ICT FOR GENERAL EDUCATION

Senior 5

TEACHER'S BOOK

Experimental version

Kigali September 2022

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FOREWORD

Dear teacher,

Rwanda Basic Education Board is honored to present Senior Five Teacher's Book

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 students 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 students can develop ideas and make new discoveries during concrete activity carried out individually or with peers.

With the help of teachers, students will gain appropriate skills and be able to apply what they have learnt in real life situations. Hence, they will be able to develop certain values and attitudes allowing them to make a difference not only to their own lives but also to the nation.

This is in contrast to traditional learning theories which view learning mainly as a process of acquiring knowledge from the more knowledgeable who is mostly the teacher. In Competence-Based Curriculum, learning is considered as a process of active building and developing of knowledge and understanding, skills, 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 students 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 students considering the importance of social constructivism suggesting that learning occurs more effectively when the learner works collaboratively with more knowledgeable and experienced people.
- Engage students through active learning methods such as inquiry methods, group discussions, research, investigative activity and individual work activity.
- Provide supervised opportunities for students 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 students 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 Teacher's Book 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 Teacher's Book contains the answers for all activity given in the Student 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 book, particularly REB staff who organized the whole process from its inception. Special gratitude goes to the University of Rwanda which provided professionals in nursing who worked diligently for the successful completion of this book. Any comment or contribution would be welcome for the improvement of this

Teacher's Book for the next edition.

Dr. MBARUSHIMANA Nelson

Director General of REB

ACKNOWLEDGMENT

Writing a Teacher's book is a team effort, and this one is no exception. I wish to express my appreciation to all the people who played a major role in development of this ICT Teacher's book. It would not have been successful without active participation of different education stakeholders.

I owe gratitude to different universities, schools in Rwanda that allowed their staff to work with REB in the production of general education book. I wish to extend my sincere gratitude to lecturers, teachers and all other individuals whose efforts in one way or the other contributed to the successful writing of this Teacher's Book.

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

MURUNGI Joan,
Head of CTLR Department/REB

PART I. GENERAL INTRODUCTION

I.0. About the Teacher's guide

This book is a Teacher's guide for senior 5 General Education combinations (excluding MCE and MPC). It is designed to help teachers in the implementation of competence based curriculum specifically ICT syllabus.

As suggested by its name, this is a guide that will help teachers in their daily preparations of lessons. Teachers 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 teachers 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 Teachers 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 Teacher will find an indication of those prerequisites and guidance on how to establish connections.

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

This section suggests cross cutting issues that can be integrated depending on the unit content. It gives guidance on how to integrate those issues. The suggested issues are indicative and teachers 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 student's book. This section of the teacher's guide provides guidance on how to conduct this activity and related answers. Students 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 teacher's guide provides the following sections:

- Summary of the unit which provides the key points of content developed in the Student's book.
- Additional information which provides additional content compared to the Student's book for the teacher 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 Answers 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 student (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: ……..

a) Learning objectives:

States the main points that have to be achieved by the end of the lesson. The proof of achievement of these objectives is got through evaluation done at the end of the lesson.

b) Teaching resources

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

c) Prerequisites/Revision/Introduction:

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

d) 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:

e) Exercises/application activities

This provides 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 way of teaching and learning which puts the student at the center. In this new approach teachers are not only responsible for the transfer of knowledge but also for enhancing student's learning achievement, and creating safe and supportive learning environment. It implies also that students 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 students can do rather than what they know. Students 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 student-centered rather than the traditional didactic approach. The student is evaluated against set standards to achieve before moving on.

Adding to specific subject competences, students 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	Compare the protected computer to the computer exposed to various security threats Demonstrate the advantage of programming.

Research and Problem solving	Research using internet or books from the library Use the different office programs to solve problems related to elaborating professional documents
Innovation and creativity	Bring advanced embellishments in excel and PowerPoint documents
Cooperation, Personal and Interpersonal management and life skills	Sharing resources using social media Protecting his/her own data and school or institution data to virus attacks Work in Pairs, small group work and large group work
Communication	Organise and present in writing and verbally a complete and clear report of their 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 teacher need to address all of them whenever an opportunity arises. In addition, students 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 students in all activities without any bias. Eg: Allow a student 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	Involve both girls and boys in all activities: No activity is reserved only to girls or boys. Teachers 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	During group activities, debates and presentations, the Teacher will encourage students 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	Student teachers should be familiar with standards used in computers in their daily interaction with different tools used in Online communications
Financial Education	Student teacher should develop this by comparing the use of digital technologies with the traditional paper based practices and analyze 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, Students learn in different ways depending on their learning pace, needs or any other special problem they might have. However, the teacher has the responsibility to know how to adopt his/her methodologies and approaches in order to meet the learning needs of each student in the classroom. Also teachers need to understand that student 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, teachers need to:

- Remember that students 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 students with special needs to stay on track during lesson and follow instruction easily.
- Vary the pace of teaching to meet the needs of each student. Some Students process information and learn more slowly than others;
- Break down instructions into smaller, manageable tasks. Students 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 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 Students will benefit from this strategy;
- Use multi-sensory strategies. As all Students learn in different ways, it is important to make every lesson as multi-sensory as possible. Students 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 is unique with different needs and that should be handled differently.

Strategy to help a Student with visual impairment:

- Help Students 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 has some sight, ask him/her what he/she can see.
- Make sure the student has a group of friends who are helpful and who allow him/ her to be as independent as possible.
- Plan activities so that students work in pairs or groups whenever possible

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

- Always get the student's attention before you begin to speak.
- Encourage the student 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 with physical disabilities or mobility difficulties:

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

I.2.4. Guidance on assessment

Assessment is an integral part of teaching and learning process. The main purpose of assessment is for improvement. Assessment for learning/ **Continuous/ formative assessment** intends to improve students' learning and teacher'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 teacher should encourage individual, peer and group evaluate the work done in the classroom and uses appropriate competence-based assessment approaches and methods.

In senior 5 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 Students 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 teacher, 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.2.5. Students' 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 students' needs, abilities and learning styles.

There are mainly four different learning styles as explained below:

a) **Active and reflective students**

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

b) **Sensing and intuitive students**

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

c) **Visual and verbal students**

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

d) **Sequential and global students**

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

I.2.6. Teaching methods and techniques that promote the active learning

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

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

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

The role of students in active learning
Students 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 student engaged in active learning:
- Communicates and shares relevant information with other students through presentations, discussions, group work and other student-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 Teacher 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 teacher should ensure that all the students have mastered the stated key unit competences basing on the criteria stated, before going to the next unit. The teacher will assess how well each student masters both the subject and the generic competences described in the syllabus and from this, the teacher will gain a picture of the all-round progress of the student. The teacher will use one or a combination of the following: a) Manipulation, (b)Computer and task/practice (c) observation, (d) pen and paper, and (e) oral Answering

A. Computing activities

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

Practical activities are mandatory in learning ICT; this method gives the student 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 students and hand-on of individual student. Preparing the next generation of experts in the field of ICT require student to experience what they are learning; Let the students perform and facilitate accordingly.
- **Debugging:** In ICT student 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 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 teacher 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 participates.

B. Research work

Each student or group of students 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 teachers are encouraged to sample and prepare project works and engage their Students in, as many as possible. Students in groups or individually, are engaged in a self-directed work for an extended period of time to investigate and respond to a

complex Answer, 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 students' interest. This technique develops higher order thinking as the students 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. Students may visit any computer related work or equipment 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 students are involved in the learning process. Below are those main part and their small steps:

1) Introduction

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

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

- **Discovery activity**

Step 1

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

Step 2

- The teacher lets the students work collaboratively on the task.
- During this period the teacher refrains to intervene directly on the knowledge
- He/she then monitors how the students are progressing towards the knowledge to be learned and boost those who are still behind (but without communicating to them the knowledge).

- **Presentation of students' productions**

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

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

- **Exploitation of student's productions**

- The Teacher asks the students to evaluate the productions: which ones are correct, incomplete or false
- Then the teacher judges the logic of the students' products, corrects those which are false, completes those which are incomplete, and confirms those which are correct.

- **Institutionalization (summary/conclusion/ and examples)**

- The teacher summarizes the learned knowledge and gives examples which illustrate the learned content.

- **Exercises/Application activities**

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

3) Assessment

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

PART II. SAMPLE LESSON PLAN

Term	**Date**	**Subject**	**Class**	**Unit**	**Lesson**	**Duration**	**Class size**
I	X	ICT	Year II	Computer graphics	Screenshot capturing tools	80Minutes	40

Type of Special Educational Needs to be catered for in this lesson and number of student teachers in each category	None
Unit title:	**Computer graphics**
Key unit competence:	To be able to use graphic tools in capturing and editing images
Title of the lesson:	Screenshot capturing tools
Instructional objectives	At the end of the lesson students will be able to take images using different tools and manipulate them properly
Plan for this class	This class will be held in computer lab and Students will be organize in small groups
Learning materials(For all student teachers)	Computers with different needed applications for each student
References	ICT for General Education Student 's Book Senior 5

Timing for each step	**Description for teaching and learning activity**		**Generic competences and cross cutting issue addressed + a short explanation**
	Answers and answers technique is used to facilitate students, group activities and presentation of findings is used for students to describe the ways of taking a screenshot of a current working window or any wanted window from computer program.		
	Teacher activity	**Student activity**	
Introduction 10 Minutes	*Teachers facilitate student to go in their	*Students observe the images presented on wall by teacher.	Communication Cooperation

	respective working groups. * By asking the Answers, the teacher helps students to discover the topic of the lesson	*Students will respond to the asked Answers by giving different ways or methods to take a picture of a working window of any computer program	Interpersonal management Gender through mixing boys and girls to do activity Inclusive education, by encouraging Student teachers to speak loudly so that the one with hearing impairment can hear what have been said
Lesson development (25 minutes)	Form groups of two students on 1 computer The teacher monitors the group work keeps focus on student with understanding what is a screenshot and the way to take it The teacher asks students to present their findings and give additional comments to the students ‘work Teacher helps students to apply two ways in screenshot capturing	In group, students discuss what a screenshot is and how it can be taken. *Students ask Answers for clarifications while discussing in groups *Students present their findings *By using snipping tool and PRT SC key, students take the screenshot of their working window from computer programs	Communication through presentations and discussing in groups. Cooperation when working together in groups Cross cutting issues: Gender, peace and value education and inclusive education: during group work encourage peers to speak loudly and if possible use total communication to help the one with hearing impairment to participate in the group Critical thinking and interpersonal cooperation
Conclusion (5 minutes)	The teacher concludes the lesson by asking Answers to the students,	Students write individually on a sheet of a paper the	

	to know the achievement of the objective	answers of application activity Answers and show to the teacher the saved snip.	

PART III. UNIT DEVELOPMENT
UNIT 1: ADVANCED SPREADSHEET II

1.1. Key unit competence:

Use the full potential of the spreadsheet to manipulate data.

1.2. Prerequisite knowledge and skills:

Student should have knowledge and skills related to spreadsheet learnt in **senior two** in Spreadsheet Basics

1.3. Cross-cutting issues to be addressed:

Financial education: While exploring different templates used in Excel, students are made familiar with the loan amortization template and here learn concepts related to loans, interest rates, capital. They evaluate the interest paid for different interest rates.
Standardization culture: while learning excel formula, students become aware that those are the same as the ones learnt in Mathematics and therefore are aware that mathematics is applicable in life

1.4. Guidance on the introductory activity

- The teacher organizes students into pairs.
- The teacher asks students to do the introductory activity in their respective pairs.
- The teacher moves around to see how students are working and provides guidance where it is needed.
- The teacher invites some pairs to presents their findings to the class
- The teacher asks students to evaluate findings.

