GSP2203: ICT IN EDUCATION– Module 8

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Learning Objectives:

After reading this module, students shall be able to:

- ✓ Define and explain the meaning of ICT
- ✓ Outline the characteristics, components and challenges of ICT
- ✓ Explain the use of ICT in the learning environment
- ✓ Explain the use of communication, online collaboration and productivity tools
- ✓ Have an overview of Mobile learning, including ts potentials, technologies involved, advantages and limitations.

1.0 INTRODUCTION TO THE CONCEPT OF ICT

The development of Information and Communications Technology (ICT) occurs at a very fast rate and affects virtually as aspects of our lives. This has posed a challenge to teaching and learning professionals to find ways of integrating ICT into the education sector. This module, therefore, will give an overall idea about the concept of ICT and discuss the need and significance of ICT in Education.

1.1 Meaning of ICT?

The term "Information and Communications Technology (ICT)" derives the integration of two concepts; Information Technology and Communications Technology. Information Technology is a scientific, technological and engineering discipline and management technique used in handing the information, it's application and association with social, economic and cultural matters. Communication Technology, on the hand, is the electronic systems used for communication between individuals or groups. It facilitates communication between individuals or groups who are not physically present at the same location. Systems such as telephone, telex, Fax, radio, T.V. and Video are included, as well as more recent computer based technologies, including electronic data interchange and e-mail.

Simply put, Information and Communications Technology (ICT) is an extended term for information technology (IT) which stresses the role of unified communications and the integration of telecommunications (wired and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information. ICT can therefore be defined as the technological tools and resources used for transmitting, storing, creating, sharing or exchanging data or information. ICT covers a broad range of technologies and broadly can consist of computers and devices, networks

(including the Internet and social networks), applications/tools, and digital content. However, ICT has no universal definition, as the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis.

1.2 Characteristics of ICT:

Information Technology has the following characteristics:

i. Acquistion, Storage, manipulation, management, transmission or reception of data or information.
ii. Real time access to information.
iii. Easy availability of updated data
iv. Connecting Geographically dispersed regions
v. Wider range of communication media.

1.3 Uses of ICT

The *Information Age* that is brought before us in this 21st century has seen the impact of ICT radically transforming our lives and opening up new vistas of knowledge, information, work, employment, business, entertainment and communication. Our lives are touched everyday by computers and information systems. Some of the areas where the greatest impacts are being felt include;

1. ***Education*** -In education, use of ICT has become imperative to improve the efficiency and effectiveness at all levels and in both formal and non-formal settings. Education even at school stage has to provide computer instruction. Teachers, students, researchers and school administrators benefits from the usage of ICT.
2. ***Banking*** - In the banking, customers, businessman & bank administrator benefits from the usage of ICT.
3. ***Industry*** - Computers are used to facilitate production planning and control systems, to support chain management and to help in product design in the industrial sector. In the industrial sector, workers, researchers and administrator benefits from the usage of ICT.
4. ***E-Commerce*** - E-commerce helps in boosting the economy. It makes buying and selling activities easier, more efficient and faster. For this application, computers, Internet and shared software are needed. In the e-commerce sector, customers, suppliers and employees benefits from the usage of ICT.
5. ***Business*** - Business organizations are probably the greatest users of ICTs because of the great gains that are achieved in efficiency and productivity when ICTs are effectively deployed.

1.4 Challenges of ICT

The use of ICT is full of challenges that restricts its use. These challenges have to be overcome to achieve full benefits. These challenges include the following.

1. ***Dependency on network infrastructure*** – You need to have access to a good quality Internet connection, such as high speed broadband, in your classroom in order to access Internet technologies during lessons. If you don't have access to a good Internet connection you will not be able to take advantage of technologies like online resources, communication tools and collaboration technologies.
2. ***Lack of computers and devices*** – You need to have access to a sufficient number of good quality computers and devices. A lack of good quality computers and devices can be a challenge to using ICT effectively.
3. ***Lack of technical support*** – You need to be able to access technical staff and support services (e.g. hotlines) when you have problems in order to use ICT effectively. You need support to maintain and upgrade technical equipment such as computers, devices, and networks. And you need support in using and maintaining software and content. A lack of technical support can leave you with ICT that you can't use.
4. ***Lack of appropriate resources*** – You need to be able to access suitable resources to effectively use ICT. You can use ICT to create your own resources but this can be time consuming.
5. ***Lack of training and support*** – You need appropriate training in various aspects of using ICT. If you don't have the required skills, you might not be confident in your abilities and this in itself can be a challenge. The type of teacher training and support you receive is typically outside your control but you can start to build your competences by taking relevant courses, talking to colleagues who have experience in the area, and joining relevant online communities.
6. ***Lack of awareness of the benefits of ICT*** – If people are not aware of the benefits of using ICT, it can result in a lack of motivation to use ICT.

2.0 ICT IN EDUCATION

2.1 Components of ICT in Education

Broadly, ICT in education can consist of computers and devices, networks (including the Internet and social networks), applications/tools, and digital content. ICT comprises of many components. These are used either singly or in combination to achieve the goals of ICT. These components are:

i. **Computers:** Used for the collection and analysis of information.

- Computers can include traditional desktop computers and mobile computers such as laptops, netbooks and tablets.

ii. **Devices:** Used for storing the information.

