only responsible for the transfer of knowledge but also for enhancing student teacher's learning achievement, and creating safe and supportive learning environment. It implies also that learners will have to show what they are able to do using the knowledge, skills, values and attitude acquired in a new or different situation.

The competence-based curriculum approach bases teaching and learning on discrete skills rather than relying on only knowledge or the cognitive domain of learning. It puts an emphasis on what learners can do rather than what they know. Learners 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 teacher is evaluated against set standards to achieve before moving on.

Adding to specific subject competences, learners also get an opportunity to develop generic competences which are transferable throughout a range of learning areas and situations in life. Below are examples of how generic competences can be developed in ICT:

Generic competence	Examples of activities that develop generic competences
Critical thinking	<ul style="list-style-type: none"> • Compare the protected computer to the computer exposed to various security threats • Demonstrate the advantage of programming.
Research and Problem solving	<ul style="list-style-type: none"> • Research using Internet or books from the library • Write a program to give a certain output • Demonstrate strategies that can be used to disinfect the computer or network attacked by malwares.
Innovation and creativity	<ul style="list-style-type: none"> • Translate the algorithms in a computing program • Identify local computing problems and ways to resolve them.
Cooperation, Personal and Interpersonal management and life skills	<ul style="list-style-type: none"> • Sharing resources using emails or other media • Protecting his/her own data and school or institution data to virus attacks • Work in Pairs • Small group work • Large group work
Communication	<ul style="list-style-type: none"> • Organise and present in writing and verbally a complete and clear report of their computing activities • Select and use appropriate formats such as tables, graphs and diagrams.
Lifelong learning	Exploit all opportunities available to improve on knowledge and skills. Use open source technologies and other digital materials to keep informed

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. The eight cross cutting issues identified in the national curriculum framework are: genocide studies, environment and sustainability, gender, Comprehensive Sexuality Education (CSE), Peace and Values Education, Financial Education, standardization Culture and Inclusive Education.

Some cross cutting issues may seem specific to particular learning areas or subjects but the tutors need to address all of them whenever an opportunity arises. In addition, learners should always be given an opportunity during the learning process to address these cross cutting issues both within and out of the classroom so as to progressively develop related attitudes and values.

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

Cross-cutting issue	Examples on how to integrate the cross-cutting issue
Inclusive education	Involve all learners in all activities without any bias. Eg: <ul style="list-style-type: none"> • Allow a learner with physical disability (using wheelchair) to take notes or lead the team during computer lab activities. • Student teacher without arms can learn ICT using their toes. • Sign language can be used to address the need of Student teachers with hearing impairments.
Gender	<ul style="list-style-type: none"> • Involve both girls and boys in all activities: No activity is reserved only to girls or boys. • Tutors should ensure equal participation of both girls and boys during activities as well as during cleaning and tidying up related activities after computer lab activities.

Peace and Values Education	<ul style="list-style-type: none"> • During group activities, debates and presentations, the tutor will encourage learners to help each other and to respect opinions of colleagues. • Student teachers must be warned about cyber security crimes and enabled to prevent hacking and stealing one's data or prevent unauthorized access of data of a person or institution. • Student teacher must develop values of browsing relevant content on the internet (Student teachers should not spend their time browsing irrelevant and harmful content).
Standardization culture	<ul style="list-style-type: none"> • Student teachers should be familiar with standards used in computers in their daily interaction with different tools used in online communications.
Financial Education	<ul style="list-style-type: none"> • Student teacher should develop this by comparing the use of digital technologies with the traditional paper based practices and analyse the benefits of the new ways • Different technologies used in networking should be an opportunity to study cost implication of individual technology. • Student teachers do analysis of financial benefits of using a computer • Student teachers must be aware of loss that can be caused by lacking security in computing

I.2.2. Attention to special educational needs and inclusive education

In the classroom, student teachers learn in different ways depending on their learning pace, needs or any other special problem they might have. However, the tutor has the responsibility to know how to adopt his/her methodologies and approaches in order to meet the learning needs of each student teacher in the classroom. Also tutors need to understand that student teacher with special needs, have to be taught differently or need some accommodations to enhance the learning environment. This will be done depending on the subject 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 (e.g. role-play, music and singing, word games and quizzes, and outdoor activities)
- Maintain an organized classroom and limit distraction. This will help student teachers with special needs to stay on track during the lesson and follow instruction easily.
- Vary the pace of teaching to meet the needs of each student teachers. 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 student teacher who has a disability with a friend. Let them do things together and learn from each other. Make sure the friend is not over protective. Both 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. Learners 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 student teacher is unique with different needs and that should be handled differently.

Strategy to help a learner with developmental impairment:

- Use simple words and sentences when giving instructions.
- Use real objects that student teachers can feel and handle. Rather than just working abstractly with pen and paper.

- Break a task down into small steps or learning objectives. The student teacher should start with an activity that she/he can do already before moving on to something that is more difficult.
- Gradually give the student teacher less help.
- Let the student teacher work in the same group with those without disability.

Strategy to help a student teacher with visual impairment:

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

Strategies to help a student teacher with hearing disabilities or communication difficulties:

- Always get the student teacher's attention before you begin to speak.
- Encourage the student teacher 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 a student teacher 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 student teacher to reach it or fit their legs or wheelchair under.
- Get advice from parents or a health professional about assistive devices.

I.2.3. Guidance on assessment

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

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

Continuous/ formative assessment

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

In Year One ICT textbook, formative assessment principle is applied through checking up activities that are planned in each lesson to ensure that lesson objectives are achieved before moving on. At the end of each unit, the end unit assessment is formative when it is done to give information on the progress of student teachers and from there decide what adjustments need to be done. Assessment standards are taken into consideration when setting tasks.

Summative assessment

The assessment done at the end of the term, end of year, is considered as summative. The tutor, school and parents are informed on the achievement of educational objectives and think of improvement strategies. There is also end of level/ cycle assessment in form of national examinations.

I.2.4. Student teachers' learning styles and strategies to conduct teaching and learning process

There are different teaching styles and techniques that should be catered for. The selection of teaching method should be done with the greatest care and some of the factors to be considered are: the uniqueness of subjects; the type of lessons; the particular learning objectives to be achieved; the allocated time to achieve the objectives; instructional materials available;

the physical/sitting arrangement of the classroom, individual student teachers' needs, abilities and learning styles.

There are mainly four different learning styles as explained below:

a) Active and reflective learners

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

b) Sensing and intuitive learners

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

c) Visual and verbal learners

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

d) Sequential and global learners

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

I.2.5. Teaching methods and techniques that promote the active learning

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

What is active learning?

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

The role of the tutor in active learning

- The tutor engages learners through active learning methods such as inquiry methods, group discussions, research, investigative activities, group and individual work activities.
- He/she encourages individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.
- He provides supervised opportunities for learners to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- Tutor supports and facilitates the learning process by valuing learners' contributions in the class activities.

The role of learners in active learning

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

- Communicates and shares relevant information with other learners through presentations, discussions, group work and other learner-centered activities (role play, case studies, project work, research and investigation)
- Actively participates and takes responsibility for his/her own learning
- Develops knowledge and skills in active ways
- Carries out research/investigation by consulting print/online documents and resourceful people, and presents their findings
- Ensures the effective contribution of each group member in assigned tasks through clear explanation and arguments, critical thinking, responsibility and confidence in public speaking
- Draws conclusions based on the findings from the learning activities.

Some active techniques that can be used in ICT

The teaching methods strongly emphasized in the competence Based Curriculum (CBC) are active methods.

When a tutor is planning his/her lesson, he/she should establish criteria for performance and behavior changes at the beginning of a unit. Then at the of end of every unit, the tutor should ensure that all the learners have

mastered the stated key unit competences basing on the criteria stated, before going to the next unit. The tutor will assess how well each learner masters both the subject and the generic competences described in the syllabus and from this, the tutor will gain a picture of the all-round progress of the learner. The tutor will use one or a combination of the following: Manipulation, Computer and task/practice, observation, pen and paper, and oral questioning

A. Computing activities

Many of the activities suggested in the ICT curriculum as well as in the student teacher's book are practical activities and projects.

Practical activities are mandatory in learning ICT; this method gives the learner the opportunity to implement a series of activities and leads to the development of both cognitive and hands-on skills.

A practical lesson is done in following stages:

- **Preparation:** Checking materials, computers and install required programs to ensure they are available and at good state; try the activity before the lesson; think of safety rules and give instructions to lab technician if you have any.
- **Performance:** Arrangement of student teachers and hand-on of individual student teacher. Preparing the next generation of experts in the field of ICT require student teacher to experience what they are learning; Let the student teachers perform and facilitate accordingly.
- **Debugging:** In ICT student teacher may not arrive at the desired output, inspire him/her to debug from his/her own work without starting from scratch where applicable.
- **Discussion:** Student teacher should discuss what they are doing and challenges they are facing. They should discuss also the implications of the results of their activities.

In some cases, demonstration by the tutor is recommended when for example the activity requires the use of sophisticated materials or very expensive materials or when safety is a major factor like disassembling a laptop in laboratory and it needs specific skills to be learnt first.

In case your school does not have enough computers, activities and projects can be done in groups but make sure every student teacher participates.

B. Research work

Each learner or group of learners is given a research topic. They have to gather information from internet, available books in the library or ask experienced people and then the results are presented in verbal or written forms and discussed in class.

C. Computer based project

ICT tutors are encouraged to sample and prepare project works and engage their student teachers in, as many as possible. Learners in groups or individually, are engaged in a self directed work for an extended period of time to investigate and respond to a complex question, problem, or challenge. The work can be presented to classmates or other people beyond the school. Projects are based on real-world problems that capture learners' interest. This technique develops higher order thinking as the learners acquire and apply new knowledge in a problem solving context.

D. Field trip

One of the main aims of teaching ICT in Rwanda is to apply its knowledge for development. student teachers may visit any computer related work or equipments in an institution around the school to satisfy their inquiries and curiosity.

Main steps for a lesson in active learning approach

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

1) Introduction

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

2) Development of the new lesson

The development of a lesson that introduces a new concept will go through the following small steps: discovery activities, presentation of learners'

findings, exploitation, synthesis/summary and exercises/application activities, explained below:

- **Discovery activity**

Step 1

- The tutor discusses convincingly with student teachers to take responsibility of their learning
- He/she distributes the task/activity and gives instructions related to the tasks (working in groups, pairs, or individual to instigate collaborative learning, to discover knowledge to be learned)

Step 2

- The tutor let the student teachers work collaboratively on the task.
- During this period the tutor refrains to intervene directly on the knowledge
- He/she then monitors how the student teachers are progressing towards the knowledge to be learned and boost those who are still behind (but without communicating to them the knowledge).
- **Presentation of learners' productions**
 - In this episode, the tutor invites representatives of groups to presents the student teachers' productions/findings.
 - After three/four or an acceptable number of presentations, the tutor decides to engage the class into exploitation of the student teachers' productions.
- **Exploitation of learner's productions**
 - The tutor asks the student teachers to evaluate the productions: which ones are correct, incomplete or false
 - Then the tutor judges the logic of the student teachers' products, corrects those which are false, completes those which are incomplete, and confirms those which are correct.
- **Institutionalization (summary/conclusion/ and examples)**
 - The tutor summarizes the learned knowledge and gives examples which illustrate the learned content.
- **Exercises/Application activities**
 - Exercises of applying processes and products/objects related to learned unit/sub-unit

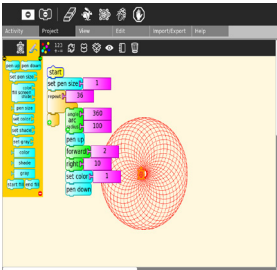
- Exercises in real life contexts
- Tutor guides learners to make the connection of what they learnt to real life situations. At this level, the role of tutor is to monitor the fixation of process and product/object being learned.