- The teacher tells the students that in the coming lessons they will have complete answers.
- If there is a question that cannot be answered, the teacher explains that by the end of the unit they will be able to answer each question

Answer of introductory activity

a. Cell that has more expectant mothers to receive super nets is cell that has more children under age Two is Ngoma **(Use Max function to get the answer)**
b. Cell that has more children under age Two is Ngoma **(Use Max function to get the answer)**
c. The average number of children to receive mosquito nets in Ngoma Sector is 12 children. This is got by using the Average () function
d. Cell that has less children under age Two is Kinazi (**Use Min function to get the answer**)

1.5. List of lessons

#	Lesson title	Learning objective	Number of periods
1	Logical functions	Explain the use of logical functions and apply them in doing different calculations	2
2	Advanced Math Spreadsheet functions	Recognize the importance of math functions and apply them	3
3	Advanced Statistical spreadsheet functions	Apply statistical functions to carry out different calculations	3
4	Text spreadsheet functions	Use text Excel functions to manipulate text and appreciate the importance of these functions in easing the work on text	3
5	Using formula & functions from different sheets	Explain the need to use formula and functions from different sheets and use them	2
6	Protecting worksheet style, contents and elements	Apply spreadsheet security features to protect them against unwanted changes	2

7	Data validation	Protect and secure a spreadsheet or cells within a spreadsheet	2
8	Using other Excel templates	Use various Excel templates to make different excel documents	2
	End unit assessment	Answer the Answer of End unit assessment	1

LESSON 1: Logical functions

a) **Learning objective**

Explain the use of logical, functions and apply them in doing different calculations

b) Teaching resources:

Students need to use computers in the computer laboratory for practicing, Projector for projecting what they discussed, textbooks and internet connectivity to facilitate research

c) Prerequisites

Students are now familiar with application programs installed in computers. As they learnt in Unit 4: Spreadsheet Basics learnt in **Senior Two**, they can therefore apply the same reasoning on Logical functions now to be learned in Year Two.

d) Learning activities:

Guidance:

- The lesson starts by analyzing questions in the activity 1.1. If answers can't be found, students are told that by the end of the lesson they will be able to answer them
- By the guidance of the teacher students explain what **Logical Function** is and brainstorm on it.
- Students give examples of **Logical Function**
- Individually and under the guidance of the teacher, students discuss the different types of logical function use each one of them
- Students do the questions in the activity 1.1 that were not answered at the beginning of the lesson.
- The teacher gives guidance on how to do application activity 1.1
    - **Answers for activity 1.1**

Names	Marks in Biology	Marks in Chemistry	Rewarded with a laptop	Rewarded with a dictionary	Not rewarded
Kabera	70	92	Not	Yes	Not
Umutoni	84	88	Yes	Not	Not
Mugabo	60	75	Not	Not	Yes
Isimbi	90	93	Yes	Not	Not
Uwase	55	70	Not	Not	Yes
Uwacu	70	81	Not	Yes	Not
Gihozo	98	95	Yes	Not	Not
Rugwiro	83	78	Not	Yes	Not

Kamikazi	62	68	Not	Not	Yes
Gakuru	80	82	Yes	Not	Not
Total laptops/dictionaries given					

a. Excel function to find students who are to be rewarded with a Laptop,
b. 3
c. dictionary and not rewarded is =IF(C6>80,"Yes","No").
d. 4 laptops and 3 dictionaries
e. Chemistry
f. Biology

e) Application activities 1.1

Answers:

a) Students answer the questions using students' book
b) Second

LESSON 2: Advanced Math Spreadsheet functions

a) **Learning objective**

Recognize the importance of math functions and apply them

b) **Teaching resources:**

Computers in the Computer Lab with Microsoft Office 2013 and above installed, Projector, Internet, textbooks to facilitate the research

c) **Prerequisites**

Students are now familiar with Microsoft excel spread sheet. As they learnt in Unit 1: advance spreadsheet in the section on logical function, then student can therefore apply the same reasoning on Advanced Math Spreadsheet functions.

d) **Learning activities:**

- **Guidance:**

- The activity is going to be done individually.
- By the guidance of the teacher, students explain what **Advanced Math Spreadsheet functions** is and brainstorm on its history

- Student gives examples of **Advanced Math Spreadsheet functions**
- In individually and under the guidance of the teacher, students discuss the different types of Advanced Math Spreadsheet functions
- For each mathematical function given, a practical example is demonstrated and the whole class practice using that function
- Students do the questions of activity 1.2 that were not answered at the beginning of the lesson
- The teacher gives guidance on how to do the Application Activity 1.2

Answers for activity 1.2

(1& 2 & 3)

Name	ICT/50	English/50	Roman	Average	Root
Munezero	35	28	XXXV	32	5,6124861
Iradukunda	28	29	XXVIII	29	5,3385391
Bagwaneza	40	33	XL	37	6,041523
Bamurange	35	28	XXXV	32	5,6124861
Kwizera	27	33	XXVII	30	5,4772256
Butera	42	29	XLII	36	5,9581876
Uwase	35	15	XXXV	25	5

4) The conversion from roman style to Arabic style number is done by the function ROMAN ( )

e) **Answers of application activity 1.2**

1. Students answer the questions using student's book
   a) ARABIC("MCCIII)=1203
   b) ARABIC("XLIX") =49 c) ARABIC("CMV") = 905
   d) ARABIC("XXIII") =23

1

LESSON 3: Advanced Statistical Spreadsheet functions

a) **Learning objective**

Apply statistical functions to carry out different calculations

b) **Teaching resources:**

Computers in the computer laboratory and preferably one for each learner, Projector, textbooks and internet connectivity to facilitate research

c) **Prerequisites**

Students are now familiar with Microsoft excel spread sheet as they learnt in Unit 1: advance spreadsheet in section logical function. Students can therefore apply the same reasoning on Advanced Statistical Spreadsheet functions.

d) **Learning activities:**

- **Guidance:**

- Students analyze the table in the activity 3 and try to fill it by doing calculations (but not using Excel).
- The teacher then introduces the lesson by stating that such calculations will be done using Excel
- By the guidance of the teacher, students explain the term **Advanced Statistical Spreadsheet functions and** brainstorm on it.
- Students give examples of **Advanced Statistical Spreadsheet functions**
- Individually and under the guidance of the teacher; students discuss the different types of Advanced **Statistical Spreadsheet functions** and do practice on them
- Using Excel Students do questions in the activity 1.3
- The teacher gives guidance on how to do the application activity 1.3

- **Answers for activity 1.3**

a) =AVERAGE(B2:D2) this formula must be applied in the first cell then apply it to other cells by scrolling it down.

Name	ICT	Biology	Mathematics	Total Marks	Average
Rutikanga	98	78	95	271	90
Mukagasana	99	86	60	245	82
Murekatete	60	90	92	242	81
Gatete	90	73	50	213	71

b) i) Mukagasana ii) Murekatete iii) Rutikanga
Those with more marks in a subject are got by using the max function and searching for the name having those marks.

e) Answer Application activity 1.3

Answers to question a, b, c and d are in the table below:

	Names	ICT/40	ENGLISH/40	MATHS/40	AVERAGE	AVERAGEIF	LARGE	MEDIAN FOR ICT
2	MULISA	34	27	35	32			30
3	MUTONI	25	30	32	29			26
4	KABANDA	39	39	15	31			30.5
5	KABERA	35	25	17	26		35	26
6	KAGIRIMP	37	27	30	31			25.5
7	MUTONI	25	39	38	34	26		25
8	MUTETERI	26	36	36	33			22
9	MUTONI	18	25	39	27			18

LESSON 4: Text spreadsheet functions

a) Learning objective

Use text Excel functions to manipulate text and appreciate the importance of these functions in easing the work on text.

b) Teaching resources:

Computer laboratory which contain a computer for each student teacher, Projector, textbooks and internet to facilitate research.

c) Prerequisites

Students are now familiar with Microsoft excel spread sheet as they learnt in Unit 1: advance spreadsheet in section logical function. Students can therefore build on the skills and knowledge acquired in that and understand easily the new lesson.

d) d) Learning activities

- **Guidance:**

- The teacher presents the scenario in the activity 1.4 to the students and the whole class debate on it by brainstorming on the size of work if the problem is manually solved
- By the guidance of the teacher, students explain what Text spreadsheet functions is and brainstorm on it.
- Students give examples of Text spreadsheet functions they may know

- In pairs and under the guidance of the teacher, Students discuss the different types of Text spreadsheet functions and practice using them following an example given on the black board
- Students do the questions of the activity 1.4. which were not solved at the beginning of the lesson
- The teacher gives guidance on how to do the application activity 1.4.

a) Answers for activity 1.4

Answer 1: As Mukamana is not familiar with the text manipulation functions she will use copy/ paste function to make Table 1 look like table 2. This will take her a lot of time.

Answer 2: If combining names by copy and paste takes one second and combining phone numbers also takes one second working on one row will take two seconds meaning that the whole document will take 2000 seconds (2*1000) equivalent to 33 minutes

Answer 3: To make Table 1 look like Table 2 first make the Last Name be in capital letter by using the UPPER ( ) function and make the First Name be in small letter with the first letter in capital by using the PROPER ( ) then combine the two rows by using the CONCATENATE ( ) but don't forget to insert in space.

The phone number columns are combined into one column by using the concatenate function but remember also to put in the "or" text

Answer 4: Using the UPPER ( ) function, the PROPER ( ) function and the CONCATENATE ( ) function in order to make Table 1 look like Table 2 can take less than 30 seconds.

e) Answers of Application activity 1.4

Answers:1. d

2. =CONCATENATE (A1&" ,"&A2&" ,"&A3)
The & symbol is used to insert in the final results characters that were not in the cells A1, A2 and A3.

LESSON 5: Using formula & functions from different sheets

a) Learning objectives

Explain the need to use formula and functions from different sheets and use them

b) Teaching resources:

Computer Lab., Projector, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with Microsoft excel spread sheet. As they learnt in Unit 1: advance spreadsheet in section logical function, therefore they can apply the same reasoning on Using formula & functions from different sheets.

d) Learning activities:

Guidance:

- The lesson is started by presenting the scenario in the activity 1.5 or any other scenario made by the teacher to make learners understand that there is always a need to combine data from different sheets
- The teacher gives an exercise that learners do in a short time. Learners who did the exercise properly explain how they did it
- An explanation on how to use formula and functions on data from different sheets is done
- Exercises are given so as to master using those formula and functions
- Teacher ask others students to comments on the results presented.
- Teacher gives instructions on how to do the Application activity 1.5

- **Answers for activity 1.5**

Learners discuss how they can combine data from different sheets. The teacher guides them to make sure the discussion is accurate.

e) Application activity 1.5

Answers: Students calculate the average by using formula which fetch data from all the three sheets.

LESSON 6: Protecting worksheet style, contents and elements

a) Learning objectives

Apply spreadsheet security features to protect them against unwanted changes

b) Teaching resources

Computer Lab, Projector, textbooks and internet connectivity to facilitate research

c) Prerequisites

Students are now familiar with Microsoft excel spread sheet. As they learnt in Unit 1: advance spreadsheet in section logical function, then students can therefore apply the same reasoning on Protecting worksheet style, contents and elements.

d) Learning activity

- **Guidance:**

- The teacher presents a scenario to make learners discover that protection of excel documents and sections is necessary
- Teacher asks students to read the activity 1.6 and give an advice as requested
- The teacher demonstrates how to protect and unprotect a worksheet, how to lock and unlock cells and for each demonstration students are given an exercise
- Teacher walks among learners to help those having difficulties in doing the exercises given
- Teacher gives instructions to do the Application activity 1.6

- **Answers for activity 1.6**

a) The Advice to the head teacher is to protect cells of first and second term in worksheet

b) The only thing to do is to unprotect cells protected

e) Application activity 1.6

1&2&3) Students answer the questions 1, 2 and three by referring themselves to the steps given in the Student Teacher's book.

LESSON 7: Data validation

a) Learning objectives

Protect and secure a spreadsheet or cells within a spreadsheet

b) Teaching resources:

Computers in the computer lab to make sure every learner has one, Projector, textbooks and internet connectivity to facilitate research

c) Prerequisites

Students are now familiar with Microsoft excel spread sheet. They learnt in Unit 1: advance spreadsheet in section logical function. Learners can therefore apply the same reasoning on Data validation

d) Learning Activity

- **Guidance:**

- Teacher organizes students in pair in order to do activity 1.7 in 10 minutes
- Teacher walks around and sees if students are doing activity in their respective pairs
- In Pairs, Students present their findings on Data validation.
- The teacher demonstrates how to protect data and learners follow suit
- The teacher gives guidance on how to do the application activity1.8

- **Answers for activity 1.7**

- Learners discuss how to fix the length of the ID so that some users don't enter more than 16 digits
- The suggested message to appear in case the entered word is not valid is "The entered number is not in range "

e) Application activity 1.7

1&2) Learners answer question 1 and 2 by referring themselves to the content in the Student teacher's book and the teacher makes sure the learners reasoning is correct.