➢ ***Devices*** can include:

- ***Mobile devices*** such as smartphones, media players, digital and video cameras, and e-readers.
- ***Classroom display devices*** such as interactive whiteboards, digital projectors and digital visualisers.
- ***Peripheral devices*** such as printers, scanners, speakers, webcams, microphones, and gaming devices.
  Note: speakers, cameras and microphones are often integrated into computers and smartphones.
- ***Assistive technologies*** such as specialist joysticks, tracker balls and keyboards.
- ***Data recording devices*** such as data-loggers.

iii. **Networks** can include external technical network infrastructures such as the Internet and internal networks such as intranets. A network can also be used to describe social networks where teachers can share experiences, information, lesson ideas and content in online communities of practice; and where students can share ideas and information. In a learning context, social networks are sometime referred to as learning networks.

iv. **Applications/tools** can include generic applications/tools, such as productivity tools, communication tools, collaboration tools, media authoring tools and assistive technology tools: tools that are used in the workplace, education, and everyday life. Other types of tools can be broadly classified as applications/tools that are created specifically for educational purposes. These tools include subject-specific applications/tools, exploratory/game-based tools and learning platforms. Note: Learning platforms are also known as learning management systems (LMS), content management systems (CMS) and virtual learning environments (VLEs).

v. **Digital content** can include digital content in the form of text, images, audio, animation, video, and interactive content. It can includes things like reference materials and subject-specific materials. Digital content used in education should be age-appropriate, suitable for the curriculum, localized and culturally relevant.

2.2 Benefits of ICT for Students

1. ***Supporting a variety of learning strategies*** – As outlined in the benefits for teachers you can use ICT to support a variety of traditional and new learning strategies including, among others, personalized learning, collaborative learning, and project-based learning. You can also use ICT to support other strategies including:
    - ✓ Active learning where the students participate in the learning process rather than being passive recipients of information. For example, students might find information and resources online or they might complete learning activities designed by you that use ICT tools to complete experiments and document results.
    - ✓ Independent learning where students, who are typically older, take responsibility for their own learning and can set and pursue their own learning goals with minimum direction. For example, older students might search online for information and resources using search engines or social networks or they might create their own learning resources using multimedia tools or productivity tools.
    - ✓ Informal learning where students follow their own learning paths rather than passively receiving information from the teacher as is usually the case in a more formal or traditional teaching model. For example, students might source and take online courses or they might join groups on social networks to share resources and ideas. As well as subjects covered by the curriculum, they might learn about other topics that interest them.
2. ***Improving access to learning*** – Students can use Internet and mobile technologies to access learning at any time and from any location. For example, older students might use the Internet to find reference materials, take an online tutorial, or communicate with their peers or experts at any time, from any location. And younger students might access age-appropriate learning at home or on a journey - for example they might practice their numeracy and literacy skills at home using online games.
3. ***Enabling choice of pace of learning*** – Students can use ICT to set the pace at which they learn. For example, students can use e-learning courses or simulations to learn at the pace that suits them.
4. ***Accommodating different learning styles*** – You can use ICT to support different learning styles by using a variety of digital resource formats. Different formats such as text, image, audio, video, simulations, games, quizzes, and demonstrations can appeal to different learners.
5. ***Improving motivation and engagement*** – You can use ICT to improve student motivation and engagement by using a variety of active and engaging electronic resource formats such as videos, games and simulations. Students can also be motivated and engaged by using tools for learning that they typically use in their free time, such as social media tools.

6. ***Supporting the development of 21st century skills*** - There are many definitions of 21st century skills defined by different bodies but they can broadly be described in this context as the skills that students need to live and work in the ever-changing digital world of the 21st century. These skills include creativity, critical thinking, problem solving, communication and collaboration skills, the ability to learn, social and civic responsibility, entrepreneurship and cultural skills, and ICT and information literacy skills. As well as developing ICT skills by learning how to use technology effectively, students can develop other 21st century skills while using technology in the learning process. For example, you can use technologies like search, collaboration, communication and content creation tools to support collaborative, problem-based and project-based learning strategies. In using these tools as part of the learning process, students can develop a wide range of 21st century skills.
7. ***Quick access to information*** - Information can be accessed in seconds by connecting to the internet and surfing through Web pages.
8. ***Easy availability of updated data*** - Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies.
9. ***Connecting geographically dispersed regions*** - With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Students from different parts of the world can learn together by using online and offline resources. This would result in the enriching learning experience. Such collaborative learning can result in developing...
    - ✓ Divergent thinking ability in students,
    - ✓ Global perspectives
    - ✓ Respect for varied nature of human life and acculturation.
    - ✓ Facilitation of learning

    ICT has contributed in shifting the focus on learning than teaching. ICT helps students to explore knowledge to learn the content through self-study. Teacher can help the students by ensuring the right direction towards effective learning. Situational learning, Programmed learning, many Online learning courses are some of the example of self-learning strategies that are being utilized with the help of ICT.
10. ***Catering to the individual differences*** - ICT can contribute in catering to individual needs of the students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of every student in the class.
11. ***Wider range of communication media*** - With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning are some of the resources that can be used in educational institutions. Collaborative learning, individualized learning strategies can enhance the quality of group as well as individual learning. with the real society. This can ensure the applicability of knowledge.
12. ***Wider learning opportunities for students*** - Application of latest ICT in education has provided many options to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can

evaluate their own progress through different quizzes, ready to use Online tests. This can ensure fulfillment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs.

2.3 ICT Resources in the Learning Environment

There are many types of ICT resources and possibilities for how they can be used to support teaching and learning. Teaching and learning is carried out by the use of ICT Resources. "ICT resource" can be used to mean different things depending on the context. Some things it might mean are:

- ✓ A form of digital content
- ✓ A communication tool
- ✓ An online collaboration tool
- ✓ An application or productivity tool
- ✓ A database
- ✓ Search engines

The first three are discussed below, while latter three, because of their importance to both students and teachers, are discussed in new chapters.