3) Assessment

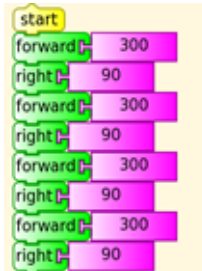
In this step the tutor asks some questions to assess achievement of instructional objective. During assessment activity, learners work individually on the task/activity. The tutor avoids intervening directly. In fact, results from this assessment inform the tutor on next steps for the whole class and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

PART II. SAMPLE LESSON PLAN

Term	Date	Subject	Class	Unit No	Lesson No	Duration	Class size
I	X	ICT	Year One	1		40	35
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category					Mild hearing impairment (1) Low vision (1)		
Unit title		Introduction to XO laptop					
Key Unit Competence:		identify different XO laptop features and use them					
Title of the Lesson		Turtle Art					
Instructional Objective		By using Turtle Art program found in XO laptops, student teachers will be able to write and analyze programs that create different outputs					
Plan for this Class (location: in / outside)		The lesson is to be conducted in the XO laptops computer lab					
Learning Materials (for all learners)		XO laptop for every learner					

Timing for each step	Description of teaching and learning activity		Generic competences and cross cutting issues addressed
	Using examples of Turtle programs, demonstrations on how to program using Turtle is done, the program and its output are analyzed, Examples are given and corresponding programs written by learners		
	Teacher activities	Learner Activities	Communication in official languages
Introduction 5min	<p>Using a projector the tutor displays an output of a program which is a sphere composed of 36 circles and asks questions on that output. Questions are aimed at discovering the program that created it and how the output was created</p>  <p>The tutor announces that at least everyone will be able to create such a program by the end of the lesson and write the new topic</p> <p>The topic of the day is written on the writing board</p>	<ul style="list-style-type: none"> Student teachers observe the output, respond to the tutor's questions and discover the name of program that has created it. 	

<p>Development Of the lesson (30 min)</p> <p>A) Analysis I</p>	<ul style="list-style-type: none"> • The tutor asks questions to make learners start the Turtle Art program • The tutor shows the toolbars one by one and asks learners to say the role of each • Now the teachers moves to the Turtle palettes and makes learners discover the role of each 	<ul style="list-style-type: none"> • Learners respond to questions and open Turtle Art • Student teacher say the role of each toolbar item. The toolbars items are: : Turtle block activity, Edit, View, Clean canvas, etc • Responses on the roles of different palettes are given 	<p>Creativity and innovation</p>
<p>Synthesis I</p>	<ul style="list-style-type: none"> • Teachers ask questions to make learners discover that a Turtle Art environment has toolbars and palettes 	<ul style="list-style-type: none"> • Student teachers discover that a Turtle Art environment consists of Toolbar items and palettes cite some of them and the role of some instruction blocks 	

<p>B) Analysis II</p>	<ul style="list-style-type: none"> • The tutor asks questions to recall on the existing geometric figures and their properties • Tutor start the first program to draw a square. As he/she does questions on which instruction blocks to use are asked • The tutor makes learners modify the instructions used to draw a square in order to make a rectangle • Tutor demonstrates how to use the Repeat instruction can be used to eliminate repetition in codes 	<ul style="list-style-type: none"> • Student teachers cite geometric shapes and their properties. Geometric shapes expected as answers are: Square, rectangle, triangle, circle, pentagon, octagon, etc • They suggest instruction blocks to use in drawing a Square • Codes for a Square:  • They create rectangles on their XO laptops by modifying square codes 	<p>Creativity and innovation:</p> <p>while assembling blocks to create shapes</p> <p>Critical thinking:</p> <p>while deciding on which instruction block best suits for what the want to have as an output</p>
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C)Synthesis II

- Tutor guides student teachers to write a program to create Letter A

- Student teachers use the Repeat instruction to remove repeated codes
- The resulting codes are:



- They create a program to draw letter A. The expected program is like below:



Summary on the process of drawing geometric shapes is done

Student teachers discover that to draw a geometric shape you need to know the number of sides, which determines the **angle to move**.
Angle size=360/ number of sides

Conclusion 5 min	Tutor gives homework tasks to consolidate what has been learnt and one example is done for/by learners	Homework: Using Turtle Art write a program to write your names Learners do one example	
Teacher self evaluation	Weaknesses: lesson required competences in Logics which are not yet acquired Learners need more practical for mastery of programming		



UNIT 1:

INTRODUCTION TO XO LAPTOP

1.1. Key Unit competence

Identify different features of an XO laptop and use them

1.2. Prerequisites

Student teachers are familiar with ordinary laptop and desktop computers and some of their software like Microsoft office programs and its different hardware parts. The familiarity of student teachers to Microsoft Office programs will facilitate the learning of some programs that require typing.

1.3. Cross-cutting issues to be addressed

Throughout every lesson, cross cutting issues have to be addressed. Addressing cross cutting issues makes a lesson not a standalone entity but something that is related to real issues in society. Here is how cross cutting issues are addressed:

Financial Education: Is covered when student teachers discuss the cost implication involved while dealing with XO laptops using different computer storage devices and software anti-virus

Standardization Culture: Student teachers have to be familiar with the fact that computers (XO laptops not excluded) have to be manufactured following specific guidelines which are common to every electronic industry. They are also going to know that nearly all electronic devices have input, output and processing parts.

Gender education: student teachers must be aware that ICT is not a subject appropriate only for girls or boys. ICT topics especially those related to programming are appropriate for both sex not for boys.

Peace and Values Education: While using XO laptops or any other computer student teachers should engage themselves in activities which are not harmful to peace and society acceptable values. While writing different programs using Turtle, Scratch and Etoys this same ethical behavior should be observed.

1.4. Guidance on introductory activity

- In the classroom the tutor introduces the unit by bringing up the scenario in the introduction activity of unit one
- Student teachers give answers questions 1.1. and 1.b. Note that answers are rapidly given, no need for advanced details
- Using a laptop whose content is projected for every student teacher to see, tutor/student teacher open different programs used in programming and describe what one can achieve/do with them.

NOTE: The introductory activity must be done quickly in order to make sure it does not take too much time that would be used for lessons. One option can be to give it as a homework to learners who will then come to the class having an idea on the new lesson

1.5. List of lessons

#	Lesson title	Learning objectives	Number of periods
1	The keyboard keys and touchpad	Identify different XO laptop keyboard and their roles	1
2	Introduction to different interfaces	Use Sugar and Gnome interfaces to navigate an XO laptop	2
3	Abiword window	Use Abiword in writing text	1
4	Programming for children: Turtle	Create and analyze programs to draw different outputs using Turtle	3
5	Programming for children: Scratch	Use Scratch in creating animations that simulate real life situations	3
6	Programming for children: Etoys Projects	Create Etoy projects to animate objects to come up with entertaining animations	2
7	End Unit assessment		1

Lesson 1: The keyboard keys and touchpad

a. Learning objectives

Identify different XO laptop keyboard keys and their roles

b. Teaching resources

The needed materials for this lesson are the regular laptop and desktop computers (keyboards and touchpads), the XO laptops specifically the parts being focused on namely keyboards and touchpads and the *Write Activity* program available in an XO laptop. There will also be a need for a student teacher book and internet connectivity for more researches.

c. Prerequisites

Student teachers are familiar with laptops and desktop keyboards as they learned it in ordinary levels in these units: Unit 2 on computer systems in Senior 1. The tutor will start the lesson by conducting a kind of review of the ordinary keyboard parts then move on to the XO laptop. As the lesson progresses the comparison between the two will continue to be drawn. This comparison is done through questions and answers and analysis done by learners.

d. Learning activities

• Guidance

- Student teachers are grouped by six so as to identify the different parts of a conventional laptop/desktop computer and then go on to identify the different parts of the keyboard
- An analogy between the laptop keyboard and the XO laptop keyboard & touchpad is drawn and student teachers identify the different types of keys available on an XO laptop keyboard and their functions

• Answers to Activity 1.1

- 1)a) Student teachers explore the laptop or desktop keys and identify their different functions by referring themselves to the content in the Student Book in the section on keyboard keys and touchpad
- b) The keys that cannot be found on a laptop/desktop computer yet are found on an XO laptop computer are: Grab key, Frame Key, View Key and Search Key

Other are found on both laptop/desktop computers and XO laptops but have different looks that one can't easily tell that they are the same.

c) The similarities between a laptop touchpad and a mouse is that both have right and left buttons which are used to select and open different items in a computer (left button) or to get different options available for that item (right button)

e. Answers to application activity 1.1

1. Student teachers use different special keys using XO laptops
2. The different shortcut keys used with XO laptops are: ctrl + x (shift + ctrl + x in Terminal), ctrl + u while using the Browse Activity, alt + esc, alt + tab, shift + alt + tab, alt + enter, alt + spacebar, alt + 1, ctrl + alt + erase, fn + 1, fn + 2, fn + 3, fn + 4, shift + alt + r, esc + Frame icon key + RightArrow + fn, fn + spacebar, fn + up arrow, fn + down arrow, fn + left arrow, fn + right arrow. Student teachers identify the role of each key.

Lesson 2: Introduction to different interfaces

a. Learning objectives

Use Sugar and Gnome interfaces to navigate an XO laptop

b. Teaching resources

For teaching this lesson there is a need to have XO laptop for each learners, a projector for demonstrations and ICT student book

c. Prerequisites

Student teacher already know an XO laptop and external hardware parts, they know Windows found in ordinary computer which plays the role of an interface in those computers.

d. Learning activities

• Guidance

- Individually student teachers start their XO laptops and observe the first interface that appear as the XO laptop is started. They identify the role of different icons found on that interface
- Student teachers open the Gnome interface by going through as instructed by the tutor
- Student teachers analyze different features of the Gnome interface and practice the steps of opening the Gnome interface as it has been demonstrated by the tutor

- **Answers to Activity 1.2**

1. Student teachers start their XO laptops, explore the Sugar interface and Switch from Sugar to Gnome interface and from Gnome to Sugar interface.
2. Student teachers describe the Sugar and Gnome interface

- **Answers to application activity 1.2**

1. Student teachers open the Sugar interface and open different activities found on the Sugar main window. They open the Write activity to write their curriculum vitae(CV).