1. Learners apply validation on the given table to make sure an input message on Idnumber is created
2. Learners create the validation to make the IdNumber be between 1000 and 7777

LESSON 8: Using other Excel templates

a) Learning objectives

Use various Excel templates to make different excel documents

b) Teaching resources:

Computers in the computer laboratory, Projector for displaying examples to learners, textbooks and internet to facilitate the research

c) Prerequisites

Students are now familiar with application programs installed in computers. They learnt in Unit 4: Spreadsheet Basics learnt in **senior two**. They can therefore apply the same reasoning on using other Excel templates.

d) Learning activity

- **Guidance**

- The teacher presents the scenario to make learners be motivated to know about the different templates which are loan amortization template, calendar, monthly company budget, student schedule, etc
- By the guidance of the teacher; students open excel and cite the different templates
- With learners; the teacher explores the excel templates and demonstrate how to use them
- For each template demonstrated, learners practice using them
- Students choose projects that they will do as homework. Here the teacher makes sure all templates are covered
- The teacher gives guidance on how to do application activity 1.8

Answers for activity 1.8

Answer 1: ICT Club members in order to make a school calendar, they are going to use "**Excel Academic calendar Template**"

Answer 2: a&b)

The answer is summarized in the table below:

LOAN SUMMARY	
Scheduled payment	108,712
Scheduled number of payments	60
Actual number of payments	60
Total interest	1,522,726.92

e) Answer of application activity 1.8

The questions in this application activity can be answered by referring to the student teacher's book content

1.6. Summary of the unit

This unit was entitled "Advanced spread sheet functions". It deals in general with complex functions / advanced excel function like logical functions, statistics function, text function, Microsoft excel validation and Microsoft excel template. The present unit greatly focused on detailing possible results which are got by using functions and formula.

The first section of this unit deals with possible Logical Function as a features in Excel that allows excel users to introduce automated decision-making when executing formulas and functions like "If", "and", "or", "not" etc. The next step is advanced

Math Spreadsheet functions that helps to perform operations on a cell content based on special criteria set by the writer or commanding man. Some of the functions discussed were Abs ( ), Arabic ( ), Roman ( ), Base ( ), Mod ( ) and Sqrt ( ).

All of these functions are helpful in the elaboration of statistical data needed in the spreadsheet space.

Lastly, the unit assessed the essential of validation and template forms which can be used in Microsoft excel. A validation rule controls any kind of data that can be entered into a certain cell. Microsoft Excel template is a powerful part of Excel experience and a great way to save time. Excel templates help to create consistent and attractive documents that impress like calendars.

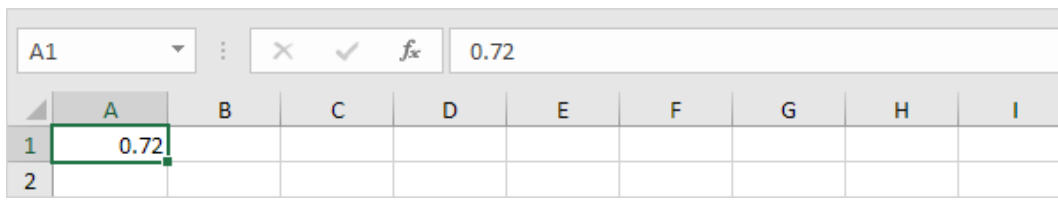
1.7. Additional information

Percentage function

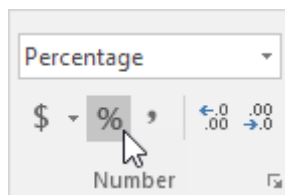
Enter a Percentage

To enter a percentage in Excel, execute the following steps.

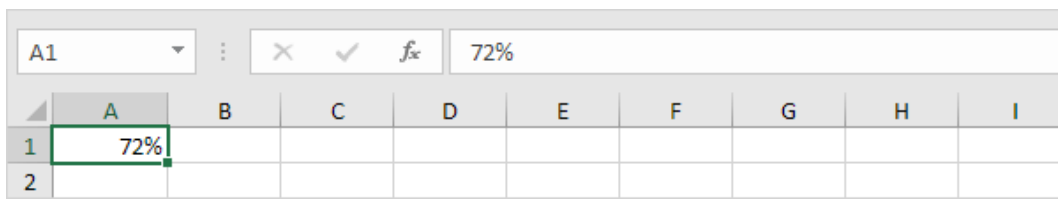
Step 1: First, enter a decimal number.



Step 2: On the Home tab, in the Number group, click the percentage symbol to apply a Percentage format.



Result.

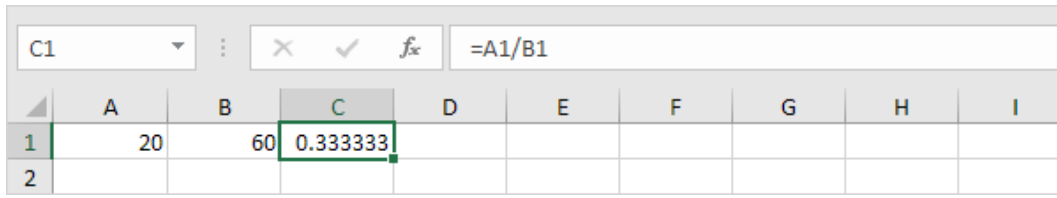


Note: to change the percentage in cell A1, simply select cell A1 and type a new percentage (do not type a decimal number).

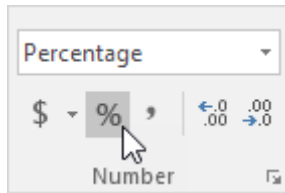
Percentage of Total

To calculate the percentage of a total in Excel, execute the following steps.

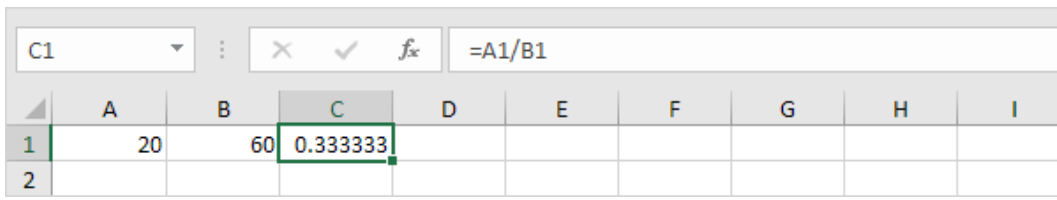
Step 1: Enter the formula shown below. This formula divides the value in cell A1 by the value in cell B1. Simply use the forward slash (/) as the division operator. Don't forget, always start a formula with an equal sign (=).



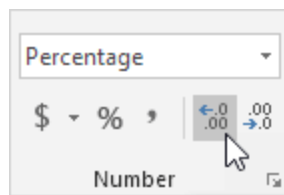
Step 2: On the Home tab, in the Number group, click the percentage symbol to apply a Percentage format.



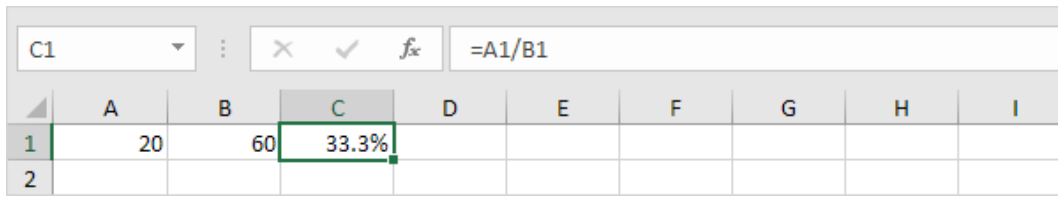
Result.



Step 3: On the Home tab, in the Number group, click the Increase Decimal button once.



Result.



Note: Excel always uses the underlying precise value in calculations, regardless of how many decimals you choose to display.

1.8. End Unit Assessment Answers

Answer 1:

1	Names	Set	Maths	Sqrt /set	Base/Maths
2	Kalisa	12	18	3.46410162	10010
3	KAMANA	18	17	4.24264069	10001
4	MUTONI	16	13	4	1101
5	MURENZI	10	20	3.16227766	10100

Answer 2:

To convert the names use the following formula:

=LOWER(KAMANA)
=LOWER(MUTONI)
=LOWER(MUREZI)

Answer 3:

=CONCATENATE(A2,"",A5)

Answer 4:

To answer question 4 use, the content in the student teacher's book.

1.9. Additional Activity

1.9.1. Remedial activity

The table below contains students' marks.

Name	French	English	Mathematics	Total	Average
Uwera	**92**	**74**	**93**		
Munezero	**94**	**86**	**65**		
Munyana	**65**	**93**	**92**		
Umulisa	**94**	**77**	**55**		

Answer the questions that follow:

a) Calculate the Total and average marks of every student

b) Give the name of the one who has more marks in:

i) French
ii) English
iii) Mathematics

1.9.2. Consolidation activities

You are given the following data in Microsoft Excel data sheet.

Name	ICT/50	English/50	Kinyarwanda/50	Roman	Square Root
Rugwiro	35	28	25		
Iradukunda	28	29	32		
Bajeneza	40	33	43		
Bamurange	35	28	37		
Mizero	27	33	45		
Buregeya	42	29	28		
Uwase	35	15	20		

Answer the questions below:

1. Convert ICT marks into roman style
2. Discuss how to calculate the total and average of students
3. Calculate the square root of Kinyarwanda marks?
4. Convert Mizero and Iradukunda into capital letter

1.9.3. Extended activities

You are given the following data in Microsoft Excel data sheet.

Name	**Age**	**School**	**Marks**
Kalisa	12	G.S Mushubati	70
Gatete	15	G.s MWENDO	73
Kamana	20	ESC.RUHANGO	70
Tumushime	17	TTC MUHANGA	73

a) Find the youngest student?

b) Find the absolute value of Marks?

c) Find the mode value of age?

d) Convert TTC MUHANGA and ES.RUHANGO into lowercase?

e) Find the medium marks value of age

UNIT 2. ADVANCED POWER POINT PRESENTATION

2.1. Key unit competence

Create a power point presentation to address a bigger audience.

2.2. Prerequisite

Students have knowledge and skills related to presentation as they learnt Unit 6 on Presentation in Senior 3. The basic knowledge they got in this unit will enable them to easily learn this new unit

2.3. Cross-cutting issues to be addressed

Peace and value education: Students must be aware that presentations should not be offensive, they should use appropriate language while presenting and should consider that in the audience there are people of different culture who can be offended easily.

Gender education: learners are to be aware that to conduct a good presentation or for a presentation to be good the presenter does not have to be male or female

Standardization culture: While presenting, students must have the culture of not using terms, words, pictures and gestures that are against the Rwandan culture.

2.4. Guidance on the introductory activity

- The teacher organizes learners into pairs and instructs them to answer questions in the introductory activity
- The teacher gives guidance wherever learners want one.
- The teacher invites pair to present their findings by using a projector
- The teacher asks students to evaluate findings and decide whether PowerPoint presentation program is necessary or can be replaced by other programs.

Answers to the introductory Activity

Answer 1: The application program that is opened in the projection is "Ms Office Power Point "

Answer 2: Ms Office PowerPoint is the application program used in presentation document.

Answer 3: Learners connect a projector to a desktop computer or to a laptop computer.

2.5. List of lessons

#	Lesson title	Learning objective	Number of periods
1	Creating, copying and inserting slides	Creating presentations and insert in new slides Manipulate the created presentation by using different options like copy, hide…	2
2	Managing slides	Managing slides by using the different options so as to make the presentation more professional	2
3	Apply design themes and format background	Create a presentation and apply themes to slides and format background	2
4	Adding notes and comments, inserting header and footer	Insert meaningful header & footer and comments to a PowerPoint Presentation	2

5	Add sound and animation to slides	Add sound and animation into slides and appreciate its importance in a presentation	2
6	Add audio and video content	Create a presentation and insert audio and video to make it more entertaining	2
7	Slide transition	Apply different transitions to slides into created presentation	2
8	Presenting using power point	Conduct an effective presentation using PowerPoint and a projector	1
9	End unit assessment		1

LESSON 1: Creating, copying and inserting slides

a) Learning objectives

- Creating presentations and insert in new slides
- Manipulate the created presentation by using different options like copy, hide.

b) Teaching resources:

Computer laboratory containing at least one computer for each learner., Projector, internet, textbooks and internet connectivity to facilitate the research

c) Prerequisites

Students are now familiar with programs installed in computers as they learnt Unit 6 in senior 3 on presentation; they can therefore apply the same reasoning in using PowerPoint.

d) Learning activities:

- **Guidance:**

- Under the guidance of the teacher, students open PowerPoint
- The teacher demonstrates how to create slides, inserting slides, copying slides
- The teacher instructs learners to create a PowerPoint presentation on Good
- Money Habit as instructed in the activity 2.1
- The teacher moves to help learners in their writing of the presentation
- Learners present some of their presentations
- Teacher gives guidance on how to do application activity 2.1

Answers for activity 2.1

Answer 1: learners give answer to the question but the following elements should be in the answer:

Content of the presentation:

- Design the PowerPoint correctly by not making longer paragraphs and making text have appropriate size (preferably not below 28)
- If possible provide notes and comments in the provided area that will help you while presenting.