2.3.1 Digital Content

One type of ICT resource is digital content. Digital content can be described as electronic forms of information accessed via the Internet, CD, DVD or television. Examples of digital content include:

2.3.1.1 ***Digital courses*** – These are commonly referred to as e-learning courses. They support distance learning and learner-centred learning. They enable the student to select the pace, location and time of their learning. They enable the student to select the pace, location and time of their learning. They can be used in the classroom to re-enforce learning, to provide instruction and for revision. Or they can be stand-alone learning environments.

2.3.1.2 ***Digital reference materials*** – These can include online encyclopaedias, maps and dictionaries. They are a good source of information and online versions can be accessed from anywhere at any time.

2.3.1.3 ***Electronic books or eBooks*** – These can include books such as subject-specific text books, reference books, and novels. They are usually downloaded and read on a mobile or handheld device. They can replace heavy hard copies of books and depending on the type of book and device they might include features such as bookmarking and highlighting.

2.3.1.4 ***Videos*** – These can include movies or short video clips. They are an engaging teaching tool and can show students things beyond the classroom that they can't experience for

themselves. You can also record your own videos to provide instruction or re-enforcement before, during or after class.

2.3.1.5 ***Audio files*** – These have similar uses to video files and can be used to engage students. They can be used as another form of instruction or reenforcement before, during or after class.

2.3.1.6 ***Simulations*** – These present the student with real-life experiences in a simulated environment. They can be used by students to learn a skill in a safe environment.

2.3.1.7 ***Virtual worlds*** – These are simulated worlds, where users interact with each other as avatars, in most cases over the Internet. They are useful for engaging students and enabling them to problem-solve, experiment and develop social skills. Students can re-create events from history or literature and carry out virtual experiments.

2.3.1.8 ***Augmented reality*** – This is a type of virtual reality in which digital content is overlaid onto physical objects or videos/pictures of objects, sometimes using GPS coordinates.

2.3.1.9 ***Digital games*** – These come in a wide variety of formats from single user/player to multiple-player.

2.3.1.10 ***Data sets*** – These are organized collections of data or information, which are usually structured in lists, tables, and databases. They are typically used in science education.

2.3.2 ICT Communication Tools

Another type of ICT resource that can be useful in supporting and enhancing teaching and learning is communication tools. These are discussed briefly below:

2.3.2.1 ***E-mail*** - E-mail is a commonly used tool for exchanging electronic text-based messages between two or more people. E-mails are exchanged over the Internet or other computer networks. They can include file attachments in multiple formats. Other features include calendars and contact lists. Some commonly used examples of e-mail tools include Google's Gmail and Microsoft Outlook.

2.3.2.2 ***Text messaging*** - Another widely used tool is text messaging. This is used for the exchange of brief, electronic messages between two or more devices over a phone network. Short message service (SMS) refers to text messages and multimedia message service (MMS) refers to picture, audio and video messages.

2.3.2.3 ***Online chat*** - Online chat is a very popular way to communicate over the Internet. It is used for the real-time exchange of text messages between two or more people over the Internet. Some commonly used examples of online chat tools include Apple iMessage and instant message in Skype.

2.3.2.4 ***Web conferencing*** - Web conferencing is another popular tool. It is used for the real-time exchange of voice and video messages over the Internet. Some web conferencing tools are

enhanced with collaboration features such as screen sharing, polls and surveys, interactive whiteboards, recording, scheduling and calendars. Some common examples include Adobe Connect 9 for schools, Blackboard Connect, Cisco WebEx, Citrix GoToMeeting, Google+ Hangouts, and Skype.

2.3.3 Online Collaboration Tools

You might use online collaboration tools for collaborating to create or share content, for commenting on and rating content, or for searching for relevant content. Which tools you use and how you use them will depend on many factors. It is useful to know the different tools available and their features so you select tools that are suitable for your purpose. Some examples include:

2.3.3.1 ***Online discussion forums*** - Online discussion forums are online sites used for discussions where people post messages. A single conversation is called a "thread" or topic and can be replied to by multiple people. Forums can be moderated or unmoderated and they can either require users to register or allow them to be anonymous. How forums work will depend on the purpose of the forum.

2.3.3.2 ***Blogs (web logs)*** - Blogs are online websites that allow users to create text entries in chronological order. They can include hyperlinks, images, audio and video files. People can post comments on the different blog entries. You can create your own blog. Some common examples of tools for creating blogs include Edublogs, Google Blogger and WordPress.

2.3.3.3 ***Microblogs*** - Microblogs are similar to blogs except that messages are restricted in length. For example, Twitter allows messages with up to 140 characters, known as tweets, which can include photos or audio clips. You subscribe to “follow” someone to receive updates from them. You can also search using topics or hashtags. Another common microblog platform is the site Tumblr.

2.3.3.4 ***Social networking sites*** - Social networking sites are public or private online websites that allow users to communicate with people in their network by sharing ideas, pictures, links, audio, video, activities, events, and interests. Most sites require users to have a profile page. As well as social networking sites like Facebook, Google+, and LinkedIn.

2.3.3.5 ***Wikis*** - These are online websites that allow users to add, edit or delete content. They can include forums and tracking features. You can create your own wiki - some common examples of wiki creation tools include: Google Sites, PBworks and Wikispaces.

2.3.3.6 ***Media sharing sites*** - Media sharing sites are online websites used for hosting and sharing media files such as photos, presentations, videos.

Some common examples include

- ✓ ***Photo sharing***: Flickr, Instagram, and Picasa
- ✓ ***Video sharing***: Vimeo, YouTube, YouTube EDU and TeacherTube
- ✓ ***Slide sharing***: Slideshare

2.3.3.6 ***Social bookmarking sites*** **-** These are websites used for collecting, storing, managing and sharing links/bookmarks and in some cases articles and images. Some common examples include Delicious, Diigo, Learnist, and Pinterest.