Lesson 3: Abiword window

- **a. Learning objectives**

Use Abiword in writing text

- **b. Teaching resources**

For teaching and learning this lesson there will be a need of XO laptops with Abiword software, a desktop/laptop computer for carrying out comparison between Word Processing and Abiword, a projector for demonstrating how Abiword is used and ICT textbook

Note: In case the tutor finds it difficult to connect an XO laptop to a projector, text written in Abiword can be displaced using an external memory and then projected

- **c. Prerequisites**

Student teachers are already familiar with Microsoft office word which so much resembles the XO laptop's Abiword. These student teachers learnt Microsoft office word in Senior One under the units Word Processing Basics I and II.

- **d. Learning activities**

- **Guidance**

- The tutor starts the lesson by doing a theoreticalrecapitulation on Word which has many features which so much resemble those of Abiword
- Tutor instructs student teachers to start Abiword. Those that have managed to do it properly explain how to open Abiword. If no student teacher has been able to open it, the tutor demonstrates how to open it and student teachers do the same

- Student teachers compare the interface they get with the interface in Word. They try to identify new features that may be available
- Under the instructions of the tutor, student teachers write a paragraph to describe their school as stated in the activity of this lesson then save it, and rename it. They also open other existing documents
- The tutor gives guidance on how to do the lesson application activity

- **Answers to Activity 1.3**

1. Student teachers open Abiword and identify its different menu referring themselves to their knowledge of Word processing
2. Student teachers write a paragraph on their school and save it under their names

e. Answers to application activity 1.3

1. Student teachers write an essay on the history of XO laptops. To do this they must do a research using books (if any) or the internet

Lesson 4: Programming for children: Turtle Art

a. Learning objectives

Create and analyze programs to draw different outputs using Turtle

b. Teaching resources

This lesson requires Xo laptops and ICT textbook for Year One. A projector is needed for displaying to learners examples.

c. Prerequisites

Though Turtle is a totally new program, dragging and dropping its blocks requires being familiar with the touchpad and how to use its two buttons at the same time and this skills was acquired throughout the Ordinary level. It requires also knowledge on geometric shapes so as to be able to draw them using Turtle program.

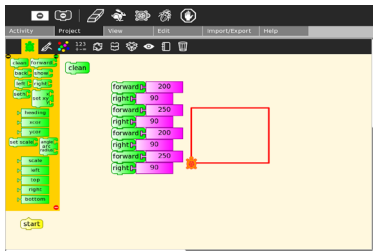
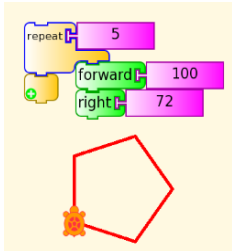

d. Learning activities

- **Guidance**

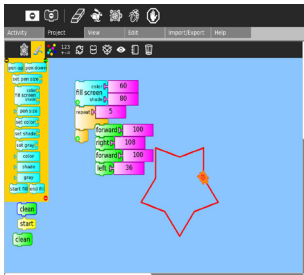

- The tutor starts the unit by asking student teachers to give examples of programming languages they know and those that are common for children
- Student teachers explain what Turtle Art can help them do as programmers

- The tutor asks student teachers to read questions in the activity 1.4 and ask them if they can do those programs. In English language, student teachers explain how the Turtle will proceed to draw the desired output
- Under the guidance of the teacher, student teachers start the Turtle Art program and describe its environment and explain the role of each instruction available in each palette
- The tutor gives a scenario to draw a square and student teachers draw it using the program they have created.
- The tutor gives guidance on how to do questions in activity 1.4 and those in application activity 1.4

• **Answers to Activity 1.4**

Turtle Art program to draw a rectangle (and its output)	Turtle Art program to draw a pentagon (and its output)	Turtle Art program to draw letter B (and its output)
		

e. Answers to application activity 1.4

1. a) Turtle Art program to create a star on a green background (and its output)	1. b) Turtle Art program write a name (and its output). The name is Yves (S was left out due to insufficient space)
	

2. Student teachers rewrite the program given in the student book, run it and interpret its output. The given program draws many circles which then make a ring. To make that ring the Turtle draw the first circle then the pen is up the Turtle moves forward by “2” and turns right by 10 so that the second circle is not drawn in first. This is repeated 36 times to draw 36 circles

Lesson 5: Programming for children: Scratch

a. Learning objectives

Use Scratch in creating animations that simulate real life situations

b. Teaching resources

Resources needed are: XO laptops, with scratch program, Year One textbooks and projector to facilitate the display of examples to the learners

c. Prerequisites

Student teachers have already notions on programming acquired in the previous unit on Turtle they can now apply them in another programming environment.

This lesson is introduced by doing questions in the activity 1.5 whereby they start Scratch and open preexisting programs then give the role of Scratch

d. Learning activities

• Guidance

- The lesson is started by quickly going through the exercise of the activity 1.5: Student teachers start the Scratch program, open one preexisting example, summarize their observations and from the observed examples brainstorm the role of Scratch
- The tutor demonstrates different menu available in the Scratch environment and demonstrate how an object (costume) can be animated and student teachers do the same
- Student teachers use practice drawing geometric shapes under the guidance of the tutor who gather ideas from learners on the properties of a specific geometric shape before drawing it.
- Under the guidance of the tutor student teachers practice setting background (stage)
- The tutor gives guidance on how to do application activity 1.5

- **Answers to Activity 1.5**

ACTIVITY 1.5:

1. A&b) Student teachers open at least two preexisting examples in Scratch that the tutor is going to choose for them. They summarize their observation and brainstorm on the role of Scratch and its potentials.

e. Answers to application activity 1.5

Student teachers paint at least 3 cows and animate them appropriately

Lesson 6: Programming for children: Etoys Projects

a. Learning objectives

Create Etoy projects to animate objects to come up with entertaining animations

b. Teaching resources

For teaching this lesson there is a need to have XO laptops with Etoys installed, a projector for displaying examples given by the tutor and ICT student book.

c. Prerequisites

Student teachers are now familiar with programming as they learned lesson 4 on Turtle and 5 on Scratch; they can therefore apply the same reasoning in Etoys.

d. Learning activities

- **Guidance**

- The lesson is started by a small motivational expose that the tutor will do in order to make student teachers understand that Etoys is very much needed in every day's life
- Under the guidance of the tutor student teachers open Etoys and identify the role of different balloons and icons
- Under the guidance of the tutor student teachers open Etoys and open the "Gallery of Projects" in order to access the Car and Pen project (or any project of the tutor's choosing). Student teachers interpret the output of the opened project and edit the project to realize how the output changes.

- Student teaches and the tutor paint a simple object that they animate. They save their project and practice opening deleting and renaming a project
- The tutor gives guidance on how to do questions in the application activity 1.6

- **Answers to Activity 1.6**

1. a) The output of this program is the running car that runs along a circle and as it moves it makes arrows. The car will follow the blue color as it is instructed by the code
1. b) Student teachers edit the program, run it and realize the role of each code

e. Answers to application activity 1.6

1. This program conducts the car in the curved road, the borders of the road are marked by yellow lines. The car is instructed not to go out of the road (border) by executing the instruction “*car one’s |...color sees |...color*”
2. Student teachers modify the program and create a closed road and make the same car run along that road.

1.6. Summary of the unit

XO laptops commonly referred to as One Laptop Per Child is a small computer mostly used by children. This laptop has content which is so interesting to children. It has programs which are different from those found in ordinary computers but there is a resemblance between some of them like Abiword and Microsoft Office Word, Gnumeric Spreadsheet and Microsoft Office Excel, making the learning of those programs easy once one is familiar with its counterpart.

An XO laptop has got two main interfaces which are the Sugar and the Gnome interfaces. Sugar is the first interface to have access to once an XO laptop is started and has many programs whose icons are presented in a ring fashion.

The Sugar interface has many activities like Write, Browse and many others. It has also programs which are so entertaining to children like Turtle, Scratch and Etoy which children use to animate different objects.

The Gnome interface presents different options including the access to some programs like Abiword and Gnumeric Spreadsheet. Abiword is a program

used for word processing and is so much similar to the Microsoft Office Word of an ordinary computer.

1.7. Additional information for teachers

Conducting a lesson using computers (XO laptops) may prove difficult when it comes to time management. For this reason, the tutor will have in advance make sure that the laptops to use are ready and usable so as not to waste time consecrated to a lesson while fixing an unsolvable laptop issue.

The tutor will use a projector so as to limit the need to move to every student teacher to show him/her how to do the different examples given. As many projectors have VGA ports while an XO laptop does not, to connect this laptop to a projector will require the use of a USB to VGA adapter. However, in case the projector has the USB port no such adapter is needed.

The acquisition of competences in programming is acquired not in one lesson but in an individual effort by the learner outside the classroom situation; this implies that the XO laptop laboratory will have to be available for student teachers to exercise as they wish and at their will.

1.8. End Unit assessment (answers)

1. Student teachers take screenshots of the projects they are doing and locate the corresponding images in the Journal. To take a screenshot student teachers use the shortcut key **ALT+1**. Student teachers open the Journal and locate the taken images that they displace to their flash disks by selecting their icons then holding down the left button and displacing the cursor holding the file to the flash disk icon which can be seen in the bottom far left corner of an XO laptop screen.
2. For each project the house to draw can look like in the image below:



3. By manipulating different keys on an XO laptop, student teacher discover the function of those keys and explain them.

1.9. Additional activities

1.9.1. Remedial activities

1. Explain the different instruction blocks found in different Turtle palette
2. Using Turtle Art write a program to draw a parallelogram. Do the same for Scratch.

1.9.2. Consolidation activities

1. Give the similarities and differences between Turtle, Scratch and Etoys
2. Being in Sugar switch to Gnome. What are the programs available in Gnome? Describe what one can do using those programs

1.9.3. Extended activities

1. By doing a research using the internet write a paper on Turtle Art, Scratch and Etoy. The Turtle should highlight the history and the advanced options each program/project can provide
2. Using Scratch make a documentary on the history of your TTC from the back years when first students attended it up to the current day
3. Through research, describe the parts of the backlit screen of an XO laptop



UNIT 2:

COMPUTER MAINTENANCE

2.1. Key Unit competence

Assemble and disassemble a computer, Identify hardware and software issues and fix them and install operating system and application software

2.2. Prerequisites

Students have learnt some concepts of computer hardware and software in Ordinary level. They ideally have some knowledge and skills related to computer hardware and computer software. This concept will help learners to apply computer maintenance principles, to install some software from known source.

2.3. Cross-cutting issues to be addressed

Throughout every lesson, cross cutting issues must be addressed. Addressing cross cutting issues makes a lesson not to be an isolated entity but relate the lesson with the issues in real world. Here below are some cross cutting issues to be addressed:

Inclusive Education: Learners with and without disabilities participate together in the same classes during teaching and learning process.