Presenting:

- Master the content to present, present with poise and use appropriate language
- Know that what you are presenting is not only on the screen so have broader knowledge of your presentation so as to provide additional explanations which are not necessarily in the presentation
  - Involve the audience for better understanding of your presentation

Answer 2: Steps to do this Answer 2 are available in the Students book.

e) Application activities 2.1

(1&2) Students choose a topic in "Kwita Izina" and create a presentation on it. They also present their topics to their colleagues using a projector

3) Presenting using paper notes without computers and projectors is less attention captivating to the audience and will require distributing printouts which is time consuming and more expensive

LESSON 2: Managing slides

a) Learning objectives

Managing slides by using the different options so as to make the presentation more professional

b) Teaching resources:

For this lesson to be properly conducted every learner should have a computer for practice. There is also a need for a projector to be used by the teacher for demonstration, textbooks and internet connectivity for research.

c) Prerequisites

Students are now familiar with Microsoft Office programs installed in computers. As they learnt Unit 6 in senior 3 on presentation. They can apply knowledge acquired to this lesson to be learnt.

d) Learning activities:

- **Guidance:**

- Under the guidance of the teacher, students in pairs, create a PowerPoint presentation on the importance of ICT.
- After observing the demonstration of the teacher; students practice hiding, moving, rearranging, deleting and dividing slides into sections using the presentations they created
- Teacher walks around and sees if learners are practicing as per the example given and provide support to the needy learners
- A few pair of students show the presentation to the rest of class
- Teacher shows students how they arrange the slides in the presentation
- Teacher gives instructions on how to do the Application activity 2.2

- **Answers for activity 2.2**

Students create a PowerPoint presentation having 10 slides and hide the last two slides

e) Answers of application activity 2.2

Steps to Create distinctive sections in the presentation are available in students' books. Therefore; they create a presentation" The role played by ICT in the country development "and create in that presentation 3 sections namely a section on "Benefits of using ICT in Rwanda as a country"; another on "Importance of technology in the development of the country" and the last section on "Role of ICT in bringing about changes"

LESSON 3: Apply design themes and format back ground

a) Learning objectives

Create a presentation, apply themes to slides and format background

b) Teaching resources:

For this lesson, every student will have a computer for practice
Computer Lab, Projector, internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with Microsoft Office programs installed in computers. They learnt Unit 6 in senior 3 on presentation; they can therefore apply the acquired knowledge in learning this lesson

d) Learning activities

Guidance:

- The teacher shows to learners a PowerPoint presentation having all the features to learn
- Methodically and step by step learners under the guidance of the teacher discover how to insert the features like the ones in the teacher's presentation.
- Teacher moves among students to help those having difficulties an practicing the creation of the show features
- A few pairs of students show the presentation to the rest of the class
- Teacher give instructions to do the Application activity 2.3

Answers for activity 2.3

Tips used to make effective and more attractive PowerPoint presentations are shown in the student book in the section "Apply Design themes and format background".

e) Answers of application activity 2.3

Students create presentation "Understanding Gender Equality". All steps to apply themes, change background and adding a section to the existing presentation are available in the students' book.

LESSON 4: Adding Notes and Comments, Inserting Header and Footer

a) Learning objectives

Insert meaningful header & footer and comments to a PowerPoint Presentation

b) Teaching resources:

For this lesson the teacher and students will need computers for each learners, Computer lab, Projector, internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with programs installed in computers. As they learnt Unit 6 in senior 3 on presentation; they can therefore apply the same reasoning in inserting header and footer.

d) Learning activities

- **Guidance:**

- Teacher shows to the learners a PowerPoint presentation in which notes, comments, header and footer have been inserted
- Learners discover the name of what they see (notes, comments, header and footers) in the shown presentation
- Under the guidance of the teacher and after the teacher's demonstration, learners practice inserting notes, comments, header and footer in a PowerPoint presentation document.
- The teacher moves among the learners to help those that may be facing difficulties
- The teacher instructs learners to do a PowerPoint presentation on "Inborn reflexes" containing at least 15 slides as it is asked in the activity 2.4
- Teacher gives instructions to do the Application activity 2.4

- **Answers for activity 2.4**

Students create a presentation with 15 slides "**on Inborn Reflexes**",they add notes, comments and a header on slide of the presentation. All steps to do this activity are available in the student teacher's book.

e) Answers of application activity 2.4

(1&2) learners differentiate header and footers and discuss the importance of notes and comments by referring themselves to the Students' book in the section on "Adding notes and comments, inserting header and footer"

3) Learners create a presentation on "Quality and Accessibility of ICT services in Rwanda". They get the content to use from the internet or any related book

LESSON 5: Add Sound and Animation to Slides

a) Learning objectives

Add sound and animation into slides and appreciate its importance in a presentation

b) Teaching resources:

For this lesson, every learner will need a computer. There will also be a need of a projector to facilitate demonstration by the teacher and books & internet connectivity to facilitate research.

c) Prerequisites

Students are now familiar with PowerPoint, how to apply themes and change background formats. As they learnt importance of theme and fonts in slides in previous lessons. They can therefore apply the acquired knowledge in this lesson.

d) Learning activities:

- **Guidance:**

- The teacher shows a PowerPoint presentation containing sounds and animations
- The teacher asks questions related to the observed slides. They identify that the observed slides have sounds inserted and slides are animated
- The teacher demonstrates how to insert a picture in slides, instructs learners to do the same and moves to help those having difficulties
- As on inserting pictures, the teacher shows how to animate text or a picture, how to set an animation delay and how to customize animation effects. For each item, the teacher does a demonstration, instructs learners to apply the shown steps to do the same and helps those that may be having difficulties.
- Under the guidance of the teacher, students do the activity 2.5. Some students show the presentation to the rest of class
- The teacher gives guidance on how to do application activity 2.5

- **Answers for activity 2.5**

Answer 1: Benefits of using multimedia in presentation are: providing more details or explanation to the content, helping the audience to understand more about the presentation, giving good appearance and more attraction to the presentation

Answer 2: Students improve the presentation on "Quality and Accessibility of ICT services in Rwanda "by adding in images that are related to the context.

e) Answers of application activity 2.5

Students create a PowerPoint presentation on **"The use of ICT in teaching science in the classroom**" and insert pictures animate the presentation as instructed in the question by using the steps shown in the Student teacher's book.

LESSON 6: Add audio and video content to slides

a) Learning objectives

Create a presentation and insert audio and video to make it more entertaining

b) Teaching resources:

For this lesson to be conducted there will be a need for a computer for each learner, a projector to facilitate demonstration, textbooks and internet connectivity for research.

c) Prerequisites

Learners are familiar with PowerPoint presentation learnt in Senior 3 and have learned some lessons in this unit which can serve as prerequisites to the new lesson.

d) Learning activities:

- **Guidance:**

- The teacher starts the lesson by asking students the role of video and audio in a presentation.
- Students give their views on the role of video and audio in a presentation.
- Under the guidance of the teacher and after the teacher's demonstration, students practice inserting audio or video, inserting a recording and inserting a screen capture
- The teacher moves among learners to help those having difficulties
- Under the guidance of the teacher, students do the activity 2.6.
- Teacher walks around and sees if students are doing activities individually
- Some students show the presentation to the rest of class
- The teacher gives guidance on how to do application activity 2.6

- **Answers for activity 2.6**

All the steps to insert a video into a slide are in the students' book. Students can refer to those steps to do the activity.

e) Answer of application activity 2.6

Students create the requested PowerPoint presentation by using the steps shown in the student teacher's book.

LESSON 7: Slide transitions

a) **Learning objectives**

Apply different transitions to slides into created presentation

b) **Teaching resources:**

For this lesson there will be a need for computers (a computer for each learner), a projector to facilitate demonstrations by the teacher, textbooks and internet connectivity to facilitate research

c) **Prerequisites**

Students are now familiar with PowerPoint as they learnt it in Ordinary level and in some lessons learnt in this unit. This knowledge can serve as a prerequisite.

d) **Learning activities**

- **Guidance:**

- Teacher plays a slideshow of a presentation having slides transitions
- Students discuss what they saw in the presentation and the importance those new features may have in improving the qualities of a presentation
- The teacher shows the different slide transitions and how to use them
- Students practice using the different slide transitions and make a presentation on "Saving culture" as asked in activity 2.7
- Teacher walks around and sees if learners are doing the exercises properly and provides help where needed
- Some students show the presentation to the rest of class
- Teacher give instructions to do the Application activity 2.7

- **Answers for activity 2.7**

Learners do the activity by referring themselves to the Students' book in which are all the steps on how to apply slide transition.

e) **Answers of application activity 2.7**

Students create a PowerPoint presentation on "Education for all". They use the steps shown in the Students' book or do their own discoveries in order to change the font, change the animation, …

LESSON 8: Presenting using power point

a) Learning objectives

Conduct an effective presentation using PowerPoint and a projector

b) Teaching resources:

For this lesson every learners will need a computer for creating PowerPoint presentations, a projector to conduct presentations, a printer to print handouts.

c) Prerequisites

Students are now familiar with power point; they know each necessary point to make a good presentation and to make it more attractive. They can now use all learnt in previous lessons to make a good presentation to the big audience.

d) Learning activities

- **Guidance:**

- Teacher organizes students in groups of 5 to do the activity 2.8 which can take up to 10 minutes
- The teacher demonstrates how to connect and use a projector
- Students are aware that handouts are necessary in a presentation and discuss their role in making a good presentation
- Students discuss the points that have to be met to make a good presentation
- Groups are given time to improve the presentation they made at the beginning of the lesson and print handouts to use
- Sample groups present in front of the whole class and other students ask questions
- At the end of each presentation, a criticism on each is done to evaluate the effectiveness of the presentation
- Teacher give instructions to do the Application activity 2.8

- **Answers for activity 2.8**

Answer 1:

Students answer this question by showing that for a presentation to be effective, it must be thoroughly prepared by making sure that the presenter master what to present and that all tools are in place and properly working

Know also that feedback is necessary and have a good attitude even toward negative feedback

Answer 2: Doing presentation using papers is very problematic because audience will lose focus easily. Reaching the effectiveness will be hard.

e) Answer of Application Activity 2.8

Answer 1:

Qualities a presentation should have:

- Short and concise sentences which are bulleted
- Highlight important points by using animations and transitions

- For long slides provide short partial synthesis to make the audience keep track of what is so far presented
- Rehearse the presentation and use scripts and notes to help you not forget the important points to mention
- Be polite and use appropriate language.

Answer 2: Options to use when a projector is connected to a computer are:

- Disconnect projector
- Duplicate
- Extend
- Projector only

To reach these options hit the windows key in combination with the letter "P" key

2.6. Summary of the unit

PowerPoint is **a** complete presentation Graphics package. It gives everything that we need to produce **a** professional-looking presentation to big audience.

Using Projector, big screen or a wall, PowerPoint is the best way to present to the big audience.

PowerPoint offers word processing software, outlining, drawing, graphing, and presentation management tools- all designed to be easy to use and learn.

To give more appearance and more attractiveness to the presentation, PowerPoint offers different options to apply to slides created in the presentation. It gives different ways to animate the slides and contents, and also gives the ways to use sounds and video in presentation.

In PowerPoint, there is a last option to print out the handouts; either they can be given to the audience or they can be kept as hardcopies of the presentation.

2.7. Additional information

Shapes

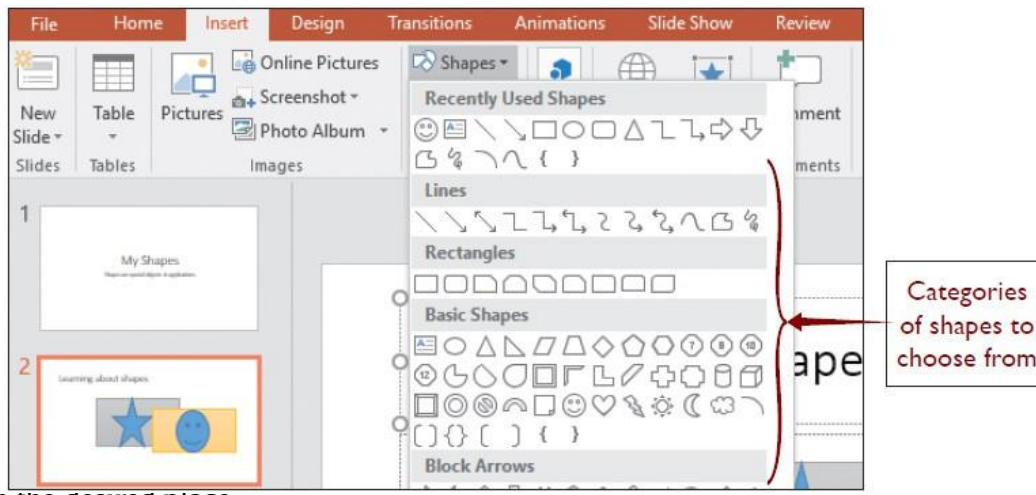
A shape is an outline form of an object. In office applications such as Microsoft PowerPoint, you can add shapes such as boxes, circles and arrows to your slide show presentation.