2.4 Productivity Tools

Another type of ICT resource is productivity tools. These are widely used to improve productivity and efficiency. Many of these tools can also be powerful tools for content creation and managing information. Word processing, spreadsheet, presentation and database tools are packaged together in Office suites such as Microsoft Office, OpenOffice and Google's offering Gsuite. Other tools such as web browsers, web search, concept mapping, online storage and note taking tools, among others, can also be described as productivity tools.

2.4.1 Word Processing Software

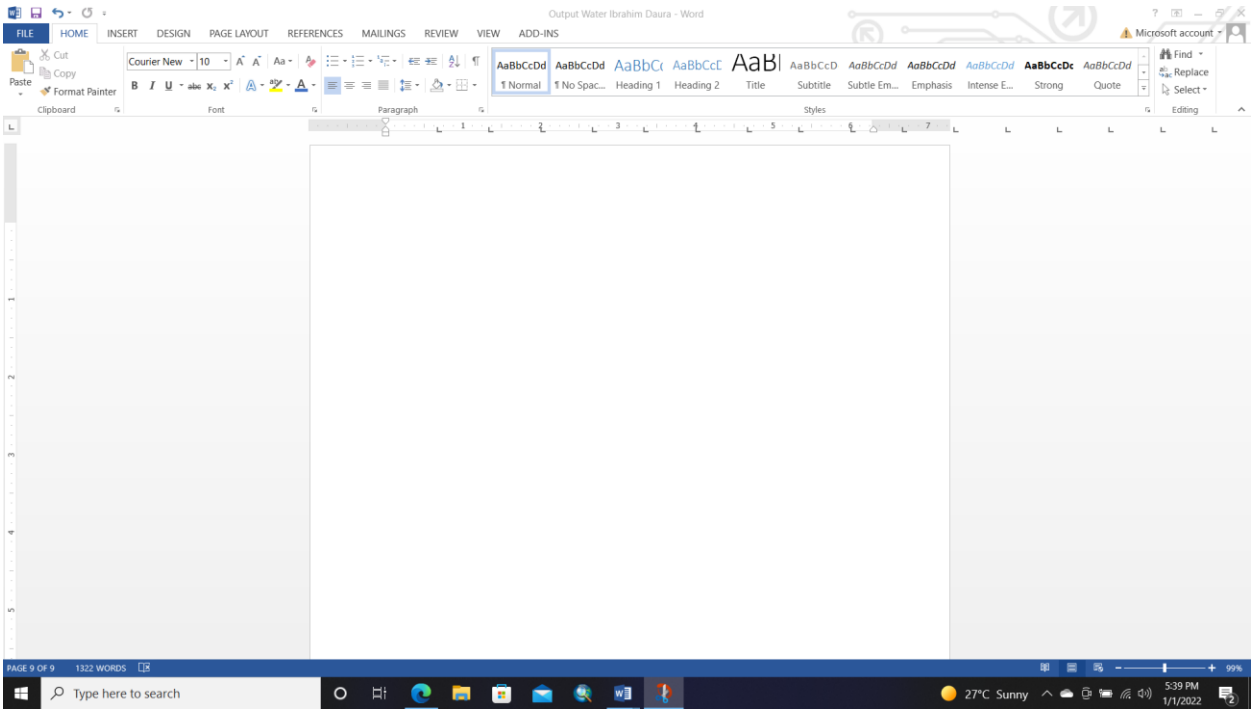
Word processing software is used for creating documents. Drafts, letters, reports, essays, write-ups, etc, can be created using word processing software. Common examples include Apple Pages, Apache OpenOffice Writer, Google Docs and Microsoft Word. However, the most commonly used word processing package in the world is Microsoft Word.

Microsoft Word is Microsoft's word processing software. It was first released in 1983 bearing the name Multi-Tool Word for Xenix systems. Later, Versions for several other platforms including IBM PCs running DOS (1983), the Apple Macintosh (1984), SCO UNIX, OS/2 and Microsoft Windows (1989) were written. It is a component of the Microsoft Office system; however, it is also sold as a standalone product and included in Microsoft Works Suite.

2.4.1.1 *MS Word Key Features*

1. ***User Friendly:*** It is an easy and simple package for a general user.
2. ***Features and Functionalities:*** The features such as paragraph, font, symbols, spell check, table, drawing, bullets and numbering, page numbering provided by this package enable a user to develop a document in an error free format.
3. ***Compatibility:*** The text file generated by MS Word is .doc. This file can be used in other applications such as MS Excel, MS Visual Studio 6.0, MS Visual Studio.net, Web browser, pdf format etc.
4. ***Key Features:*** Some of the commonly used crucial features in MS Word include:
   - ✓ Toolbar support
   - ✓ Find and Replace
   - ✓ Paste special
   - ✓ Insert Objects
   - ✓ Themes

- ✓ Multi-Column text
- ✓ Referencing and Citation
- ✓ Mailing
- ✓ Spelling and Grammar Checks, Thesaurus and Translators
- ✓ Review - Track Changes
- ✓ Flexible viewing capabilities, etc.



2.4.2 *Spreadsheet Software*

Spreadsheet is a computer application that simulates a paper worksheet. It displays multiple cells that together, make up a grid consisting of rows and columns, each cell containing either alphanumeric text or numeric values. Spreadsheets are frequently used for financial information because of their ability to recalculate the entire sheet automatically after a change to a single cell is made. Common examples include Apple Numbers, Apache OpenOffice Calc, Google Sheets, and Microsoft Excel.

Starting in the mid-1990s and continuing through the present, Microsoft Excel has dominated the commercial electronic spreadsheet market.