Standardization Culture: to be covered when explaining the standards required during installation of system software and application software and factors that need to be considered in order to minimize health risks such as RSI (Repetitive Strain Injuries) and eye strain while using computer. Students must be familiar with the standards of computer hardware devices and software by making sure that they always have to use devices and software from known manufactures

Gender education: All students must get involved in class activities regardless of gender

2.4. Guidance on introductory activity

Though the guidance of the tutor, referring to the image in student book

- Tutor instruct learners to observe the image on the computer being repaired carefully
- Tutor let learners discuss about the image observed

2.5. List of lessons

#	Lesson title	Learning objectives	Periods
1	Elements of the computer system unit and their roles:	Identifying the elements of the computer system unit and give their roles	2
2	Computer maintenance principles	Apply computer maintenance principles to ensure that computer remains in normal working condition	1
3	Computer capacity:	Identify the measurements of computer capacity and read memory size and processor speed of a computer	2
4	Identifying and addressing hardware issues	Identify and address hardware problems and fix them	2
5	Assembling a computer & Disassembling a computer	To assemble and disassemble a computer by respecting the procedural steps	2
6	Software installation principles	Identify types of computer software and system requirement to install any software	1
7	Computer software issues:	Identify operating system issues and software issues and fix them	1
8	Computer software installation: Installation of an OS,	Explain and apply different steps to install an operating system	2
9	Computer software installation: Installation of an Application software	Explain and apply different steps to install an application software	4
	End Unit assessment		1

Lesson 1: Elements of the computer system unit and their role

a. Learning objectives

Identifying the elements of the computer system unit and give their roles

b. Teaching resources:

This lesson need regular used materials such as computers connected to the internet to conduct more research, projector, computers for maintenance, a student text book with teacher's guide and manufacturer's manual.

c. Prerequisites:

Learners have basic knowledge and skills about input and output devices learnt in ordinary level, they should also be familiar with some internal components that they find in phones and other electronic devices.

d. Learning activities

• Guidance

This topic introduces the students to the various components found inside system unit of a typical computer. Due to the sensitivity of most of these components, during demonstration intended to practically identify these components, let the students observe caution when handling the components. In this case:

- Under the guidance of the tutor student teachers observe the image in the activity 2.1. They identity the parts they see in the image
- Tutor opens the computer case of some available computers for the student teachers to be able to see the internal components.
- Student teachers identify the different components and their roles
- The tutor gives guidance on how to do activity 2.1 and application activity 2.1

• Answers to Activity 2.1

1a&b) Through observations students teachers identify various components inside the system unit and their role.

e. Application activity

• Answers to application activity 2.1

1. Tutor guides students to identify different ports available on either laptop or desktop such as: Mouse port and keyboard sometime known as PS2 port, VGA Port, USB Port, Parallel Port, Serial port, HDMI port, Digital Video Interface (DVI), Audio Ports etc

2. After searching the internet student teachers explain primary, secondary and tertiary memory

a. Primary storage: Also known as Main memory is a type of storage that is directly accessible by the processor. Example of primary memory are ROM and RAM

Secondary storage: Secondary storage, also referred to as auxiliary storage, are devices that provide alternative long-term storage for programs, data and information. Because of their large capacity they also referred to as mass storage devices. They are regarded as secondary because unlike primary storage, they are not directly accessible by the CPU.

Tertiary storage: The main purpose of tertiary computer storage is to store data on a very large scale. This includes optical jukeboxes and tape libraries. They require a database to organize the data stored in them.

b. Some storage devices are called mass storage because they can store large amount of data for a long time.

Lesson 2: Computer maintenance principles

a. Learning objectives

Apply computer maintenance principles to ensure that computer remain in normal working condition

b. Teaching resources:

Devices like computers, projector, and repair tool kit, some samples of ergonomics equipment like mouse, keyboard, screen, and chair are needed to conduct the lesson in an effective manner.

c. Prerequisites

Student teachers are aware and familiar with the problems related to malfunction of electronic devices such as radio, computer and printer. They also have knowledge and skills on proper use of cleaning tools learnt in ordinary level

d. Learning activities

• Guidance

- Teacher groups learners into small groups so that they share ideas on the principles of maintaining a computer
- Teacher walk around the group to guide the groups and to make sure every member is participating

- Group representative to present their finding to the rest of the class
- With the guidance of the tutor a summary on computer maintenance principles is done

● **Answers to Activity 2.2**

1. The activity in question one requires the learner to identify factors such as poor sitting posture, prolonged use of computers, ventilation, poor display unit and electric shock, etc.
2. Drinks by drop on computer accessories causing short circuit or damage to electrical parts while solid food substances may cause blockage of moving parts or keys on the keyboard

e. Application activity

• **Answers to application activity 2.2**

1. Maintenance keeps the computer working at optimum level and prevents unnecessary breakdowns caused by dirt, water or other kinds of misusing computer.
2. Use different preventive maintenance such as using blower to blow out dust, wipe the computer clean with a soft absorbent piece of cloth and non-water based cleaner liquid, etc.

Lesson 3: Computer capacity

a. Learning objectives

Identify the measurements of computer capacity and read memory size and processor speed of a computer

b. Teaching resources:

This lesson could be conducted in computer lab with a projector for presentation, different removable devices such as flash disk, memory card, hard disk, CD/DVD will also be needed for more clarification on memory capacity. The syllabus and the student teacher book are also needed.

c. Prerequisites:

Student teachers have knowledge about the size of different storage devices (memory card, flash disk, CD/DVD) used in some electronic devices such as phone, radio and computers

d. Learning activities

- **Guidance**

- On the instruction of the tutor, student teachers analyze the scenario in the activity 2.3 and answer the questions in that activity
- Student teachers identify the measurements of the computer capacity (memory and processor speed) and brainstorm on how to view those properties in the computer
- The tutor demonstrate using a projector how to view the memory size and processor speed of a computer and learners follow suit
- Teacher walks around and checks if students doing as per the given demonstration.
- Tutor gives guidance on how to do application activity 2.3.

- **Answers to Activity 2.3**

- a. The activity 2.3 require students to use their brainstorming, some suggestions may be to advise Peter to buy a flash a disk of higher capacity
- b. The size of each film is 512 MB as 1GB is equivalent to 1024MB but for simplicity reasons 1GB is equal to 1000MB.

e. Answers to application activity 2.3

1. First convert the capacity of the DVD in MB

The 4.7GB are equal to $1024\text{MB} * 4.7 = 4812.8\text{MB}$

The number of CDs in one DVD equal to $4812.8\text{MB}/700\text{MB} = 6.87$

As there cannot be parts of a CD the total number of CDs is 7 (**A DVD can store data that can be stored on 7 CDs**)

2. 4Gb is equivalent to $4 * 1024\text{MB} = 4096\text{Mb}$

If 4Mb are downloaded in to 6sec

Then 1 MB is downloaded in $6\text{sec}/4$

Therefore 4GB will be downloaded in $6\text{sec}/4 * 4096$ seconds (which is 6144 seconds)

Lesson 4: Identifying and addressing hardware issues

a. Learning objectives

Identify and address hardware problems and fix them

b. Teaching resources

The needed resources are computers as the lesson will be conducted in the computer, there is also a need for a projector for displaying examples to learners and a tool to use in case the issue requires opening the computer case. The lesson will also require having the student book and the syllabus.

c. Prerequisites

Student teachers should have knowledge and skills related to computer maintenance, General precautions, power connectivity and precautions for connecting the mouse, keyboard, and other external peripherals. They will have acquired these basic competences from lower secondary.

d. Learning activities

• Guidance

- The tutor takes one computer with an issue and present it to the class under the guidance of the tutor student teachers identify the problem may have
- The tutor switch on a computer with improperly fixed hardware component so that the computer emits a POST sound of warning
- For every other problem (Blank monitors, Mouse Problems. Computer does not recognize USB, Keyboard Problems, Power Cord Problems ...) the tutor shows a computer or an image or a video with such a problem and learners brainstorm on it.

● Answers to Activity 2.4

To connect both projector and monitor to a single computer requires that the computer have two VGA ports or an adapter having two VGA ports

e. Application activity

Answers to application activity 2.4

This activity requires students to discuss about hardware problems of their school computer lab. Student teachers also discuss about possible solutions to the identified problems.

Lesson 5: Assembling a computer & disassembling a computer

a. Learning objectives

To assemble and disassemble a computer by respecting the procedural steps

b. Teaching resources:

The needed materials for this lesson are: computer preferably with internet connectivity to facilitate additional researches, projector, screw driver set, electric blower, internal parts of a computer that can be used to replace those with issues.

c. Prerequisites

Student teacher have knowledge of tools used to open and connect together electronic devices like radio, phones and some of them are similar to those to assemble and disassemble a computer. They are familiar with some problems of computers though they are not able to solve them.

d. Learning activities

• Guidance

This topic requires practical approach to take the students through step-by-step process of assembling and disassembling a computer.

- The tutor shows the different components found in the computer case and tells learners that they are going to assemble them in the computer case
- Step by step and under the guidance of the tutor student teachers assemble the dismantled computer

• Answers to Activity 2.5

1. This is an observation activity that requires the learners to identify various tools such as extended extractor, antistatic wrist member, screw drivers and Ethernet crimping tools in a computer repair toolbox.
2. Student teachers explain the reasons that may prompt a technician to remove any internal part of a computer

e. Application activity

Answers to application activity 2.5

1. This is a practical activity that requires the guidance of the teacher or qualified lab technician to assist the learners mount a motherboard in the system unit. This procedure should be handled with care to avoid electric shock or damaging the motherboard.

2. The question 2 in application activity require teacher to let student to use their brainstorming and discuss about different types of expansion card here below are some suggestion:

- Industry Standard Architecture (ISA), Extended ISA (EISA),
- Peripheral Component Interconnect (PCI);
- Accelerated Graphics Ports (AGP);
- Video Electronics Standards Association (VESA);
- Audio Modem Riser (AMR);
- Communication Network Riser (CNR). Network Card, Sound Card, Video capture card, Video Card, etc.

Lesson 6: Software installation principles

a. Learning objectives

Identify types of computer software and system requirement to install any software

b. Teaching resources:

Student book, manual user guide and computer, internet connectivity for research, different software to install, computers to use in carrying out installations

c. Prerequisites

Students have knowledge and skills on computer capacity learned in “lesson 3: Computer capacity” in which they were also taught about processor speed

d. Learning activities

• Guidance

- Before the introduction of this topic, it is important that tutor searches for basic requirement needed so that user can install any software. The reason is not every computer can support any software and run it. This depends on the different factors like processor speed and memory .
- The tutor connects a computer to a projector and tries to install a software on a computer that does not have the necessary system requirements
- Student teachers brainstorm the reason why the software failed to install

- Student teachers brainstorm the system requirements for common software found in the school's computers
- Under the guidance of the tutor system requirements of Windows 10 are discussed and examples of applications software incompatible with it are also discussed

- **Answers to Activity 2.6**

1. Importance of reading the user manual before installing new software is helpful for different reasons such as: The manufacturer's user manual is important in identifying the hardware specifications required in order to install the new software; It helps to know the procedures to follow in order to install the new software, it can also help to know whether the software being installed is genuine or not
2. Student teachers give the factors to consider while purchasing application software
3. For this question refer to the student book

e. Application activity

Answers to application activity 2.6

Student teachers to the questions in application activity 2.6 and the tutor guides them

Lesson 7: Computer software issues

a. Learning objectives

Identify operating system issues and software issues and fix them

b. Prerequisites:

Student teachers are familiar with the use of computer and other electronic devices they also have basic knowledge bad software like viruses as they learnt it in ordinary level

c. Teaching resources

To teach this lesson requires:

- Having computers preferably one for each student teacher,
- Computer with software issues that are going to be solved
- Internet connectivity for additional researches and downloading some software that will be needed
- ICT student teacher's book and the syllabus

d. Learning activities

- **Guidance**

- Tutor asks questions to students aimed at finding answers to questions in activity 2.7
- Tutor shows computers with issues presented in the student book. Where such a computer cannot be found the tutor uses an image or a video
- For each issue, student teachers identify the causes, the symptoms and how to solve the issue

- **Answers to Activity 2.7**

Let student teachers carry out the activity in their respective groups and guide them to describe what happens to the computers after doing the activity. Let students discuss the measure that can be taken

e. Application activity

Answers to application activity 2.7

1. The first question in application activity 2.7 requires the learner to search on the internet other common sources of computer virus that have not been seen in student book
2. This is an exploratory activity that requires the learner to brainstorm on various means of acquiring software such as download, buying from vendors or developing their own software.
3. The activity requires the learner practically perform disk cleanup procedure by following the steps provided in the student's book or using cleanup in the search box to display Disk Cleanup utility on the startup menu.