Insert a shape

Use the steps given below and insert any type of shape you want. Open Nature-protect file or create a new presentation. In the open file create a new slide for your shape(s) as slide 10.

Step 1: Click on **Insert** tab.

Step 2: Click **Shapes** from the **Illustrations** group.



s e in the desired place.

After drawing a shape, you can add text, bullets and numbering to them. You can also change their fill, outline and other effects on the Format tab.

2.8 Answers of End unit assessment

Students create a presentation of 12 slides on the topic “Nature-Protect” by using the knowledge acquired throughout the lessons of Unit 2.

2.9. Additional activities

2.9.1. Remedial activities

1. Define a presentation

   A presentation is an organized report or message prepared as a talk before an audience, with the help of a computer program.

2. Differentiate a page to a slide

   A slide refers to a single page of presentation while a page is one or both sides of a sheet of paper in a book or in word document

3. Create a presentation with 3 slides, and apply the following activities:
   - Write Hello world in first slide
   - In second slide, introduce your self
   - Copy the third slide and make a presentation of 4slides.

4. Save your presentation as My presentation

2.9.2. Consolidation activities

1.Create a presentation on early marriage in Rwanda society. Your presentation must have 5 slides with animation in the last slide.

2.8.3. Extended activities

Create a presentation on early pregnancy in Rwandan young girls

a) On slide 2, select the text box that contains presentation title, and add a Pulse animation from the Emphasis group.
b) In the same text box, add a Wipe animation from Entrance group.
c) Change the Effect Options so it wipes From Left.
d) Add note and comments to help the presenter
e) Change the Start options for the Pulse animation so it starts After Previous.
f) Add sound and video to make audience more attentive
g) Add date on slides as footer
h) Save the presentation.

With the guidance from the teacher, connect the computer to the projector and present to the rest of the class.

UNIT 3. COMPUTER GRAPHICS TOOLS

3.1. Key unit competence:

To be able to use graphic tools in capturing and editing images

3.2. Prerequisite

Students should have knowledge and skills related to computer graphics learnt in senior 3, unit 7 introductions to computer graphics.

3.3. 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.

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

Peace and value education: Students must be aware of crimes that are committed using computer graphics on different websites or in magazines.

They must also use the photo of others with their permissions, if not; this can cause conflict.

Environment and sustainability: Students should be informed about the refurbishment and disposal of perished photo capturing tools.

Standardization culture: Students must have the culture of not taking and keeping pictures that are against Rwandan culture.

3.4. Guidance on the introductory activity

- Teacher organize student teachers into pairs in order to observe the image in the introductory activity and answer related questions
- Teacher gives students time to discuss about the image observed
- The teacher asks students to do the introductory activity in their respective pairs.
- Teacher asks the students to work independently for 10 minutes into their pairs.
- Teacher moves around to see how students are working and provides guidance.
- Teacher invites some pairs to presents their findings
- Teacher asks students to evaluate the findings.

3.5. List of lessons

#	Lesson title	Learning objective	Number of periods
1	Introduction to computer graphics	Explain different concepts related to computer graphics	2
2	Image formats	Differentiate the types of image formats and calculate their size	3
3	Image capturing tools	- Identify and describe the parts a camera and scanner - Use a camera and a scanner	3
4	Screen shot capturing	Identify ways of capturing a screenshot from a computer and apply them	2
5	Graphics software-paint	Edit digital graphics images using MS-Paint	3
	End unit assessment	Answer the Answers of End unit assessment	2

LESSON 1: Introduction to computer graphics

a. Learning objectives

Explain different concepts related to computer graphics

b. Teaching resources:

For this lesson the Teacher will need a video to explain the concepts like morphing, 2D image, 3D image. There is also a need to have a digital camera, a scanner and computers. For additional research textbooks and internet connectivity are needed

c. Prerequisites

Student teachers already learnt the Unit 7 in senior 3 on Introduction to computer Graphics. The prerequisites got in that unit will enable learners easily learn this new unit and lesson.

d. Learning activities:

- **Guidance:**

- The Teacher shows a scanned student ID card and an ID taken with a smart phone and the class discuss on their difference
- The Teacher ask questions which will make learners come up with the term “computer graphics”

- Learners define what computer graphics is and suggest different hardware tools that are used in computer graphics
- Under the guidance of the Teacher learners explain the different terms that are found in the computer graphics world. Such terms are: pixel, 2D, 3D, morphing, random scan, etc
- The activity is done individually.
- Teacher give instructions to do the Application activity 3.1

- **Answers of activity 3.1**

a. The difference between the scanned ID card and the picture of the ID card taken by the Smart phone is the quality of the picture. The picture of the photo taken by smartphone is clear (beautiful) than the scanned one.

Note: Be careful of the Camera used doing this activity. We recommend where it is possible to use High definition camera.

b. The cause of this difference is the resolution.

e. Answers of application activity 3.1

Answers for the application activity 3.1 are available in the content of the student teacher book.

LESSON 2: Image formats

a. Learning objectives

Differentiate the types of image formats and calculate their size

b. Teaching resources:

For this lesson to be efficiently conducted there is a need for computers to view different image formats and image size. There is also a need for a projector, textbooks and internet for additional research.

c. Prerequisites

Student teachers have some knowledge on computer graphics as they learnt it in Introduction to computers in Senior 3. These acquired knowledge will help learners in understanding this lesson.

d. Learning activities:

- **Guidance:**

- The Teacher shows different images having different formats and learners differentiate them

- Under the guidance of the Teacher, student teachers practice image compression, and calculating an image size
- Teacher give instructions on how to do the Application activity 3.2

- **Answers of activity 3.2**

The Answer 1 & 2 in activity requires the learner to describe the image formats in in the activity and to differentiate the image formats they see..

Answer 3: Save a document in proper file extension allows the operating system of the computer to identify the application software that opens it. It also prevents the file for not being lost and it helps to keep its originality.

e. Answers of application activity 3.2

Answers for questions 1 to 4 of the application activity 3.2 can be answered by reading the content available in student teacher's book

Answer 5:

To answer this question first we need to have the size of the flash disk in MB and in KB.

The size of flash disk in MB= 32* 1024=32,768 Mb

The size of the flash disk in Kb is 32768*1024= 33,554,432KB

The number of films can be kept on the flash= 32,768/ 600= 54 films

The number of documents= 33,554,432/900=37,282 Documents

LESSON 3: Image capturing tools

a. Learning objectives

- Identify and describe the parts a camera and scanner
- Use a camera and a scanner

b. Teaching resources:

Computer Lab, digital camera, scanner, internet, textbooks to facilitate the research

c. Prerequisites

Student teachers are now familiar with computer graphics and images. As they learnt Unit 7 in senior 3 on Introduction to computer Graphics; they can therefore apply the same reasoning on image capturing tools and how to use them.

d. Learning activities:

- **Guidance**

- The Teacher ask questions so that they discover different image capturing tools
- Under the guidance of the Teacher student teachers describe the parts of each image capturing tool (camera, scanner) and their parts

- The Teacher demonstrates how to use a camera and a scanner and student teachers follow the examples
- The Teacher gives guidance on how to do the application activity 3.3

- **Answers of activity 3.3**

Answer 1: The observed figure are: Digital camera and Scanner.

Answer 2: In our days, the device which is most useful in photo capturing is Digital camera.

e. Answers of application activity 3.3

Answers for the application activity 3.1 are available in the student teacher book.

LESSON 4: Screenshot capturing

a. Learning objectives

Identify ways of capturing a screenshot from a computer and apply them

b. Teaching resources:

This lesson requires that every learners have a computer with Windows operating system so as to have access to the snipping tool. These computers also have to have a keyboard with a PrtSC (Print Screen) key. There will also be a need for textbooks and internet connectivity for more researches

c. Prerequisites

Student teachers are familiar with the keyboard and know its different keys, they know copying and pasting which they will use to copy and paste images taken using the print screen key or the window snipping key

d. Learning activity

- **Guidance**

- The Teacher ask learners to identify specific keys that are on the keyboard so that they discover the print screen key
- Under the guidance of the Teacher, student teachers practice using the print screen key. They paste the taken images of the screen in word and edit them using the image tools
- Under the guidance of the Teacher, student teachers explore programs found in the **Accessories** and identify the one used to take screen images

- The Teacher demonstrates how to use the Snipping tool, how to paste an image in word and how to edit it and learners follow suit.
- The Teacher gives guidance on how to do the application activity 3.4

- **Answer of activity 3.4**

Answer 1: Student teachers give various answers, the right answer is that they are screenshots

Answer 2: There is various tools used to take a screenshot, the most used are: snipping tools and PrtSc (Print Screen)

Answer 3: Using snipping tools and PrtSc (Print Screen), you can take a picture of active window. More details are explained in the student teacher book.

e. Answers of application activity 3.4

1. The difference between an image and a snip is that Image is a visual representation of something while a snip is a small piece that is snipped off.
2. All steps to do to Answer 2 &3 are available in student teacher book.

LESSON 5: Graphic software -Paint

a. Learning objectives

Edit digital graphics images using MS-Paint

b. Teaching resources:

Computer Lab, internet, textbooks to facilitate the research

c. Prerequisites

Student teachers are familiar with image tools as they applied them while learning the snipping tool and the print screen tools. This knowledge can be used for more understanding of the lesson on Paint.

d. Learning activities:

- **Guidance:**

- The Teacher instructs learners to explore the Accessories programs and show the one used in manipulating images (Paint)
- The Teacher instructs learners to open the Paint program
- Under the guidance of the Teacher, student teachers identify the environment of different Paint tools and identify their use.
- Under the guidance of the Teacher, student teachers draw different shapes by using Paint
- Teacher walks around and sees if students are practicing well and provides help to those that may be having difficulties

- Teacher give instructions on how to do the Application activity 3.5

  - **Answers of activity 3.5**

All steps to do the activity 3.5 are available in student teacher book.

e. Answers of application activity 3.5

Answer 1: The difference between computer graphics and Paint is that computer graphics is the use of a computer and specialized programs to produce and manipulate pictorial images while paint program is a software that allows the user to draw or paint bitmapped images on a computer.

Answer 2: Paint is used for basic drawing and shape manipulation. It is used for pasting the screenshots from other applications and it is used for changing images from one format to another.
Answer 3: Paint is used to create, edit and modify pictures which can be used in advertisement which is a communication through various mass media, including traditional media such as newspapers, magazines, television, radio, outdoor advertising or direct mail; and new media such as search results, blogs, social media, websites or text messages,
Answer 4: The difference between the use of fill color tool and pick color tool is that Fill color tool is used to fill an area of similar color with another color while pick color tool is used to select a color on the active layer. By clicking a point on a layer, you can change the active color to that which is located under the pointer.

Answer 5&6) All steps to do Answer 5 & 6 are available in student teacher book.

3.6. Summary of the unit

Computer Graphics is an art of drawing pictures, lines, charts, etc, using computers with the help of computer programs. The term refers to computer-generated image data created with help from specialized graphical hardware and software.
Image compression is minimizing the size pf a graphics file without degrading the quality of the image to an unacceptable level. The reduction in file size allows more files to be stored in a given amount of disk or memory space.

The determination of an image's file size and dimensions differs according to the Operating System being used; On MS Windows computers, Open the image in Windows Explorer to check dimensions and file size by clicking the Windows Start button on the taskbar. After opening the folder containing the image, right clicking the icon of the image file, and in the pop up menu, click on property and details.

Image file formats are standardized means of organizing and storing digital images. Image files are composed of digital data in one of the formats that can be rasterized for

use on a computer display or printer. Image file format including TIFF, JPEG, GIF and PNG.

The images or pictures are captured or taken by different tools such as digital camera, those mobile phones, scanners etc. But those tools are different according to their parts and function.

A digital camera and a mobile telephone are devices which produce digital images that can be stored in a computer and displayed on screen while a scanner is an electronic device which can capture images from physical items (printed text, handwriting, photographic prints, posters, magazine pages, and similar sources) and convert them into digital formats, which in turn can be stored in a computer and viewed or modified using software applications.

Without using any tools, a picture of a working or a current window can be taken in two different ways: using snipping tool or using a Prt SC key

The environment should generally include hardware for display of pictures, and software tools that written programs can use to perform the actual drawing of pictures. There are commonly used software for producing graphics. An example of such software is Microsoft Paint.

Microsoft Paint or MS Paint is a basic graphics/painting utility that is used to draw, color and edit pictures, including imported pictures from a digital camera or somewhere else.