2.4.2.1 Microsoft Excel Basics

The intersection of a column and a row is known as a cell. Each cell has a name or a cell address. The cell address consists of the column letter and row number. For example, the first cell is in the first column and first row. First column name is A and first row number is 1. Therefore, the first cell address is A1. Similarly, the address of last cell is IV65536 i.e. column IV and row number is 65536.

The total cells in a worksheet are 256 × 65536.

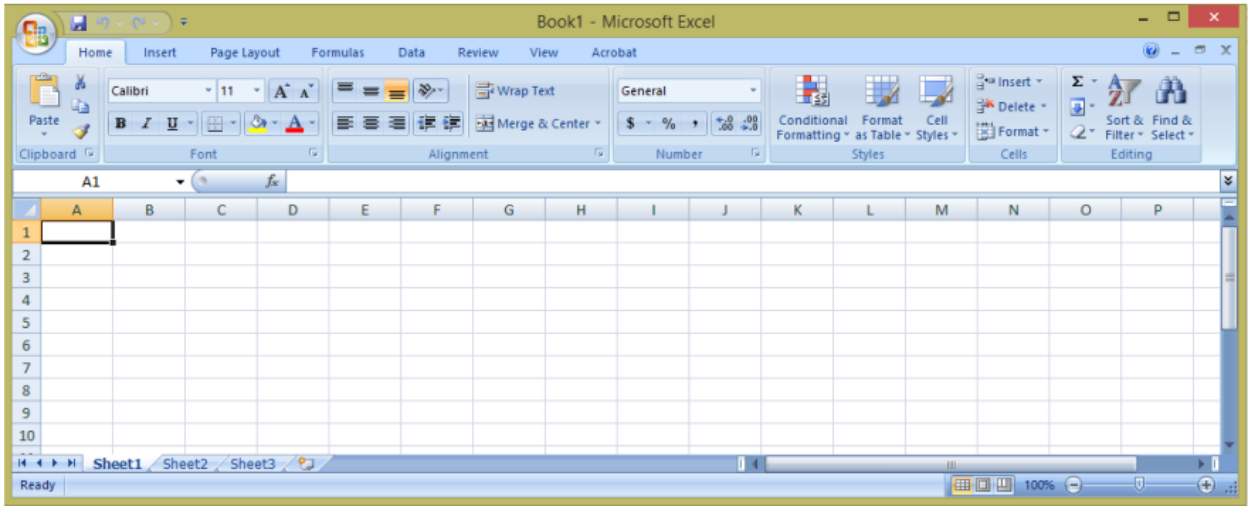


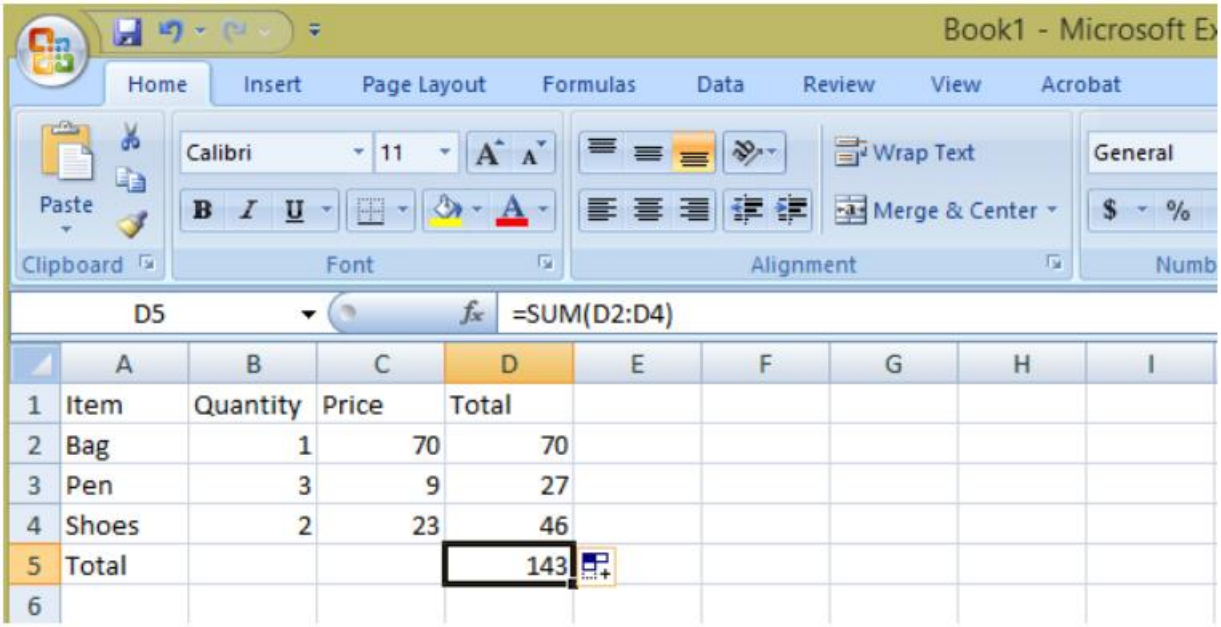
Figure 3.1 A Microsoft Excel Window

Key Features:

- ✓ Title Bar
- ✓ Menu Bar
- ✓ Standard Tool bar
- ✓ Formatting Toolbar: Allows the user to give commands related to formatting cells and cell contents such as Bold, Underline, Font Style, Font Size, Colour etc.
- ✓ Name box
- ✓ Formula bar
- ✓ Colum and Row headers
- ✓ Current Cell
- ✓ Scroll Bars
- ✓ Sheet Tab
- ✓ Status Bar
- ✓ Auto Fill function

2.4.2.2 Formulae in MS Excel

The following snapshots show simple data processing in Excel using the formula function. Basic arithmetic operations, multiplication and addition, are presented.