Lesson 8: Computer software installation

(Installation of an Operating System)

a. Learning objectives

Explain and apply different steps to install an operating system

b. Teaching resources

For teaching this lesson we will need Computers, Projector, Software, External Hard Disk, bootable Flash Disk or Windows Genuine installation DVD.

c. Prerequisites

Student teachers are familiar with software installation skills applied in ordinal level senior three. They may also have basic skills about the installation of some application software in the phones.

d. Learning activities

• Guidance

- This activity takes place in the computer lab where teacher form group of at least five students
- Teacher starts the lesson by asking student to give the name of the program they likely to use
- The teacher asks students to carry out Activity 2.8 in their respective groups.
- An operating system is installed on a computer connected to the projector and at each step of the installation student teacher describe what they see.
- In groups student teachers install an operating system and describe each step

• Answers to Activity 2.8

The first program that teacher or lab technician need to install first is the operating system because it is the only software which manages hardware and application software resources and without operating system computer cannot boot.

e. Application activity

Answers to application activity 2.8

Referring to the steps provided in the student book student teachers do questions in application activity 2.8

Lesson 9: Computer software installation

(Installation of application software)

a. Learning objectives

Explain and apply different steps to install an application software

b. Teaching resources

To conduct this lesson requires having computers as the lesson will be conducted in the computer lab. There will also be a need of a projector for displaying examples to learners, installation CD/DVD for Microsoft Office 2013, flash disk to use for installation. There will be a need for internet connectivity in case some software need to be downloaded.

c. Prerequisites

Student teachers are already familiar with installation of some application in their smart phone which is so much like the installation of application software into a computer. They also have basic skills and knowledge about installation of software from known manufactures acquired in senior three

d. Learning activities

• Guidance

- The tutor starts the lesson by doing a theory recapitulation on basic principle of software installation together with the process of installing operating system.
- Tutor organizes students in pairs in order to do the lesson's activity.
- Student teachers give examples of applications softwares and state which ones they know to install
- One student teacher comes and install office by using a computer connected to a projector. With other learners each steps reached is explained
- Student teachers install other application software on their computers like VLC, YouTube downloader,...

• Answers to Activity 2.9

a&b) Teacher summarizes the contents and explains to students that the problem of John's computer is regarding to the missing of specialized programs to carry out each desired task.

To overcome the issue John needs to install appropriate program to play music VLC for example and other appropriate program to helping him to open his document such as Microsoft office

e. Application activity

Answers to application activity 2.9

This activity requires the students to install Microsoft Office 2016 by referring to General procedure to Install Software in student book

2.6. Summary of the unit

Hardware refers to any physical or tangible part of a computer. It can be either external or internal. Internal components are all components that are found inside the system unit such as disk drives, motherboard, processor power supply, memory, etc. While external components of a computer also known as peripherals refer to all external devices connected to central housing known as the system unit such as mouse, keyboard, scanner, monitor, printer or storage devices such as a hard drive or flash drive, memory card. Peripherals devices are connected to the system unit through port.

Computer maintenance can be done on hardware and software. It requires addressing hardware and software issues and finding solutions to overcome those issues. In this topic computer Assembling and disassembling procedures have been discussed together with how to install software such as operating system and application software.

2.7. Additional information for teachers

To conduct computer maintenance learners must be participative because most lessons of the topic require practical activities; different devices for practical should also be made available in order to enhance learning.

The use of modern technology such as us projector and internet is crucial because this enhance the quick lesson delivery and make students to be more attractive during the lesson delivering.

2.8. End Unit assessment (Answers)

1. Student teachers reflect on the rules followed while being in either computer lab, chemistry lab or physics lab.
2. This is a practical activity that requires the guidance of the teacher or qualified lab technician to assist learners identify and replace CMOS battery mounted on a motherboard. The same procedure is repeated to replace the RAM. Notice that these procedures should be handled with care to avoid electric shock or damaging the motherboard
3. a) An operating system refers to a type of system software that manages the hardware resources and control execution of application programs installed on the computer.
b) The three phases taken by operating system during its installation are: copying files, installing features and drivers, and lastly configuring settings.
c) Basic functions of operating system:

The operating system is a resource manager. All the functions it performs are aimed at efficiently and effectively managing the resources of the computing machine. In groups student teachers discuss the functions and present them to the class.

4. There are many factors to consider before purchasing application software some of them are software license, the use needs, the operating system environment, The hardware requirements needed to run the software, etc.
5. Motherboard is the first element to be installed because it is where all internal components of computer are interconnected and communicate one each other. Thus you need to first install it and attach other internal device after

The reason why it is the last to be uninstalled is that during uninstall process you start by disconnecting all those part connected to it and thus terminate by removing the motherboard which hold any attachable device.

2.9. Additional activities

1. a. Open at least three different documents from different application program installed on your computer
 - b. Press a combination of CTRLR +ALT+ Delete. Go to the Task Manager.
 - c. Right click on first document, click on End Task. What do you observe? Does it still open or not? In which condition does the above combination can be helpful can be
2. Explain the steps followed once you need to uninstall application software from a computer:

2.9.1. Remedial activities

1. Discuss the following:
 - a. Various input devices and their functions
 - b. Various output devices and their functions
 - c. Storage devices
 - d. What are common problem of some of the devices cited in (a), (b) and (c)
2. The Central Processing Unit is the most important part of computer and is considered as brain of computer

- a. Explain why this part is considered as brain of computer?
- b. What are the function of the CPU
- c. List and explain the parts of the central processing unit

2.9.2. Consolidation activities

1. a) Differentiate the term scanning from updating
b) Why is it advisable to scan any storage device connected to a computer
2. The process of installing more than one operating system inside one computer is known as “multi booting system” then you are asked to install window 10 and window 8 into your computer. Search on internet how to proceed this activity.

2.9.3. Extended activities

1. Define the term e-waste
2. The power supply inside the computer is used to convert alternative current into direct current, explain how you can replace it once damage.



UNIT 3:

ADVANCED WORD PROCESSING

3.1. Key unit competence:

Apply advanced skills to create suitable word documents

3.2. Prerequisite

Student teachers learnt in ordinary level how to open Microsoft word, save a document, identify Microsoft word tool bar, insert object, etc. they have basic skills which can allow them to acquire competences they are supposed get in advanced word processing.

3.3. Cross-cutting issues to be addressed:

- **Financial education:** Through typing scenario related to money management and do related application
- **Gender education:** All students must get involved in class activities regardless of gender
- **Inclusive Education:** Learners with and without disabilities participate together in the same classes during teaching and learning process
- **Peace and value** through typing a text describing peace

3.4. Guidance on introductory activity

The activities shown in the introductory activity are given to student teachers as a homework at the end of Unit 2. The only thing to do in class is to project the different elaborated documents.

- Tutor makes student teacher read the questions in the introductory activity and discuss on them
- Student teachers are put into groups so as to perform activities shown in the introductory activity which is given to them as a homework
- Time is set aside to project the different groups' documents
- By analyzing the look of different documents presented the tutor becomes aware of the level of student teachers in word and builds on that

3.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods
1	Formatting a document	Describe different way of formatting a text Apply different methods to format a text of a word document	2
2	Paragraph group	Create and insert footnotes and endnotes	2
3	Referencing a word document	State the steps of creating and updating a table of content, referencing ,and protecting a document	2
4	Creating and updating a table of contents	Create and update a table of content	2
5	Page layout tab command	Make page set up by putting margin, page orientation and column	2
6	Protecting a document from unauthorized access and changes	Practice the way of protecting documents from unauthorized changes and authorize reviewer to insert comment and tracked changes only	2
7	End Unit Assessment		1

Lesson 1: Formatting a document

a. Learning objective

- Describe different way of formatting a text
- Apply different methods to format a text of a word document

b. Teaching resources

- Instructional materials required for teaching and learning this lesson are Computers, projector, soft documents, text books, and the internet

c. Prerequisites

Ordinary level ICT: how to underline text, put it in italic, use bullets numbering etc.

d. Learning activities

• Guidance

- Tutor tell student teachers to type a text and apply the required steps to change font type, font size, font color,.
- Under the tutor's guidance student teacher put written text in upper case, underline it , make it bold and put it in italic

Answers to activity 3.1

Student teachers do this activity individually. Students open a blank document in Ms Word then type in the document this text “Hano Hari inzu ikodeshwa “and save it as”Inzu.docx” then apply on it the following:

1. Changing the font size to 36
2. Changing the font – type to Book Antiqua.
3. Changing the text font colour to red.
4. Changing text to Bold Italic and Underline it.
5. Changing text to the UPPERCASE.

All steps on how to accomplish this are available in the students' book.

e. Application activity 3.1

1. Student teachers type the text of 3 paragraph describing peace and apply on it different font following the steps provided in students book: Change the first and second sentence to the font type =”Poor Richard” ,font size =”14” , font color =”Blue” and finally make sentences italic
2. Student teacher individually change the third and fourth sentence to the font type ”**Tahoma**”, font size ”**12**”, font color ”**Red**” and underline those sentences of the PEACE document all question two question will be done using steps ffound in students book on section formatting a document

Lesson 2: Paragraph group

a. Learning objective

Create and insert indent, spacing, bullets, numbering and alignment

b. Teaching resources

- Computers, projector, soft documents, text books, and the internet

c. Prerequisites

- Student teacher have prior knowledge about bullets numbering and numbering list, add or remove borders, shading paragraph, find on paragraph group of Home tab.

d. Learning activity

• Guidance

- Student teachers write the text that is going to be used in different formatting
- Tutor demonstrates how to perform different actions shown in the student book and learners follow suit
- As student teachers are doing what is demonstrated, the tutor moves around to help those that may be having difficulties

• Answers to activity 3.2

1. Student teachers type text which describe last holidays and try to apply on asked paragraph format find in paragraph group. And Tutor facilitate them so that to enter in new lesson with prior knowledge/ skills.

e. Application activities

Application activity 3.2

Student teacher has to type a text from an English book and apply on it all asked format following all steps in student book: indenting the first sentence, changing the font type to “Time New Roman “ , size =”12” , line spacing =”2.0, changing the alignment from Left to Justified alignment

Lesson 3: Referencing a word document

a. Learning objective

Create and insert footnotes and endnotes

b. Teaching resources

Computers, projector, soft documents, text books, and the internet

c. Prerequisites

In Ordinary level ICT, student teacher learnt how to insert page number as they read book they always seen these header, footer even if they not yet know how to call them. This, will facilitate them to acquire new knowledge of describing inserting header, footer, footnote, endnote, based on that past experience

d. Learning activity 3.3

• Guidance

- Tutor introduces new lesson by asking student teacher to brainstorm in pairs the meaning the following term: footnote, endnote, header, footer.
- Tutor asks student teacher to take hard book and look on the top and the bottom of page and tell him/ her what they see. Which are header and footer. From there ask them to state common things find in header and footer like date, authors, chapter, unit title, etc.
- Tutor guides student teacher to follow the steps of inserting header, footer, endnote, foot note and converting footnote into endnote.