3.7. Additional information

In engineering and architectural systems, the products are modeled using computer graphics commonly referred to as CAD (Computer Aided Design). In many design applications like automobiles, aircraft, spacecraft, etc., objects are modeled in a wireframe outline that helps the designer to observe the overall shape and internal features of the objects.

Computer Art:
A variety of computer methods are available for artists for designing and specifying motions of an object. The object can be painted electronically on a graphic tablet using stylus with different brush strokes, brush widths and colors. The artists can also use combination of 3D modeling packages, texture mapping, drawing programs and CAD software to paint and visualize any object.

Entertainment:
Computer graphics methods are widely used in making motion pictures, music videos and television shows. Graphics objects can be combined with live actions or can be used with image processing techniques to transform one object to another.

Education and training:
Computer graphics can make better the understanding of the functioning of a system. In physical systems, biological systems, population trends, etc., models make it easier to understand. In some training systems, graphical models with simulations help a

trainee to train in virtual reality environment. For example, practice session or training of ship captains, aircraft pilots, air traffic control personnel.

Image processing:
Image processing provides techniques to modify or interpret existing images. One can improve picture quality through image processing techniques. For instance, in medical applications, image processing techniques can be applied for image enhancements and is been widely used for CT (Computer X-ray Tomography) and PET (Position Emission Tomography) images.

Graphical User Interface:
GUI is commonly used to make a software package more interactive. There are multiple window systems, icons, menus, which allow a computer setup to be utilized more efficiently.

a. Logo (abbreviation of logotype, from Greek: is a graphic mark, emblem, or symbol used to aid and promote public recognition. It may be of an abstract or figurative design or include the text of the name it represents as in a logotype or word-mark.

b. An illustration is a decoration, interpretation or visual explanation of a text, concept or process, designed for integration in published media, such as posters, flyers, magazines, books, teaching materials, animations, video games and films.

c. A magazine is a publication, usually a periodical publication, which is printed or electronically published (sometimes referred to as an online magazine). Magazines are generally published on a regular schedule and contain a variety of content.

3.8. End unit assessment

Answer 1:

a. **a pixel** is a minute area of illumination on a display screen, one of many from which an image is composed.
b. **a snipe** is a cut made by snipping tool
c. **Morphing** is a technique which involves using a computer to make an image on film or television appear to change shape or change into something else.
d. **Paint:** A paint program is a software graphics program that allows the user to draw or paint bitmapped images on a computer.
e. **Aperture** is camera part that affects the image's exposure by changing the diameter of the lens opening, which controls the amount of light reaching the image sensor.

Answer 2:

- JPEG: Joint Photographic Experts Group
- PNG: Portable Network Graphics
- CMOS: Complementary Metal Oxide Semiconductor

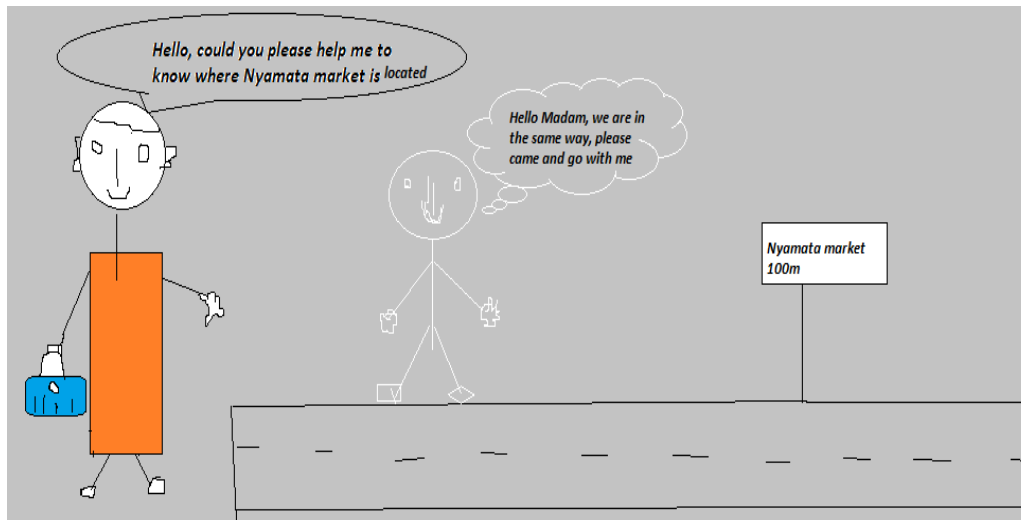
Answer 3: The importance of computer graphics in decoration services is that it is used to create decoration items

Answer 4: The file size of a color image in megabytes is: width * height * 3 = 780*1024*3=2,452,320 KB/(1024*1024)= 2.33 GB

Answer 5: the names of the different parts are available in the student book.

Skills Lab

By using Paint and text, make a pictured story on importance of ***using computer graphics in advertisement***. Be creative! The short story bellow is an example:



3.9. Additional activities

3.9.1. Remedial activities

1. Define computer graphic

Answer of this Answer refer to section 3.1 in student book

2. What does it mean by Morphing?

3. Differentiate digital camera to scanner

Answer of this Answer is referred to lesson 3.3

1. Draw a blue car and save it.

3.9.2. Consolidation activities

1. What is image compression?

Image compression is minimizing the size in of a graphic file without degrading the quality of the image to an unacceptable level

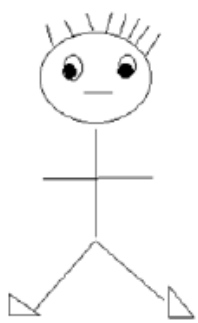
2. Compare Random scan to Raster scan

Random Scan	**Raster Scan**
It has high Resolution	Its resolution is low.
It is more expensive	It is less expensive

Any modification if needed is easy	Modification is tough
Refresh rate depends or resolution	Refresh rate does not depend on the picture.
Only screen with view on an area is displayed.	Whole screen is scanned.

3. Now days, youth like posting their nakedness pictures on social media. Discuss the inconvenient.
4. Use Paint to create the following effects:

Draw a picture of some people stick figures. Be creative! The figure bellow is an example:

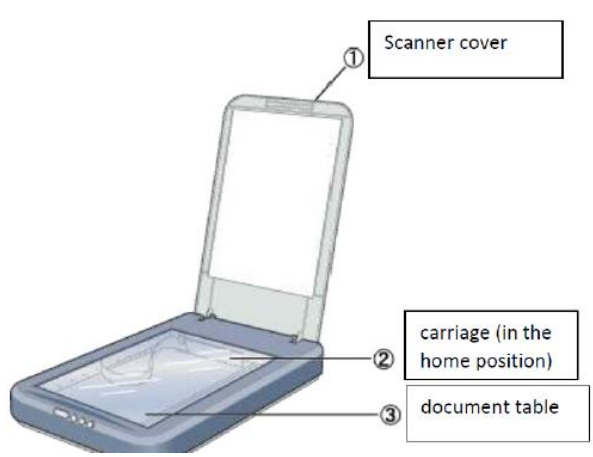


3.9.3. Extended Activities and Answers

1. By definition, differentiate SLR to DSLR

SLR: Single Lens Reflex camera; which is a camera that typically uses a mirror and a prism system that permits the photographer to view through the lens and see exactly what will be captured while **DSLR;** is a digital camera that combines the optics and the mechanisms of a single lens reflex camera with a digital imaging sensor.

2. List and show different parts of scanner cover



3. You have a flash disk of 16GB. How many documents each of 800Kb can it keep. Give the size of free space after keeping the documents
   The size of flash disk in KB = 16*1024* 1024= 16,777,216 KB
   The number of documents that can be kept on the flash= 16,777,216/800= 20,971 docs
   Free space=16,777,216-(800* 20,971) = 416KB
4. Discuss the importance of using a screen shot to the computer users

Unit 4: E commerce, social media and online services

4.1. Key unit competence:

To be able to request for online services and access social media

4.2. Prerequisite knowledge and skills:

Students should have knowledge and skills related to online services and access social media learnt in **Senior two** on Network Components and Social Media Applications.

4.3. Cross-cutting issues to be addressed:

Peace and values Education: student must be aware of crimes that are committed using online services and social media while using them in the different activities, and student will be aware of friendship developed through social media.

Gender education: student should be informed that online services and social media are all used by male and female.

Standardization culture: While presenting their works, students must be aware that pictures may have copyright issues attached to them and therefore should not be used in social media posts. They have also to be aware that posting nude pictures is against Rwandan culture. Pictures that make people feel concerned, worried, grieved should be avoided.

4.4. Guidance on the introductory activity

- The teacher organizes students into groups of 4 students.
- The teacher asks students to do the Introductory Activity in their respective groups.
- The teacher moves around to see how students are working and provides guidance to needy groups
- The teacher invites representatives of groups to presents their findings
- At the end of each presentation, students give inputs and the teacher help them by making sure that the overall help comes at the end of all the presentations
- The teacher tells the students that in the coming lessons they will have complete answers.

Answer Introductory Activity

Answer a: The ways the manager can use to communicate with the supplier to obtain the price of the goods are:

- He can send an email directly to the suppliers
- He can text the supplier through WhatsApp messaging or through any other social media

Answer b: There are various businesses that can be conducted on the Internet which all can be summarized under the name of online shopping, e-banking, e-payment and e-commerce

Answer c: Social media platforms that are used for daily communication are Facebook, Instagram, Twitter, WhatsApp and many others

Answer d: The way can be used for payment are bank cheque, wiring transfer, Used of credit card, mobile money

4.5. List of lessons

#	Lesson title	Learning objective	Number of periods
1	E-Commerce & E commerce models	Understand ecommerce and apply E commerce principles to purchase goods and services online	3
2	Online Payment methods	Understand the payment methods used in online shopping	3
3	Facebook	Use facebook to inform and be informed	2
4	Twitter	Understand the importance, usage of Twitter in our daily life	2
5	Instagram	Understand the importance of Instagram and use it in every day's life	2
6	WhatsApp	Understand the importance and usage of WhatsApp in daily life and use it	2
7	E Banking and e payment	Understand e banking and e payment and their roles in requesting and providing online services	3
8	Irembo local online services	Request for online services using Irembo	2

	End Unit Assessment		2

LESSON 1: E commerce

a) Learning objectives

Understand e commerce and apply E commerce principles to purchase goods and services online

b) Teaching resources:

Students and the teacher need to use computers in the computer laboratory for practicing, projector for displaying the content of the lesson, Internet and textbooks to facilitate the research

c) Prerequisites

Students are now familiar with browsing the Internet as they learnt the access social media in **Senior two.** The skills acquired in this unit will enable them to properly learn this new lesson.

d) Learning activities:

- **Guidance:**

- The lesson is started by reading the scenario in the activity 4.1.
- The teacher asks the students to answer the questions in activity 4.1 individual and independently for 10 minutes
- Teacher walks around and sees if students are doing activity individually
- Few students present their findings to the rest of the class
- Teacher ask others students to comments on the results presented.
- Under the guidance of the teacher; students explore the **Amazon** and **Kikuu** shopping platforms
- Teacher gives instructions to do the Application activity 4.1

- **Answers for activity 4.1**

Answer 1:

Answer a: Kamikazi must have an account on the online shopping platform that sells the book then will have to place an order of the Psychology book and thereafter pays the book using one of the paying method available on the platform. The company selling the book on the website will deliver the book at Kamikazi‘s address.

Answer b:

- Local online platform are vubavuba ,Kikuu shopping
- Global online platform are Amazon, Alibaba
- And many others. (Students explore as many online platforms as they can)

Answer 2: The consumer provides goods or services to the company.

e) Answer to application activity 3.1

All answers for the application activity 3.1 are available in student teacher’s book.

LESSON 2: Online Payment methods

a) **Learning objective**

Understand the payment methods used in online shopping

b) **Teaching resources:**

For this lesson students and the teacher will need to have a projector, a mobile telephone to exercise themselves on mobile money, any debit or credit card, computers with internet connectivity and textbooks for more research.

c) **Prerequisites**

Students are familiar with local online payment methods like MTN Mobile Money, Tigo cash and AirTel Money as they learnt this in **Senior Two Unit 2**: ICT in financial transactions. They also learnt the first lesson in this unit which cleared their minds on the concept of online payment methods

d) **Learning activities**

Guidance:

- The teacher shows to students an image in the activity 4.2 showing the different payment methods
- Students analyze the image and identify the different payment methods shown on the image

- Students differentiate cash payment and online payment
- Under the guidance of the teacher; students identify the different parts of a debit/credit card
- If means allow it, students practice paying using a debit/credit card and phone based money under the guidance of the teacher.
- Teacher gives instructions to do the Application activity 4.2

Answers for activity 4.2

Answer 1: Payment method used in Rwanda are: MTN Mobile money, Airtel money, Visa card and Master card.