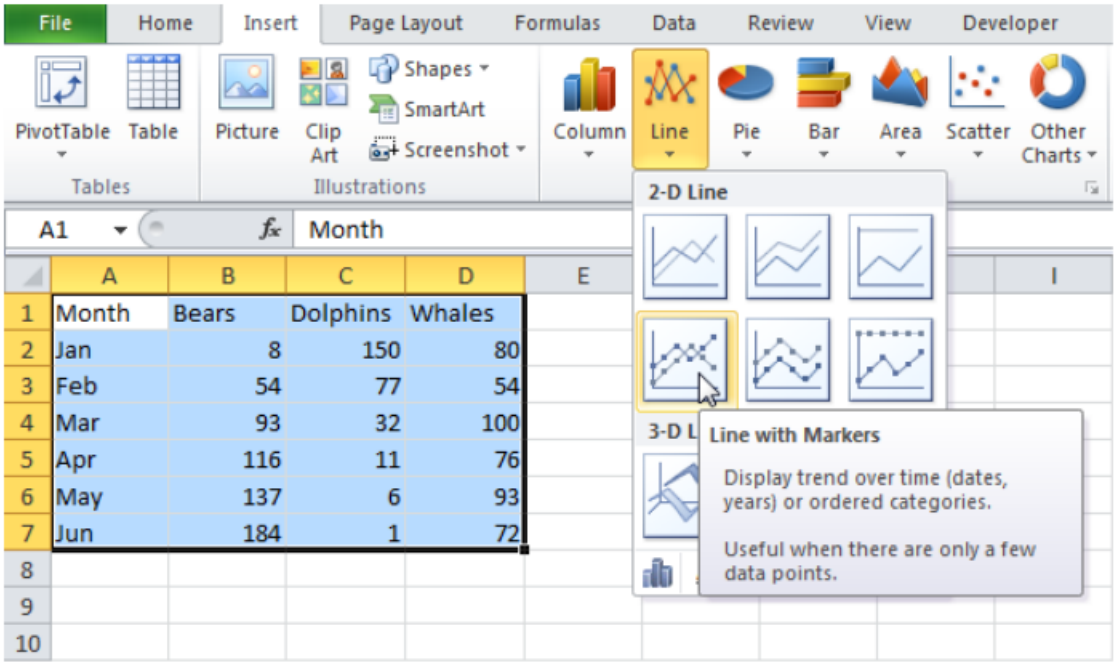


Example of the use of a formula in Excel sheet

2.4.2.3 Charts in MS

Excel Charts are used to display series of numeric data in a graphical format to make it easier to understand large quantities of data and the relationship between different series of data.

"A simple chart in Excel can say more than a sheet full of numbers..."



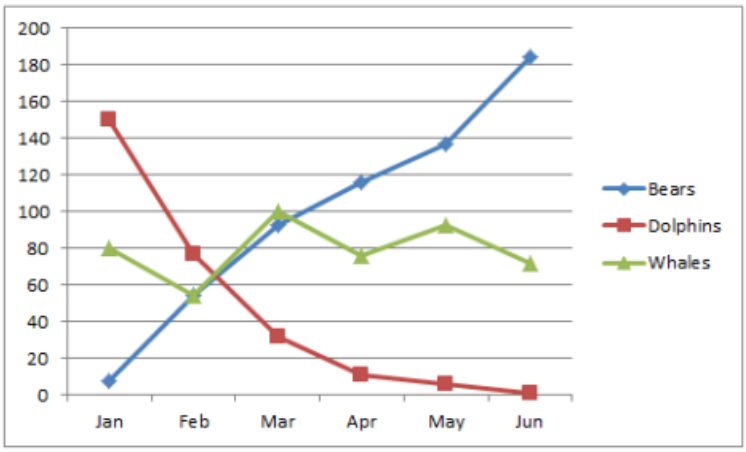
Example of a chart creation using excel

2.4.2.4 Creating an Excel Chart

To create the line chart above, execute the following steps.

i. Select the range A1:D7.

ii. On the Insert tab, in the Charts group, choose Line, and select Line with Markers.



Example of graphs created using MS Excel

2.4.3 Presentations Software

Presentation tools are commonly used for the display of information in a slide show. They can include animations, images, sound and video clips. Common examples include Apple Keynote, Apache OpenOffice Impress, Google Slides, Microsoft PowerPoint, and Prezi. Microsoft PowerPoint is a presentation program developed by Microsoft. It is part of the Microsoft Office suite and runs on Microsoft Windows and Apple's Mac OS X computer operating systems.

PowerPoint is widely used by business people, educators, students and trainers and is among the most prevalent forms of persuasive technology. It is a type of business software that enables users to create highly stylized images for slide shows and reports. The software includes functions for creating various types of charts and graphs and for inserting text in a variety of fonts. Most systems enable you to import data from a spreadsheet application to create the charts and graphs.
Similar to Excel, the PowerPoint screen has many elements as shown in the following.