• Answers to activity 3.3

1&2&3) For answers to question 1, 2 and 3 consult the Student book in the section on Header and Footer

e. Application activities 3.3

1. Difference between footnotes and endnotes is that footnotes appear at the bottom of the same page, while endnotes appear at the end of the paper.
2. Student teachers open file crated in activity 3.3 and create 5 endnote on their choice in that document
3. Here the student teacher convert the above created endnote to footnote.

Lesson 4: Creating and updating a table of contents

a. Learning objectives

Create and update a table of content

b. Teaching resources

In teaching and learning this lesson, computers, projector, soft documents, text books, and the internet for research are needed for effective learning.

c. Prerequisites

Student teachers learnt in ordinary level Microsoft words window environment and have prior knowledge about **Heading** on home tab. And while reading books they often looking in table of content of given book. So constructing new knowledge, skills, will be based on that past experience.

d. Learning activity 3.4

• Guidance

- Tutor asks and guides student teachers to brainstorm the advantages of creating table of content in pairs
- For managing time, tutor tells student teacher to copy a text of 3 pages from the softcopy book available on REB website.
- Using projector, tutor demonstrate step by step the process of creating table of content. And on their computers, student teachers follow all the steps shown by tutor then create table of content
- After creating table of content, tutor demonstrate how to update created table of content then the student teachers practice the process on their computers

• Answers to activity 3.4

Student teachers copy a text of 3 page which describe computer hardware and software save it as “*information, communication technology*” from softcopy books available on REB website. The process of applying all asked things on this activity is shown in students book on both two sections font and creating table of content.

e. Answer to Application activity 3.4

1&2) Student teachers create headings as instructed in the question

Lesson 5: Page layout tab command

a. Learning objective

- Make page set up by putting margin, page orientation and column

b. Teaching resources

Instructional materials needed for this lesson are Computers, projector, soft documents, text books, and the internet for more research.

c. Prerequisites

Student teachers have basic skills in Word got from Ordinary Level in ICT subject

d. Learning activity 3.5

• Guidance

- To start this lesson teacher tells learners to click **on layout tab** and discuss on the use of the page setup items.
- Using projector, tutor model the steps of setting marge and guide learners to apply this process in their computers
- Student teacher apply the process of page orientation guided by teacher's demonstration
- Using required steps student teacher create predefined column and user defined column helped by tutor

• Answer to activity 3.5

1&2&3) For answers to question 1, 2 and 3 consult the Student book in the section **on page setup**

e. Application activity 3.5

To answer this application activity, the student teacher writes a document which describe their school environment then split Split the paragraph into 2 columns. For making the page Landscape follow the steps in students group in the section **Page Setup**

Lesson 6: Protecting a document from unauthorized access and changes

a. Learning objective

Practice the way of protecting documents from unauthorized changes and authorize reviewer to insert comment and tracked changes only

b. Teaching resources

Instructional materials needed for this lesson are Computers, projector, soft documents, text books, and the internet for more research.

c. Prerequisites

Student teacher are familiar with word as they learnt it in Ordinary Level ICT

d. Learning activity 3.6

• Guidance

- Tutor asks student teacher to discuss the benefits of protecting a document in small groups
- Tutor demonstrates the steps of protecting a document from unauthorized users and then the student teacher practice the process on their computers
- Guided by tutor student teacher do practice on how to unlock protected documents
- Individually student teacher practice on how to set permission on making change to restricted document.

• Answers to activity 3.6

The process of protecting a document with password is in student book on section Protecting Word files with a password

Answer to application activity 3.6

Answer

1. Open a document which describes the benefits of learning in your option that you protected and remove password. The steps are available in the Students Book on section of unlock protected document.
2. After typing a text related their career, student teacher apply the steps of Protect it and mark the parts that can be changed

3.6. Summary of the unit

Advanced Word Processing enables learners to acquire skills in referencing a word document where Header and footer, Creating and inserting footnotes and endnotes, converting footnotes to endnotes, Creating and updating a table of contents are given much emphasis. Learners also study Page layout tab command which include Page set up group, Margin, Orientation and Column.

Student teachers have acquired skills to secure a word document by protecting it from unauthorized changes, setting a password to open and modify a document, restricting formatting and editing of a document, allowing editing in a protected document, authorizing reviewers to insert comments and track changes only, authorize reviewers to insert comments only and removing document protection

3.7. Additional Information for teachers

How to Cross Reference Footnotes and Endnotes?

If you want to use the same footnote or endnote more than once throughout the text, there's an easy way to do it without having to insert the same thing over and over again.

Step 1: Place your insertion point where the reference is inserted in the text. On the **References** tab, click the **“Cross-Reference”** button.

Step2: In the Cross-Reference window, choose either “Footnote” or “Endnote” from the “Reference Type” dropdown menu.

Step 3: Next, click the **“Insert Reference To”** dropdown menu.

Word lets you create hyperlinks between cross-references so you can easily find the same footnote everywhere it appears in the document.

3.8. End unit assessment

(Answers)

1. The answer of both concept formatting and paragraph are in students book in section of formatting a document
2. To answer this question, student teacher have to type a document (one page) about XO laptop hardware apply all asked font, insert given footer, and header and protect created document with a password

3.9. Additional activities

3.9.1. Remedial activities

Write a paragraph of at least 4 lines and do the following:

1. First line: Arial 16, bold 3
2. Second line: 14, bold, underlined 4.
3. Bullets: right aligned

3.9.2. Consolidation activities

1. Write a text on any topic of ICT and do the following
 - a. Change the Header “your name at the top left of the top margin”
 - b. Change the Footer : “I am enjoying the ICT class “
 - c. Change your left and right margins to 1.5”, double space, Centre the page when finished.
2. Write a text on why to make a budget and format it accordingly to make it look more beautiful. This text should have at least 5 lines.

3.9.3. Extended activities

Make a text on the use of money that you are going to get from the internet and do the following:

1. Create a space at the top of the document and type the heading “Make budget plan”, font size 20 points, italicized, bold, centred, and underlined.
2. Change the line spacing of the second paragraph to 1.5 spacing.
3. Split text into 2 columns

UNIT 4:

ADVANCED SPREADSHEET I

4.1. Key unit competence:

Apply conditional formatting and filtering and integrate spreadsheet to other applications

4.2. Prerequisite

Student teacher have learnt Microsoft Excel in Ordinary Level, Mathematics (Statistics) which will facilitate them to learn some skills related to advanced spreadsheet.

4.3. Cross-cutting issues to be addressed:

- **Financial Education:** Is covered when student teachers working on sales data in conditional formatting, through interpreting chart created in spreadsheet.
- **Gender education:** Student teachers must be aware that both girls and boys must be involved equally in all teaching and learning activities. Programming is appropriate for both sex not for boys.

4.4. Guidance on introductory activity

Learners open Spreadsheet software available in the school computer. They create a Spreadsheet file and save it as “*Burera Ltd Sales data*” into ICT work folder at the desktop.

After saving the file, learners enter data into Spreadsheet software. *Burera Ltd sales data* describe sales of 6 months in Burera Ltd. This file is going to be used throughout this unit.

4.5. List of lessons

#	Lesson title	Learning objectives	Number of periods
1	Conditional formatting	Apply conditional formatting to cells	3
2	Charts	<ul style="list-style-type: none">• Create, and format charts, labels and axes• Interpret a chart data	2

2	Data organization (sorting, filter)	Use sorting and filtering technique in worksheet	3
3	Integrating with other applications	Export excel data to other applications	1
4	End unit Assessment		1

Lesson 1: Conditional Formatting

a. Learning objective :

Apply conditional formatting to cells

b. Teaching resources :

The required materials are Computers, Projector and Excel applications

c. Prerequisites

As student teacher learnt some topics in Microsoft excel such as cell formatting, inserting formula in ordinary level, logic in mathematics, they have prior knowledge which facilitate them to learn conditional formatting in spreadsheet.

d. Learning Activity 4.1

• Guidance

- Tutor introduces the lesson by guiding student teachers to brainstorm the meaning of conditional formatting and asking them the necessity of applying conditional formatting on given data in small group. Then tutor add explanation on student's findings.
- Using projector, the tutor demonstrates the steps of highlighting cell rules and students themselves do that practice on their computer using inserted data in activity 4.1
- Student teacher apply the steps of clearing rules and discuss reason of clearing cell rules.
- Tutor guide learners the benefit of creating top/bottom rules and follow the steps of creating top/bottom rules
- Tutor present available options of creating a formula based conditional formatting and choose one or two options to follow their steps together with student teacher on their computers

- **Answers to activity 4.1**

1&2&3) For answers to question 1, 2 and 3 consult the Student book in the section on **conditional formatting**

- e. Application activity 4.1**

1&2&3) Student teachers use conditional formatting to highlight certain cells which meet the criteria shown in the question 1, 2 and 3

Lesson 2: Charts

- a. Learning objective**

- Create, and format charts, labels and axes
- Interpret a chart data

- b. Teaching resources :**

Needed materials to conduct this lesson: Computers, Projector and Excel applications, students book

- c. Prerequisites**

In mathematics, especially I statistics lesson, student teacher learnt how to create different types of charts and interprets them which facilitate them to make graph here in advanced spreadsheet.