Answer 2: answers for this question are available in student teacher's book.

e) **Answers of application activity 4.2**

1. All answers for question 1available in the students' book
2. Students discuss the payment methods used at their schools which vary depending on the school
3. Mobile Money has the following advantages:
    - Money can be transferred almost anywhere, even when there are no banks nearby.
    - It enables cashless payments which reduces dependency on cash
    - Customers need not require middlemen for money transfers
    - It avoids long travel to send/receive money or to pay bills by standing in long queues.
    - It allows purchasing of online goods and services
    - It allows providing services to the people who are geographically inaccessible

LESSON 3: Facebook

a) **Learning objective**

Use facebook to inform and be informed

b) **Teaching resources:**

Students need to have computers with internet connectivity so that they can have access to facebook and do additional researches. There will also be a need of projector to display and do demonstrations to students.

c) **Prerequisites**

Students are now familiar with social media as they learnt **Unit 8:** Network components and social media applications in Senior Two. The knowledge acquired in this unit can be applied in learning this lesson

d) Learning activities:

Guidance:

- The teacher opens facebook and asks questions on the opened window.
- The questions aim at discovering the role of facebook and how to access its full functionalities.
- Under the guidance of the teacher, students create facebook accounts.
- The teacher moves in the class to help those facing difficulties.
- After creating accounts the teacher demonstrates how to edit the profile and students follow suit
- The teacher demonstrates how to get friends and students do the same by befriending their classmates
- Under the guidance of the teacher; students create posts
- Teacher give instructions to do the Application activity 4.3

Answers for activity 4.3

Answer 1: The figure in the activity is part of the facebook homepage

Answer 2: Social media are interactive computer-mediated technologies that facilitate the creation and sharing of information, ideas, career interests and other forms of expression via virtual communities and networks

Answer 3: Positive Effects of Social Media

- Social networking sites allow people to communicate and remain in contact with friends as well as meet new people.
- The use of social networking helps to improve technological skills of students, and exposes them to many diverse views about things.

e) **Answers of application activity 4.3**

All answers for the application activity 4.3 are in the content of the students' book.

LESSON 4: Twitter

a) **Learning objectives**

Understand the importance, usage of Twitter in our daily life
• Use Twitter to be inform and be informed

b) **Teaching resources**

Students need to use computers in the computer laboratory or mobile telephones to have access to Twitter, a projector is needed for doing demonstrations by the teacher, textbooks for additional reading and internet connectivity for having access to twitter by using a computer or a mobile telephone.

c) **Prerequisites**

Students are now familiar with social media as they have already learnt how to use facebook. They also learnt Twitter in **Unit 8:** Network components and social media applications in Senior Two. The knowledge acquired in the previous lesson and the unit in Senior Two can be applied in learning this lesson.

d) Learning activities:

Guidance

- Teacher asks students to read the activity 4.4 and answer related questions
- Under the guidance and demonstration of the teacher, students create Twitter accounts
- Teacher walks around and sees if students are not facing difficulties in creating accounts
- Students edit their twitter account profiles and post their tweets.
- Thereafter students follow each other on twitter
- The teacher walks among students to make sure everyone has created a twitter account and has posted a tweet
- Students identify the different icons found in Twitter and how to use them
- Teacher gives instructions to do the Application activity 4.4

Answers for activity 4.4

Answer a: The figure in the activity is logo of Twitter
Answer b: Twitter is used as a social media through which users write tweets in the form of text, images or videos that will be viewed by an account follower or whoever search for it on twitter

e) **Answers of application activity 4.4**

All questions in the application activity 4.4 can be answered by reading the content of the students' book, in the section on Twitter.

LESSON 5: Instagram

a) **Learning objective**

Understand the importance of Instagram and use it in every day's life

b) **Teaching resources:**

Teacher needs a computer with internet connectivity or a mobile phone with Instagram installed, he/she will also need a projector for projecting in front of the class. Students will need computers connected to the internet and textbooks for additional reading.

c) **Prerequisites**

Students are now familiar with social media as they learnt different social media in the previous lessons of this unit and learnt the unit 9: Computer Network and Data Communication in Senior three (S3).

d) Learning activities:

Guidance:

- The teacher shows an image in which are icons of different social media and students identify which one is for Instagram.
- Students describe the Instagram icon and guess that Instagram is used more for images basing on the fact that its icon looks like a camera
- After the teacher's demonstration, students open their Instagram accounts.
- The teacher moves among students to help those that may be facing difficulties
- Under the guidance of the teacher, students identify the different Instagram icons and practice using them
- Students follow each other on Instagram and create posts
- Teacher give instructions on how to do the Application activity 4.5

Answers for activity 4.5

Answer a: Instagram is a free, online photo-sharing application and social network platform that was acquired by Facebook in 2012. Instagram allows users to edit and upload photos and short videos through a mobile app.

Answer b: basing on what they have already learnt and by doing additional researches on the internet students differentiate Instagram, Twitter, WhatsApp and facebook.

Answer c: The Instagram icon is a camera. This symbolizes the fact that it focuses on posting images and videos online which are then commented by viewers.

e) **Answers of application activity 4.5**

All answers for the application activity 4.5 are available in student teacher book.

LESSON 6: WhatsApp

a) **Learning objectives**

Understand the importance and usage of WhatsApp in daily life and use it

b) **Teaching resources:**

For this lesson there will be a need of smart phones on which to install WhatsApp with internet connectivity. Where those telephones cannot be got they will use an Android simulator which, once installed on a computer (laptop) will allow the installation of Android applications (like WhatsApp) on that computer.

This lesson will also need to have a projector and textbooks for additional reading.

c) **Prerequisites**

Students are now familiar with social media, they know how to send and receive a message and write posts. This necessary prerequisite was got not only in Senior Two but also in the previous lessons of this unit.

d) **Learning activities**

Guidance

- The teacher shows an image of a smart phone screenshot like the one in the activity 6.1 and ask them to show the one for WhatsApp
- Under the guidance of the teacher; students brainstorm the use of WhatsApp
- The teacher demonstrates how to download applications from Play Store including the WhatsApp application.
- Teacher explains what Play/ Apple Store is.
- The teacher demonstrates and explains the steps to install WhatsApp
- Students create their WhatsApp accounts using their computers (on which Nox player was installed to allows WhatsApp installation), change their profiles and send each other WhatsApp messages
- Sample students have their computers connected to the projector to see if their WhatsApp accounts were created
- Teacher gives instructions to do the Application activity 4.6

- **Answers for activity 4.6**

Answer 1: Umurerwa should use WhatsApp which is the second from the left.

Answer 2: One like Umurerwa can choose to use WhatsApp because it allows real time chat, send and receiving images, video and other files and allow video calls

e) **Answers of application activity 4.6**

Answer 1: Students discuss the improvements that WhatsApp has brought about in the communication field in Rwanda

Answer 2: Difference between WhatsApp and Instagram are:

a) Whatsapp:

- it is a free messages services with free VoIP calling and video calling
- no profile
- No Sign Up & Sign In.

b) Instagram

- It is a photo and video sharing
- It is a sells advertising
- You need account for signing in or signing out

LESSON 7: E Banking and e payment

a) **Learning objectives**

Understand e banking and e payment and their roles in requesting and providing online services

b) T**eaching resources:**

Students use Computer Lab for doing the practice and receiving message using online service, Projector for projecting what they discuss or what they are taught, internet for creating account, sending and receiving a massage, and textbooks to facilitate research.

c) **Prerequisites**

Students are familiar different payment methods seen in the previous lesson on Online Payment methods. The knowledge acquired in this lesson will enable them understand the new one

d) **Learning activity**

- **Guidance:**

- The teacher makes one learner read the scenario in the activity 7.1 and the whole class debate on it by answering its questions
- The teacher writes a question on the black board that the whole class is going to discuss in groups. The question is: "Discuss in details the terms e-banking and e-payment by showing its advantages and possible disadvantages". To do this questions students have to be provided with internet for research.
- Groups present their findings in front of the whole class and other students provide inputs.
- A summary basing on what has been presented is realized
- Teacher give instructions to do the Application activity 4.7

- **Answers for activity 4.7**

Answer 1: Using the school's telephone Kamana will call his parents and inform them of the school fees issue and Kamana'parents will inform the school bursar that they are going to solve the problem using Funds **transfer** to the school account or **MTN Mobile Money.**

Answer 2: Services that can be paid electronically in Rwanda are Electricity, water and many others

e) **Answer of application activity**

Answer 1: Mobile money generally refers to payment services operated under financial regulation and performed via a mobile device while credit card is where the cards pull the money from your bank account.

Answer 2: For this question, students do a research by reading books or using the internet and present the findings to the class so as to draw a common conclusion

LESSON 8: Irembo local online services

a) **Learning objectives**

Request for online services using Irembo online platform

b) **Teaching resources:**

Students need to use computers with internet connectivity for doing practice and sending a request using Irembo, projector for projecting what they learn and textbooks for additional reading.

c) **Prerequisites**

Students are now familiar with online services as they saw them in lesson one of this unit on **E Commerce**. They browsed online shopping platforms like **Amazon** and **Kikuu.** They are also familiar with the payment methods which are also used to pay for services requested on irembo

d) **Learning activities**

 Guidance

- The teacher asks students to brainstorm the steps to go through in order to get registered to sit for a provisional driving license test. In the answer the Irembo platform must be mentioned
- Under the guidance of the teacher, students discuss in groups the problems that Irembo came to solve. Sample groups present their findings and receive feedbacks from other groups
- Under the guidance of the teacher, students explore different services available on Irembo
- Students create Irembo accounts after the teacher's demonstration. They must be aware that once an id number is entered in the platform it is not possible to create another account. For this reason they must remember their credentials
- The teacher demonstrates how to request a service. It is better to request for a service which is really needed in order to avoid tampering with the Irembo system.
- Teacher give instructions to do the Application activity 4.8

 Answers for activity 4.8

Answer: Here are different categories of services available at Irembo: Immigration and emigration, Land, Local government, National ID, Notarization and Gazette services, Police, Rwandans living abroad, Media, Education and many others. They all respond to local citizens' need.

e) **Answer of application activity 4.8**

All answers for the application activity 3.8 are available in student teacher's book.

4.6. Summary of unity

This unit entitled “e commerce, social media and online service” is very useful and interesting in nowadays technology. Business contributes to the human living condition by ameliorating the future capability in problem solving and self-management.

Normally E-Commerce or Electronic Commerce known also as “eBusiness”, is the buying and selling process via internet. Historically it started very soon in the 21st century. E commerce goes hand in hand with payment method such as debit/credit card, mobile phone based money and so many others.

The unit goes hand in hand with social media usage. Social media are online communication means or channels that are spread in the community to enable users to create or share valuable contents together with participating in business and leisure attachments. Examples of social media highlighted in this book are Facebook, twitter, WhatsApp, Instagram, etc.

Undoubtedly e commerce and social media are inseparable with online service. One is an agent of another in the achievement of any task. Therefore online services are information and services provided over the Internet. It is not only communication but also giving a clear unlimited access to information and online services.

4.7. Additional Information

How to connect with users on social media

Social media marketing, like all marketing, centers on getting the attention of your target audience and forging a connection. While social media can be used to directly promote products and deals, it is not an effective means to connect with new users on networks such as Facebook and Twitter. Social media is a place to genuinely interact with users and tell them what makes your business unique

Instead, success on social media is built on the creation and sharing of relevant, interesting content. This can range from something as simple as posting a photo on Facebook to creating and tweeting a link to your latest blog post.

Grabbing a user’s attention on social media begins with something they’re interested in, not something you want them to do. By demonstrating your topical expertise and introducing people to the voice of your brand, interested users then have a reason to visit your website and see what you have to offer.

Content and social sharing

In addition to driving traffic to your site directly, the communal nature of social networks provides an extra benefit: organic customer acquisition. If you provide content that users find relevant to their interests, they will share it with their friends and contacts. Essentially, your potential customers will actually be marketing for you. Even better, since the content is being referred from a friend or family member rather than directly

from a business it is seen less like an advertisement and more as trusted information from a verified source. Many customers become acquainted with a brand via informational content, then come to find out about their products or services.

Decide which social media platform is best for your business

Facebook: The world›s largest social network, Facebook›s massive audience is highly coveted by online businesses. A regular presence of informational content, industry news, and product promotions can generate brand loyalty and increased sales.

Instagram: Ecommerce performance is highly impacted by product images highly impacted by product image, making this visually-dominated social platform a key driver of brand awareness for online businesses. Regularly sharing product images and lifestyle posts relevant to a brand can go a long way to expanding your audience.

Twitter: Popularity and engagement on Twitter can be just as effective as Facebook, when done properly. Staying active and engaging with other users combined with content marketing strategies employed on Facebook can reinforce your presence on other social media platforms and generate awareness among new prospects.