2.4.3.1 Standard and Formatting Toolbars

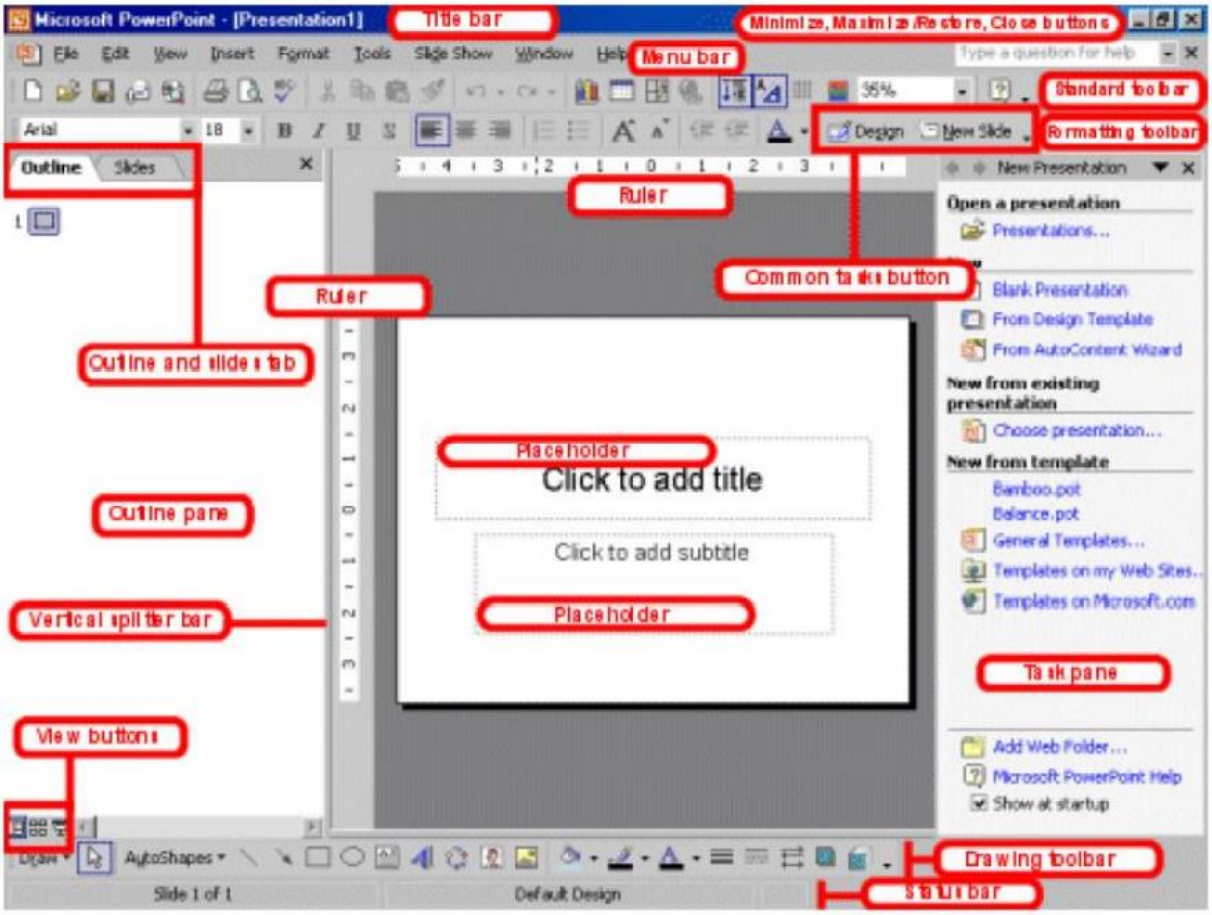
PowerPoint has several toolbars. Toolbars provide shortcuts to menu commands. The most commonly used toolbars are the Standard and Formatting toolbars.

1. Standard toolbar provides functions such as open a file; save a file; print a file; check spelling; cut, copy, and paste; undo and redo; or insert a chart or table.
2. Formatting toolbar is used to change the font, font size or font color; bold, underline, or italicize text; left align, right align, center, or justify; bullet or number lists; highlight; or decrease or increase the indent.

2.4.3.2 Slide Show

Use the Slide Show view when you want to view your slides, as they will look in your final presentation. When in Slide Show view:

Esc	Returns you to the view you were using previously.
Left Clicking	Moves you to the next slide or animation effect. On reaching the last slide, you automatically return to the last view.
Right Clicking	Opens a pop-up menu. You can use this menu to navigate the slides; add speaker notes; select a pointer; and mark your presentation.



Parts of a MS PowerPoint window

2.5 Mobile Learning

Widespread ownership of mobile phones and the increasing availability of other portable and wireless devices have been changing the landscape of technology supported learning.

Mobile learning can be described as the use of mobile devices to enable learning anytime and anywhere through the use of Wi-Fi or mobile broadband. Mobile learning happens when people are away from their offices or classrooms. There are currently an estimated 1.7 billion mobile phones in use around the world. Learning can take place in the classroom or outside the classroom. For example, learning can happen on school field trips, at home and on journeys.

In the past 10 years, the increasing development of mobile phone technology has been unbelievably swift: from plain and simple cell phones to the current high-tech phones which can serve as a Personal Digital Assistant (PDA), mini-computer, telephone or camera, and transfer data as well as video and audio files. Mobile devices that support mobile learning are sometimes referred to as personal learning devices. Some examples are;

- ✓ E-book readers
- ✓ Laptops
- ✓ Netbooks
- ✓ Tablets
- ✓ Smartphones
- ✓ Mobile phones
- ✓ Portable media players

Different mobile devices may have different capabilities for connecting to the Internet. As mentioned, the two main ways of connecting to the Internet using mobile devices are:

1. Wi-Fi – this is a connection via a wireless network.
2. Mobile broadband – this is a connection via a mobile phone network.

Generally smartphones can connect to the Internet via Wi-Fi or via mobile broadband so they typically can connect from anywhere at any time. There may be an additional cost from a mobile network provider for this service and it may be costly.

Generally, tablets connect to the Internet via Wi-Fi access. Not all tablets can connect to the Internet via mobile broadband so a tablet may not connect to the Internet when it is outside a Wi-Fi spot. You can still view content that is stored on your device and use many apps without an Internet connection.