- d. Learning Activity 4.2**

- **Guidance**

- Students open the spreadsheet software and enter data in the table below and save the file as “Cereal Production”
- With the help of the teacher, students in pairs are going to use them to create a Chart

Answers to activity 4.2

1&2) Student teachers enter the given data and create a graph looking like the one given in the student book by using the steps given in the student book

- e. Application activity 4.2**

1&2) Student teachers create charts as instructed in the questions and by using the steps shown in the student book

Lesson 3: Data organization

a. Learning objectives:

Use sorting and filtering techniques in worksheet

b. Teaching resources:

For effectively facilitating this lesson, the needed instructional materials are: Computers, projector and Excel applications, student book, internet connection for more research.

c. Prerequisites

Student teachers learnt in early age how to sort number, or object in ascending and descending order so this will facilitate them to learn data filtering and sorting data easily

d. Learning Activity 4.3

• Guidance

- Guided by tutor, Students open Burera Ltd Sales data using spreadsheet software. Students update the worksheet by adding a new column “Region”.
- Using updated Burera Ltd Sales file, students start to do the activity 4.3 and apply there the process of filtering and sorting data

• Answers activity 4.3

1)a&b)For answers to this question, consult the Student book in the section on data organization

e. Application activities 4.3

1)a&b) Students open Burera Ltd Sales data using spreadsheet software. Students update the worksheet by adding a new column “Product” and answer other questions accordingly.

Lesson 4: Integrating with other applications

a. Learning objective:

Export excel data to other applications

b. Teaching resources:

Computers, Projector and Excel applications, students book

c. Prerequisites

Students know that sometimes it may be necessary to copy text from one program to another. Build on this to introduce the lesson

d. Learning activity 4.4

- **Guidance**

- Tutor asks student teachers to brainstorm the importance to export excel files to PDF
- Student teachers open Burera Ltd Sales data using spreadsheet software. Then tutor use that file demonstrate them how to export excel files to PDF, other file types and student teachers do the same.

- **Answers to activity 4.4**

- 1) For answers to this question, consult the Student book in the section **on Exporting Excel files to PDF or other file types**

e. Application activities

1. Student teachers export Burera Ltd Sales Data File to web page file format y using the steps described in the student book
2. For this question student teacher will apply the process of exporting the above file to PDF and discuss the benefit of saving excel worksheet tom PDF

4.6. Summary of the unit

In this Unit 4 Advanced Spreadsheet, learners got advanced skills in Conditional Formatting by applying highlight cell rule, top/bottom rule, and a new rule to selected data. It includes also Charts and Data organization where students learnt various techniques of sorting and filtering.

Finally, learners integrated spreadsheet files with other applications. The integration is done by exporting data from Excel to another file type such as pdf, Web page, Xps and etc.

4.7. Additional Information

How to filter with a search

Excel allows you to **search** for data that contains an exact phrase, number, date, and more. This can be done in this way:

Step 1: Select the **Data** tab, and then click the **Filter** command. A **drop-down arrow** will appear in the header cell for each column.

Note: If you've already added filters to your worksheet, you can skip this step.

Step 2: Click the **drop-down arrow** for the column you want to filter.

Step 3: The **Filter menu** will appear. Enter a **search term** into the **search box**. Search results will appear automatically below the **Text Filters** field as you type. Click OK when done

4.8. End unit assessment

Referring to the table below:

2	Names	Math			Physics			Computer			General			Entrepreneu			
3		TJ	Ex	Total	TJ	Ex	Total	TJ	Ex	Total	TJ	Ex	Total	TJ	Ex	Total	Grand Total
4	Munezero	4	3	7	6	6	12	2	5	7	6	10	16	9	7	16	
5	Umutesi	3	5	8	9	8	17	5	6	11	2	3	5	6	8	14	
6	Rurangwa	6	3	9	7	3	10	9	4	13	3	6	9	8	8	16	
7	Ishimwe	8	7	15	5	5	10	6	6	12	5	5	10	8	9	17	
8	Mugisha	1	6	7	8	9	17	2	7	9	6	6	12	3	5	8	
9	Keza	2	4	6	7	6	13	6	6	12	3	4	7	8	6	14	
10	Iradukunda	6	4	10	6	2	8	4	8	12	9	5	14	5	6	11	
11	Rugira	3	5	8	2	2	4	8	8	16	7	9	16	6	7	13	
12	Ingabire	6	6	12	3	7	10	7	5	12	7	8	15	5	5	10	
13	Kalisa	6	4	10	7	4	11	7	5	12	3	6	9	5	6	11	
14	Rugamba	5	3	8	6	4	10	2	3	5	8	7	15	7	7	14	
15	Mukamana	9	7	16	6	5	11	7	3	10	6	4	10	3	7	10	
16	Mwiza	3	8	11	4	6	10	4	5	9	5	6	11	7	5	12	
17	Sugira	8	9	17	2	3	5	8	8	16	4	5	9	4	5	9	

1. Calculate total for each subject
2. Calculate the grand total
3. Highlight in red and bold students who scored less than 5 points in each subject
4. Use Green fill and with dark green text to highlight students who have total above 12 in any subject
5. Using blue highlight show all students who score 55 and above
6. Sort Grand Total in descending order

4.9. Additional activities

4.9.1 Remedial activities

Consider the table below:

SN	Items	Unit Price (Frws)	Qty(Kgs)	Total cost	Tax (10)
1	Bananas	200	240		
2	Beans	350	400		
3	Potatoes	150	300		
4	Rice	700	200		
5	Sugar	800	350		
Grand Total					

1. Calculate the total cost and the tax
2. Make the Pie chart of items and unit price
3. Show data label and Give the chart title

4.9.2. Consolidation activities

Considering the table below:

Name	50	50	100	50	50	100	50	50	100	50	50	100		
	Math			English			Physics			Computer				
Name	Test	Exam	Total	Test	Exam	Total	Test	Exam	Total	Test	Exam	Total	GT	Average
Yves	13	20		25	18		32	28		21	16			
Batesi	2	23		48	13		34	27		10	18			
Hirwa	21	34		35	28		36	23		22	29			
Cyeza	5	26		25	16		37	30		10	22			
Cyiza	25	28		28	24		33	31		15	21			
Uwera	43	38		43	26		47	44		31	44			

- i. Calculate total for each subject
- ii. Calculate the Grand Total and Average
- iii. Highlight in red and bold students who scored less than 5 points in each subject
- iv. Use Green fill and with dark green text to Highlight students who have total above 15 in any subject
- v. Using blue highlight show all students who score above the average
- vi. Create a bar column

4.9.3. Extended activities

Considering the table below:

	Name	Chemistry 100	English 100	Math 100	Total	Average	maximum	Minimum
1	KANEZA	45	90	64				
2	RUKUNDO	80	76	44				
3	AKEZA	88	89	79				
4	HIRWA	76	56	95				
5	SHEMA	45	77	65				
6	ISIMBI	56	36	33				
7	SUGIRA	60	95	69				
	AVERAGE							
	MINIMUM							
	MAXIMUM							

- i. Display in red color the Total Points of KANEZA in 3 subjects.
- ii. Display in blue color the Average Points of RUKUNDO in 3 subjects.
- iii. Highlight Maximum Points of all these Students in these 3 Subjects?
- iv. What is the Minimum Points of all these Students in these 3 Subjects?
- v. Did ISIMBI and SUGIRA fail or pass?
- vi. If they Failed or Passed, Display the Formula.
- vii. Display the Average point of all Students in Chemistry only.
- viii. Display the Minimum and Maximum points of all Students in English and Math.
- ix. Sort Students Names in Ascending Order.
- x. Which Steps we follow to create a Chart of the whole table.



UNIT 5:

SEARCHING THE INTERNET

5.1. Key Unit competence

Use ethically the internet in doing researches

5.2. Prerequisites

Students are familiar with the internet as they learned related concepts in Ordinary level and use it for research in everyday lesson activities

5.3. Cross-cutting issues to be addressed

Inclusive Education: students with and without disabilities participate and learn together in the same classes.

Peace and Values Education: students must be aware of internet based crimes like hacking and prevent accessing people's data without permission

Financial Education: to be covered when explaining students cost related to anti spyware and firewall used in the web security

Standardization culture: To be covered through the rationalization of internet ethics relating to the increasing technology of computing device and to avoid actions that are against Rwandan culture such as pornography, hacking ...

5.4. Guidance on introductory activity

- The tutor makes learners observe the image and describe what they see
- Student teachers brainstorm the importance of such a room and the materials needed to create one
- Guide learners to list all possible elements that make this communication possible
- Tutor guides learners to identify devices and transmission medium used to facilitate sending and reception of the email
- Tutor let learners express themselves about the use of emails. Let learners express themselves about the use of emails Remember the goals/objective is to introduce learners the concept of internet ethics. Therefore, do not spend much time on email.

5.5. List of lessons

#	Lesson title	Learning objectives	Number of periods
1	Internet ethics	Show interest in using internet appropriately by respecting all the related ethic principles	1
2	Web security: spyware, hacking, firewall	Describe various web security mechanism and tools	2
3	URL and its parts: Protocol, host name, domain name, sub domain	Identify and explain components of URL	2
4	Search on the internet: Simple search techniques (keyword searching)	Explain the internet search strategies for better search results	2
5	Search on the internet: Advanced search techniques (Boolean operators, quotation marks, tilde sign...)	Apply internet search techniques so as to get better search results	2
6	Search on the internet: Searching for documents, books, images, video on the internet	Apply acquired knowledge to request for a service online	2
7	Search on the internet: Searching by image	Apply acquired knowledge and skills to request for information online	2
8	Browser's Techniques for remembering: Cookies, Bookmark, Cache and Browser history	Apply different mechanism of revisiting a website easily. Understand strategies used to make the internet remember its users	1
9	End Unit assessment		2

Lesson 1: Internet ethics

a. Learning objectives

Show interest in using internet appropriately by respecting all the related ethic principles

b. Teaching resources

Computers with internet connectivity and internet browsers, Projector, books

c. Prerequisites:

Students have learnt some concepts of computer internet in Ordinary level. They ideally have some knowledge and skills related to computer network and data communication.

d. Learning activities

• Guidance

- Tutor guide learners by forming small group of at least five learners per group
- Teacher guide student to think about the scenario in the activity 5.1
- Teacher walks around to see if everyone is participating actively
- The teacher can use this exercise to make students aware that in today's world people pretend to be who they are not and may trick someone using the internet
- Groups present their ideas on the given scenario and present other behaviors that are against internet ethics

• Answers to Activity 5.1

The activity 5.1 requires student to use their brain storming as there is no specific answer

e. Answers to application activity 5.1

The application activity 5.1 requires learner to appreciate the impact of ICT and internet on ethics, privacy and intellectual property. Let the student teachers explore various policy that safeguard or regulate effects of internet on the these issues

Lesson 2: Web security: spyware, hacking, firewall

a. Learning objective

Describe various web security mechanism and tools

b. Teaching resources

Computer lab, Internet and textbooks to facilitate research

c. Prerequisites

Students and teacher are aware with computer security; they also have knowledge about internet ethics issues learnt from previous lesson.

d. Learning activities

• Guidance

The activity 5.2 in student book is used to introduce the lesson. Students visit the school computer lab and observe how computers are arranged and protected. The teacher asks students to take notes of what they observed and to reply the questions in the activity. By using technical explanations teacher helps students to understand the importance of computer security.

Teacher organizes students in pairs in order to do activity.