LinkedIn: The most-used professional networking platform enables companies and individuals with similar interests to connect. LinkedIn is best suited for thought leadership content, particularly for high-end and high-AOV brands. Many executives and CEOs share business wisdom and culture pieces to indirectly promote their company.

4.8. End Unit Assessment Answers

All the questions in the end unit assessment can be answered by referring to the content related to this unit available in the student teacher's book.

4.9. Additional Activity

4.9.1. Remedial activity

1. Buying and selling the products over the Internet is called
    a. Electronic Commerce
    b. EDI
    c. Electronic Market d) E-Shopping
    d. None of the above
2. E-Commerce means _____
    b) Education Version of Commerce
    c) Buying and selling product and service over the internet c) Account

d) D.All above

e) None of these

3. Disadvantage of E- Commerce is
    a) Distribution delivery
    b) Problem of controlling privacy and security
    c) New technology
    d) High price
4. What is the difference between e-commerce and traditional commerce?
5. What are the different e-commerce business models?

4.9.2. Consolidation activities

1. E-Commerce provides customer service
    a) Worse
    b) Better
    c) Same
    d) All of above
    e) e) None

2. In E-commerce, customer is _____
    a) Purchaser
    b) Cyber surfer
    c) Seller
    d) Player
    e) None

3. Currency can be replaced with……transaction for payment in E-commerce
    a) Credit Card
    b) Password
    c) Login User
    d) Barcode system

4. Give characteristics of a strong password for your social media login?
5. Explain the advantages to society because of e-commerce?

4.9.3. Extended activities

1. Internet can be used for …….. parts of trade cycle
    a. Search
    b. Order
    c. Invoice
    d. None
    e. All
2. Internet commerce support ……..
    a. Paypal
    b. Online Payment
    c. Cash Payment
    d. Net Banking Payment
    e. Cheque Payment
3. ……is used to identify of each person in an electronic transaction
    a. Digital transaction
    b. Digital Certificate
    c. License
    d. Password
4. Disadvantage of E- Market
    a) Reduce search cost
    b) Market is available round the clock
    c) Dialogue between seller and customer are not possible d) Customer are not aware of new technology
    d) None
5. Discuss the best time to discuss your vacation and post pictures on social media?

UNIT 5: DATABASE BASICS

5.1 Key unit competence:

Explain the different concepts used in database management

5.2 Prerequisite knowledge and skills:

Students have learnt in the previous **Unit 1** the advance spreadsheet II, this unit will help students to understand the basic of database and why it is important in data management process.

5.3 Cross-cutting issues to be addressed:

Peace and values Education: student teacher must be aware of crimes that are committed using online services and social media while using them in the different activities, and student teacher will be aware of friendship developed through social media.

Gender education: student teacher should be informed that online services and social media are all used by male and female.

5.4 Guidance on the introductory activity

- The teacher organizes students into pairs.
- The teacher asks students to do the Introductory Activity in their respective pair.
- Students observes the image in the Introductory activity and respond the questions.
- The teacher moves around to see how students are working and provides guidance to needy pair.
- The teacher invites representatives of each pair to presents their findings
- At the end of each presentation, teacher give his/her inputs on the presentations
- The tutor tells the students that in the coming lessons they will have complete answers.

Answer Introductory Activity

1. File can be stored in computerized manner or in manual ways.
2. Having a database is the best way of keeping tract on files.
3. According to the scenario, it is hard to store files.
4. Lost file, mismatch information.
5. The solution to the issue is the creation of a database.

5.5 List of lessons

#	Lesson title	Learning objective	Number of periods
1	Introduction to database	Understand the database concepts	1
2	Database approach	Understand the database approaches and where these approach are applied in to real life	3
3	Area where database can be applied	Understand the use of database into the real life	1
4	Database access level and users	Understand the importance of access level of the various database users in data management process.	3
5	Relational model	Understand the use of the relational model in the database	3
	END UNIT ASSESSMENT		1

LESSON 1: Introduction to database

a) Learning objectives

Understand the database concepts

b) Teaching resources

Students and the teacher need to use computers in the computer laboratory for doing research, projector for displaying the content of the lesson, Internet and textbooks to facilitate the research

c) Prerequisites

Students have learnt in the previous Unit 1 the advance spreadsheet II. In this lesson, students will be introduced to the database concept.

d) Learning activities:

Guidance:

- The lesson is started by reading the scenario in the activity 5.1.
- The teacher asks students to answer the questions in activity 5.1 individually and independently for 10 minutes
- Teacher walks around and sees if students are doing activity individually
- Few students present their answers to the rest of the class
- Teacher asks others students to comments on the results presented.

- Under the guidance of the teacher, students get to know the difference between data and information
- Teacher gives instructions to do the Application activity 5.1

- **Answers of activity 5.1**

1. Data collection can be done through Interview, questionnaire and other technique available in data collection
2. Data need for each student may be: Names, Name of both parent, Date of birth, address (Umudugugu, Umurenge, Akarere, Intara) an other
3. In a spreadsheet
4. Information
5. Database for students
6. Other teachers, school administration and parent

e) Answer to application activity 5.1

All answers for the application activity 5.1 are available in students' book.

LESSON 2: Database Approach

a) Learning objectives

Understand the database approaches and where these approach are applied in to real life

b) Teaching resources:

Students and the teacher need to use computers in the computer laboratory for doing research, projector for displaying the content of the lesson, Internet and textbooks to facilitate the research

c) Prerequisites

Students have learnt in the previous **Unit 1** the Advance Spreadsheet II. In this lesson, students will be introduced to the database Approach and they are being used.

d) Learning activities:

- **Guidance:**

- The lesson is started by reading the scenario in the activity 5.2.
- The teacher asks students to answer the questions in activity 5.2 individually and independently for 10 minutes
- Teacher walks around and sees if students are doing activity individually
- Few students present their answers to the rest of the class
- Teacher asks others students to comments on the results presented.

- Under the guidance of the teacher, students get to know the difference between data and information
- Teacher gives instructions to do the Application activity 5.2

Answers of activity 5.2

1. Data in these 3 department are not organized. It is not easy to update them.
2. The best suggestion is to have all data organized into table. Such as salary table, restaurant and dispensary.

e) Answer to application activity 5.2

All answers for the application activity 5.2 are available in students' book.

LESSON 3: Area where database can be applied

a) Learning objectives

Understand the importance of access level of the various database users in data management process.

b) Teaching resources:

Students and the teacher need to use computers in the computer laboratory for doing research, projector for displaying the content of the lesson, Internet and textbooks to facilitate the research

c) Prerequisites

Students have learnt in the previous **Unit 1** the advance spreadsheet II. In this lesson, students will be introduced to the database concept.

d) Learning activities:

Guidance:

- The lesson is started by reading the scenario in the activity 5.3
- The teacher asks students to answer the questions in activity 5.3 individually and independently for 10 minutes
- Teacher walks around and sees if students are doing activity individually
- Few students present their answers to the rest of the class
- Teacher asks others students to comments on the results presented.
- Under the guidance of the teacher, students get to where database is used on the everyday basis.
- Teacher gives instructions to do the Application activity 5.3

- **Answers of activity 5.3**

1. Mr. Mugabo can improve his shop management by introducing database system.
2. Advantage of database management system are available in the students 'book

e) Answer to application activity 5.3

All answers for the application activity 5.3 are available in students' book.

LESSON 4: Database Access levels and users

a) Learning objectives

Understand the importance of access level of the various database users in data management process.

b) Teaching resources:

Students and the teacher need to use computers in the computer laboratory for doing research, projector for displaying the content of the lesson, Internet and textbooks to facilitate the research

c) Prerequisites

Students have learnt in the previous **Unit 1** the advance spreadsheet II. In this lesson, student will be introduced to the database concept.

d) Learning activities:

- **Guidance:**

- The lesson is started by reading the scenario in the activity 5.4.
- The teacher asks students to answer the questions in activity 5.4 in pair for 10 minutes
- Teacher walks around and sees if students are doing activity in pair
- Few students present their answers to the rest of the class
- Teacher asks others students to comments on the results presented.
- Under the guidance of the teacher, students get to know the difference between data and information
- Teacher gives instructions to do the Application activity 5.4

- **Answers of activity 5.4**

The figure shows the access the level of the database and database users.

e) Answer to application activity 5.4

1. Answers for the question:
    a. Hidden: no access to the database, this user can be anyone outside of your shool
    b. Read: This user can only read; this can be a student or a parent
    c. Read and write: this user can read and write, it means, he/she can add new record in the database but he/she is not able to change(update)and delete any record into the database.
    d. Read, write and Update: this user can read, write and update, it means, he/she can add new record and change (update) record in the database but he/she is not able to delete any record into the database.
    e. The use has total access to the database.
2. The difference between logical independence and physical independence is give in the students 'book.

LESSON 5: Relational database

a) Learning objectives

Understand the use of the relational model in the database

b) Teaching resources:

Students and the teacher need to use computers in the computer laboratory for doing research, projector for displaying the content of the lesson, Internet and textbooks to facilitate the research

c) Prerequisites

Students have learnt in the previous **Unit 1** the advance spreadsheet II. In this lesson, student will be introduced to the database concept.

d) Learning activities:

- **Guidance:**

- The lesson is started by reading the scenario in the activity 5.5
- The teacher asks students to answer the questions in activity 5.5 individually and independently for 10 minutes
- Teacher walks around and sees if students are doing activity individually
- Few students present their answers to the rest of the class
- Teacher asks others students to comments on the results presented.
- Under the guidance of the teacher, students get to know the difference between data and information
- Teacher gives instructions to do the Application activity 5.5

- **Answers of activity 5.5**

The other database models are:

- Hierarchical model
- Relational database model
- Network database model
- Object oriented database model

e) Answer to application activity 5.5

All answers for the application activity 5.1 are available in students' book.

5.6 Summary of the unit

The database basic unit introduces to students the database concepts. In this unit, students discover the importance of databases in every activity. The unit also discusses the database approaches where the traditional database management and computerized database management system.

The database access level is well discussed combined with the database user, in order to achieve the data independence. Finally, the relation database model is introduced to the students.

5.7 Additional information

The difference between Data Consistency and data Inconsistency

The data Inconsistent problems occurred when there is data redundancy. data redundancy occurs when the data/ file/database file contains redundant (unnecessarily duplicated data).

- **Data consistency** means that the changes made to the different occurrences of data should be controlled and managed in such a way that all the occurrences have the same value for any specific data item.

Data inconsistency leads to a number of problems such as: including loss of information and incorrect results. In the database approach, it is controlled because data is shared and consistency is controlled and maintained.

Data consistency meaning is the validity, accuracy and usability of related data. It ensures that each database user observes a consistent(Same) view of the data, including changes made by the user's own transactions and transactions of other users.

- **Data Inconsistency:** means that there are different versions of the same data appear in different places.

5.8 End unit assessment

1. Database users are:
    i. **The database administrator (DBA):** Responsible for authorizing access to the database, for coordinating and monitoring its use, acquiring software and hardware resources, controlling its use and monitoring efficiency of operations.
    ii. **The database designer:** Responsible to define the content, the structure, the constraints, and functions or transactions against the database. They must communicate with the end-users and understand their needs.
    iii. **The end-user, who accesses: End-users**, they use the data for queries, reports and some of them update the database content.

2. The difference between File Processing System and Database Management System approach. The **Traditional File System** is basically a way of arranging the files in a storage medium like a hard disk. The file system organizes the files and helps in the retrieval of files when they are required. File systems consist of different files which are grouped into directories. The directories further contain other folders and files. The file system performs basic operations like management, file naming, giving access rules, etc. while the Database **Management System** is basically software that manages the collection of related data. It is used for storing data and retrieving the data

effectively when it is needed. It also provides proper security measures for protecting the data from unauthorized access.

3. Data independence is the ability to modify the scheme without affecting the programs and the application to be rewritten. Data is separated from the programs, so that the changes made to the data will not affect the program execution and the application
4. The uses of databases in business environment.
    - Customer Relationship Management
    - Inventory Tracking Database.
    - Payroll and Scheduling Database.
    - Business Data Analysis.

5.9 Additional activities

5.9.1. Remedial activities

1. List any eight applications of DBMS?
2. Define database management system?
3. What are problems with traditional file processing system?

5.9.2. Consolidation activities

1. What are the disadvantages of file processing system?
2. What are the advantages of using a DBMS?
3. Give the levels of data abstraction?

5.9.3 Extended Activities and Answers

1. Give at least 3 roles of the following database users:
    i. Database administrator
    ii. Database designer
    iii. End users
2. Differentiate data and information?
3. What do you understand by data redundancy?

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