2.5.1 Potentials of Mobile Learning.

1. Access to documents or document libraries.
2. Access to quizzes and self-assessment as question or games.
3. Ability to participate in lessons and tutorials.
4. Receive lectures archived (past lectures) or broadcasted live.
5. Access to video clip or audio libraries.
6. Read asynchronous postings.

7. Exhibit student work.
8. Participate in virtual learning communities on the go.

2.5.2 The Technologies of Mobile Learning

There are various technologies associated with mobile learning. Some of these technologies include;

a. **SMS:** Short Message Service allows users to send/receive messages of up to 160 characters between mobile phones (text messaging).
b. **MMS:** Multimedia Messaging Service serves the same purpose as SMS but allows the inclusion of graphics.
c. **WAP:** An international protocol that allows users to access the internet via their WAP enabled mobile phones.
d. **GPRS:** An always on internet connection for mobile devices that provides greater speed of connection (171kb/s).
e. **Bluetooth:** A short range wireless connection. This enables PDAs (Personal Digital Assistants) to pass messages to and from other mobile devices.
f. **3G and 4G phones**: 4G (4th Generation mobile phones) provide up to 100 megabits per second transmissions adequate for multimedia.
g. **PDAs**: Personal Digital Assistants have evolved to mini PCs able to carry out many of the basic functions of a larger PC using the Palm OS or MS Pocket PC operating system.
h. **MP3s:** Audio file format that efficiently compresses files and enables them to be shared.
i. **CAMs**: Video cameras now embedded into mobile phone and PDAs.

2.5.3 Using mobile devices for teaching and learning

There are many benefits of mobile learning, which can lead to improved learning outcomes for students.

- ✓ **Support for learning:** Mobile devices can support new ways of learning such as student-centred and personalised learning as well as just-in time learning and just-in-time assessment.
- ✓ **Availability of options:** One can select suitable apps and content for the curriculum and individual students from a wide range on the various online app stores.
- ✓ **Engaging:** Mobile content is interactive and engaging and can help bring subjects to life which can help students gain a deeper understanding of the subject.
- ✓ **Appealability:** Mobile technologies are relevant and appeal to students which can help improve their motivation and engagement.
- ✓ **Flexibility:** One can design learning activities based on using mobile devices which can make learning active and engaging. For example, students can create multimedia projects collaboratively using their mobile devices.

- ✓ **Accessibility:** Students can access mobile courses from their mobile device from anywhere at any time, including at home, on the train, in hotels - this is invaluable for work-based training.
- ✓ **Intractability:** One can create interactive content and courses using mobile devices. Learners can interact with each other and with the practitioner instead of hiding behind large monitors. Student can also interact with instructors and among each other.
- ✓ **Accomodibility:** It's much easier to accommodate several mobile devices in a classroom than several desktop computers.
- ✓ **Portability:** PDAs or tablets holding notes and e-books are lighter and less bulky than bags full of files, paper and textbooks, or even laptops. They also enable the student to take notes or input data directly into the device regardless of location either typed, handwritten or using voice.
- ✓ **Intuitiveness:** Handwriting with the stylus pen is more intuitive than using keyboard and mouse.
- ✓ **Sharing ability:** It's possible to share assignments and work collaboratively; learners and practitioners can e-mail, cut, copy and paste text, pass the device around a group, or 'beam' the work to each other using the infrared function of a PDA or a wireless network such as Bluetooth.
- ✓ **Stimulating:** These devices engage learners and motivate them. Owner ship of the handheld devices seems to increase commitment to using and learning from it. Young people who may have lost interest in education, like mobile phones, gadgets and games devices such as Nintendo DS or Playstation Portable.
- ✓ **Affordability:** This technology may contribute to combating the digital divide, as these equipments (for example PDAs) are generally cheaper than desktop computers, hence more affordable than larger systems. They are accessible to a larger percentage of the population.
- ✓ **Accommodate special needs:** May assist learners with some disabilities.
- ✓ **Collaborative:** Enables several students work together on assignments even while at distant locations.
- ✓ Just-in-time learning: Increases work/learning performance and relevance to the learner.

2.5.4 Limitations of using Mobile Devices for Teaching and Learning

The using Mobile Devices for Teaching and Learning may have the following potential disadvantages:

- ✓ Small mobile and PDA screens limit the amount and type of information that can be displayed.
- ✓ There are limited storage capacities for mobiles and PDAs.
- ✓ Batteries have to be charged regularly, and data can be lost if this is not done correctly.
- ✓ They can be much less robust than desktops (although tablet PCs are beginning to tackle this problem).
- ✓ It's difficult to use moving graphics, especially with less sophisticated mobile phones.
- ✓ It's a fast-moving market, especially for mobile phones, so devices can become out of date very quickly.

- ✓ Wireless bandwidth is limited and may degrade with a larger number of users when using wireless networks.
- ✓ Lack of common operating system.
- ✓ Lack of common hardware platform make it difficult to develop content for all.
- ✓ Limited potential for expansion with some devices.
- ✓ Difficulties with printing, unless connected to a network.

2.5.5 Benefits of Mobile Learning to Special Needs Students

The size, shape, weight and portability of mobile devices make them particularly effective for users with disabilities. The organizer functions usually included in mobile devices are extremely useful for learners with learning difficulties to help them organize their lives and achieve some independence. PDAs often also incorporate dictionaries and thesauruses, which provide handy reference tools for learners with dyslexia or other learning difficulties. Tablet PCs include text-to-speech and voice recognition as standard tools, which are valuable for users with disabilities or learning difficulties. The devices can also be attached to wheelchairs with the use of small brackets.