- Teacher asks students to form small groups to do the learning activity 5.2 and to state other ideas related to Web security spyware, hacking, firewall
- Teacher walks around and sees if students are doing the given activity
- Teacher lets students present their answer to the rest of class.
- Teacher lets Students react on the finding/ answers from other groups.
- From the presentations and additions by the tutor, a summary on Web security spyware, hacking, firewall is done

• Answers to Activity 5.2

1. In the computer lab, some computers are secured with password other are not. Depending on students' reaction some measures that can be taken are the following: installing anti-virus in all computers, Protect all computers with password, etc
2. The second question require students to reflect about the malpractices done on internet such as stealing the identity of customer bank and get the money without permission, stealing information(hacking) using internet, different online harmful services such as human trafficking, etc.

e. Answers to application activity 5.2

1. Importance of web security is summarized here below:
 - Web security helps to keep safely data and equipment functioning and provide access only to appropriate people.
 - Web security is important as it helps keep information protected. Helping to prevent uploading or downloading malware and helping programs run more smoothly.
 - Web security is important for preventing theft of data, software, services and equipment
2. a. The type of security used here is authentication
 - b. It is important because authentication grant someone permission to do or have something.
3. The activity requires learners to use internet to search about the five categories of firewall. The five types of firewalls are these: Packet filtering firewall, circuit-level gateway, stateful inspection firewall, Application-level gateway, Next-generation firewall. Student teachers describe them extensively.

Lesson 3: URL and its parts (Protocol, host name, domain name, sub domain)

a. Learning objective

Identify and explain components of URL

b. Teaching resources

The successful implementation of this lesson requires learners and teacher the need of regular materials such as Computers with internet connectivity and internet browsers, Projector. There will also be a need for a student teacher book books.

c. Prerequisites

Learners have basic knowledge about the use of internet acquired in ordinal level senior one and senior three.

d. Learning activities

• Guidance

- Tutor organizes learners into groups in order to do the activity. 5.3. They identify the different parts that the REB website name

- Students in groups, discuss probable ways used to get their result from REB's website
- Tutor walks around and sees if each student is participating in group activity.
- Tutor lets learners share their answers in presentation.
- Tutor lets learners react on the findings from their colleagues
- Tutor gives the instructions on how to write the REB's web address into address bar of any browser

- **Answers to Activity 5.3**

1. The first activity require student to discuss in groups the steps that each one have used in order to obtain his or her result. Thereafter they share their findings and these findings lead them to conclude about the asked question 2&3) Explanations on these terms are in the student book

e. Answers to application activity 5.3

1&2&3) For answers to question 1, 2 and 3 consult the Student book in the section on URL and its parts

Lesson 4: Search on the internet: Simple search techniques (keyword searching)

a. Learning objectives

Apply different simple search techniques to search information on internet

b. Prerequisites

Learners have basic skills and knowledge about the use of internet. They also have knowledge about internet ethics learnt in previous lesson

c. Teaching resources

Computer lab with internet connectivity and different internet browsers, Projector, books are needed.

d. Learning activities

- **Guidance**

- This lesson have to be conducted inside computer lab where teacher guide student to start their computer. These computers have to be connected to the internet.
- Teacher guide student to open any browser.

- Teacher help each student to type the search engine in ULR of opened browser by doing a demonstration using a projector
- For each strategy to get better search results the tutor does a demonstration using a projector and learners discuss the accuracy of the results got
- Learners enters search terms in their browsers following the tutor's demonstration

- **Answers to Activity 5.4**

1. The parts labeled from A to G **A:**Title Bar **B:** Address bar **C:**Menu Bar **D:** Control button **E:**Search query **F:** Search Text Box **G:**Search Button
2. The second activity require learners to make peer group and discuss the impact of ICT in Rwandan school and thereafter open the computer internet to search about the related question

e. Answers to application activity 5.4

This practical activity requires learners to conduct research by typing the search keywords (impact of gira inka munyarwanda, rwandan prime ministers) in search box of used search engine. The search engine to use is Google.

For question 2 better use the website: minaloc.gov.rw”prime ministers”

Lesson 5: Advanced search techniques

(Boolean operators, quotation marks, tilde sign...)

a. Learning objectives

Explain the internet search strategies for better search results

b. Prerequisites

Learners have basic skills and knowledge about the use of internet they also have knowledge about internet ethics learnt in pervious lesson

c. Teaching resources

This lesson require regular material such as Computer lab with internet connectivity and different internet browsers to carry out more practice and doing research. Tutor will need a projector for displaying information to the student without walking around each student. Student book and teacher guide will be additional tools.

d. Learning activities

- **Guidance**

The guidance of this learning is the same as the one for the previous lesson except addition instruction from the teacher to include advanced searching techniques seen in student book.

- Using computers connected to the internet learners to open any browser.
- The tutor demonstrate search techniques one after another. For each search technique a demonstration is done, learners interpret the results and do the same using their computers

- **Answers to Activity 5.5**

Learners conduct researches using different techniques which are boolean operators, quotation marks, tilde sign...

e. Application activity

Answers to application activity 5.5

1. Learners conduct search in each previous learnt subject activity using different advanced search techniques seen in student book
2. Learners discuss the use of NEAR keyword and use it in searches

Lesson 6: Searching for documents, books, images, video on the internet

a. Learning objectives

Apply acquired knowledge to request for a service online

b. Prerequisites

Learners and teacher are familiar with the use of internet and they have basic skills about searching on internet learnt from previous lessons

c. Teaching resources

Material such as Computer lab with internet connectivity and different internet browsers to carry out more practice and doing research, Projector for displaying guideline.

d. Learning activities

- **Guidance**

- Learners brainstorm on which kind of resources found on the internet (documents, books, images, video) and give examples of websites that have got those resources
- For each kind of search, learners give ideas on how it is done, the tutor demonstrate using a projector the results given by the learners' ideas
- The teachers improves the learners ideas and demonstrate the search techniques he/she wants to convey
- Learners discuss the accuracy of the results got and apply the same techniques by searching using their computers

- **Answers to Activity 5.6**

Students use different techniques and search for the video related to the asked question in student book, some students will have to display the video using projector.

e. Answers to application activity 5.6

Learners search for grain germination videos, Imigani Miremire book/text, current map of Rwanda. They discuss the results got in terms of accuracy.

Lesson 7: Searching by image

a. Learning objective

Apply acquired knowledge and skills to request for information online using image

b. Teaching resources

The use of regular material such as computer with internet connection, different web browsers add-on software, projectors together with student book.

c. Prerequisites

Learners have basic skills about searching on internet using different techniques acquired from previous lessons

d. Learning activities

- **Guidance**

This lesson has to be taught in computer lab through this activity:

- Tutor send downloaded image to every student using email or any removable device.
- Tutor asks learners to copy the shared image
- Tutor guide student by showing them the area where to paste the copied image
- Tutor asks learners to observe carefully the search engine result and describe their observation

- **Answers to Activity 5.7**

The practical activity requires learners to conduct the research for the content and other related image using the shared image

e. Answers to application activity 5.7

Learners download ICT books using learned techniques

Lesson 8: Browser's techniques for remembering:

Cookies, Bookmark, Cache and Browser history

a. Learning objectives

Apply different mechanism of revisiting a website easily and understand strategies used to make the internet remember its users

b. Teaching resources

Computers with internet connectivity and internet browsers, Projector and the student book.

c. Prerequisites

Learner and teacher are familiar with the use of internet such as using email or other social media like face book

d. Learning activities

- **Guidance**

- The lesson starts with the interpretation of the image in the activity 5.8. This is compared to the cookie technique used by browsers

- For each technique the tutor display a demonstration using a projector and an interpretation of the technique is done

- **Answers to activity 5.8**

1. Referring to the cord found in the bible students will brainstorm on its role
2. There are some special program used by the browser that helps to store username but they do not save password for security purpose

e. Answers to application activity 5.8

1. The purpose of Bookmark, cookies Cache and Browser history have been discussed in student book
2. The activity requires learners to use internet to search for different way the user can view bookmarks using different browsers

5.6. Summary of the unit

Internet ethics means acceptable behavior of using internet, throughout this lesson some ethics have been discussed together with internet issues that can arise while using internet in improper way.

The unit covers the information about web security together with how to prevent unauthorized access by using different techniques such as using firewall. The web address also known as URL with its part has been discussed. Least but not last, this unit covered also the searching on internet using simple search techniques together with advanced search techniques (Boolean operators, quotation marks, tilde sign...), the unit covered the process of searching for documents, books, images, video on the internet lastly browser's techniques for remembering have been pointed on.

5.7. Additional information for teachers

Internet ethic refers to acceptable behavior of using internet, there are some commandments that have to be respected while using internet. Web security have to be applied in order to avoid network attach by hackers for example

The access to internet requires the use of web browsers such as Chrome, Firefox, Internet Explorer, Opera, Safari etc; the search of the document, image or videos online using search engine require different techniques

Once the searched item from internet need to be reused it is advisable to clarify the source in order to avoid plagiarism

5.8. End Unit assessment (answers)

1. a) URL stands for Uniform Resource Locator
b) Parts of URL are: Protocol, Domain, sub domain, Top Level Domain and Path for more explanation refers to student book
2. The https:// stands for Hypertext Transfer Protocol Secure; it is the protocol that govern how data is transmitted over a network
3. This is practical activity requires learners to open any browser and try to open many windows regarding to the provided site and try to navigate them.
4. The term **web browsing history** refers to a list of web pages a user has visited recently and associated data such as page title and time of visit which is recorded by web browser software as standard for a certain period of time. Web browsers software do this in order to provide the user with a back button and a history list to go back to pages they have visited previously as well as displaying visited links
5. Search Engines refer to programs that help a user to look for and identify items that corresponds to keywords or phrases specified from the World Wide Web. Examples include; Yahoo, Google, Bing and Ask.com among others.
6. This activity requires the learner practically perform video search procedure by following the steps provided in the student book
7. This activity requires the learner to open any browser and enter the web address into the address bar and observe careful on the opened web page the information regarding to the applying for ID

5.9. Additional activities

1. Discuss about ethical challenges arising from the use of computers and other electronic devices such as phone, tablet, I pad etc..
2. Referring to web security differentiate the term authentication from authorization

5.9.1. Remedial activities

1. On World Wide Web apart from the Google search engine, conduct research about other ten top search engines that are commonly used
2. Explain the difference between a spyware and a spam. Identify risks that can arise when your computer is infected with spyware.

5.9.2. Consolidation activities

1. Respond by true or False

- a. Ethical issues are defined by laws and societal standards.
- b. Handheld electronic multimedia computer devices enable communication on the go, any time, and any place.
- c. Intranets use firewalls to protect computer systems from outside intruders.
- d. Privacy laws prohibit conducting research surveys on the internet.
- e. Groupware can make it possible for group members to access one another's schedules.
- f. A telecommuter works regularly from a location away from the company work site.
- g. Videoconferencing is a viable alternative to face-to-face meetings.
- h. Synchronous collaborative writing is interactive.
- i. If you talk on the cell phone in public, you should talk loud enough that people around you can hear effortlessly.
- j. E-mail and cell phone records are confidential and when erased cannot be retrieved.

5.9.3. Extended activities

1. Search on internet can be carried out in different way; is there any difference between search image and search by image o internet? If yes explain.
2. a) Define the term software add-ons
 - b) Research on internet about how to download and install add-ons within any browser

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