

Computers

OVERVIEW:

In this activity, students will use a hands-on approach to learn the basic parts and functions of a computer. Students will identify the elements of a computer and explain their function. Students will explain how a computer communicates. In addition, students will explain the role of the Internet and how technology has advanced because of the Internet.

CONCEPTS:

National Science Foundation Standards:

Standard E: Science and Technology

(Understanding about Science and Technology)

- Contributions to science and technology made by many people and cultures
- Ways in which science and technology are reciprocal

Benchmark 3: The Nature of Technology

B: Design and Systems

- Almost all control systems have inputs, outputs, and feedback. The essence of control is comparing information about what is happening to what people want to happen and then making appropriate adjustments. This procedure requires sensing information, processing it, and making changes. In almost all modern machines, microprocessors serve as centers of performance control.

OBJECTIVES:

Student will:

- Identify the basic parts of a computer and their function
- Identify the primary role of a computer
- Identify how a computer communicates
- Identify Internet Basics

PROCEDURES:

- Allow 3 hours to present the background information and to complete the activity.
- Present the background information.
- Complete the activity (Part A.)
- Follow up activity with discussion questions. (see Part B.) These questions may be used for assessment purposes.

MATERIALS:

- Background information
- Computer per student

BACKGROUND:

What do we think about when we see computers? Do we want to begin sending emails to our friends and family, or do we think, “What a complex electronic gadget this is!”? There is so

much that we can learn about a computer without having to turn it on. And once we turn it on, there is still much more to learn.

OVERVIEW SYSTEMS AND COMPONENTS

One of the great strengths of the PC *platform that* has led to its overwhelming success in the marketplace is its *modularity*. Most PCs are made up of many different individual components which can be mixed and matched in thousands of different configurations. This lets you customize your exact needs.

System Case

The box or outer shell that houses most of the computer, the *system case*, is usually one of the most overlooked parts of the PC. While it may seem inconsequential, the case actually performs several important functions for your PC, including protection for the computer circuits, cooling, and system organization. In addition, the system case is normally purchased together with the system power supply, and must also be matched with the size, shape, and electrical requirements of your motherboard. Therefore, it has an impact on your options with these important components as well.

Power

Your computer is obviously an electronic device, and its many components of course require power. Like the case, most people don't give much thought to the power supplied to the system. There are two aspects to power in the PC:

- **External Power:** This refers to the power that is delivered to the back of the system case. There are several considerations regarding this power and how it is supplied that will determine if your internal power supply is going to work the way it should.
- **Power Supply:** This is the small box that sits inside your case and takes the external power you supply to the computer. Its main job is to transform this power into a form the rest of the computer can use.

Motherboard and System Devices

The motherboard is the base of the modern computer system. It is amazing how little attention this critical component gets in mainstream circles, considering how much it does—though the situation is now improving, fortunately. If the processor is the brain of the computer, then the motherboard is the central nervous system and circulatory systems, plus much more, all rolled into one. Here are the main parts of the motherboard and its related devices:

- **Motherboard:** This is the main circuit board on the computer where everything comes together.
- **System Chipset and Controllers:** The chipset and other motherboard circuitry are the same “Smarts” of the motherboard.
- **System Buses:** These are the electrical channels through which various parts of the computer communicate.
- **BIOS:** (Stands for *Basic Input/Output System*) the system is a computer program that is built into the PC's hardware.
- **Cache:** This is a small, high-speed memory area that is placed between the processor and the system memory.

- **System resources:** These are not actual physical devices; they are nothing you can reach into the machine and touch. But they are very important for two reasons. *First*, they dictate how your PC organizes its access to various memory areas and devices. *Second*, they are one of the most common areas where people have problems with the set-up of their PCs (so-called resource conflicts). These are the four types of resources that various parts of your computer can sometimes decide to fight over:
 - **Interrupts (IRQs):** a device requests time from the processor using these interrupt requests.
 - **Direct Memory Access (DMA) Channels:** Some devices have the ability to read and write directly from the system memory, instead of asking the processor to do it for them. Each device that does this needs its own DMA channels.
 - **Input/ Output (I/O) Addresses:** Devices exchange information with the system by putting data into certain specific memory addresses.
 - **Memory Addresses:** Similar to (I/O) addresses, many addresses use blocks of memory as part of their normal functioning.

The Processor

One of the smallest parts of the computer but the one that gets most of the attention, but is often thought of as the “brain” of the computer (often called the CPU-Central Processing Unit).

The processor reads instructions (commands) from memory that tell it what it needs to do to accomplish the work that the user wants, then executes them.

System Memory

It holds all the information the computer is using.

When you turn the computer on the memory is empty. Each program or data file you load uses part of the system memory. When you close a program, the memory is freed up for other uses. Generally, the more memory your computer has, the more things you can do with it simultaneously. Increasing the amount of memory in the system also improves performance in most cases.

Video Cards

Your video card performs the function of displaying the screen you see on the monitor. Inside the video card is a special kind of memory called *video memory*, where information is stored that represents what you see on the screen. If you look closely at the screen you can see that it is made up of many dots, or *pixels*. Each pixel’s color and brightness is stored in the video memory.

Monitors

In simple terms, the monitor, sometimes also called the CRT after the main technology used in making them, is a specialized, high-resolution screen, similar to high-quality television.

The screen is made up of a matrix of red, green, and blue dots. The information your video card sends controls which dots are lit up and how bright they are, which determines the picture you see.

Hard Disk Drives

Your hard disk drive is your computer's main, "long term memory"—it holds your operating system, program and data files. Hard drives are the fastest form of long-term storage your computer uses.

Floppy Disk Drives

These are the computer's smallest and slowest form of long term storage. Floppy disks provide a simple convenient way to transfer information, install new software, and back up small amounts of files.

CD-ROM Drives

CD-Rom stands for *Compact Disk-Read Only Memory*. As the name implies, CD-Rom drives use compact disks, similar to the ones that hold music, to hold computer information. And also as the name implies, they are a read-only medium. You can read information from them but not write to them (with some special exceptions). CD-ROMs are currently the most popular way that computer companies distribute applications and games and are ideal for multimedia information like videos, music and large graphic files.

Peripheral I/O

Peripherals are external devices that you connect to your PC.

There are two main ways that you can connect peripherals to your machine:

- **Serial Communications:** A serial connection sends information over the line one bit at a time. It is a simple way to send information in and out of the computer, but is not as fast as other ways the computer can communicate. Serial connections are typically used for devices such as mice and modems.
- **Parallel Communication:** This is faster than a serial connection because it sends many bits in parallel. The advantage is that it is faster. The disadvantage though is that it is more complicated to do.. Parallel communications are used most often for printers and removable storage drives, which need more speed than serial peripherals.

Keyboards

This is the main input device for most computers. It is used to input textual information to the PC. Keyboards are pretty much standard affairs these days, although they can vary greatly in quality and appearance, and some have significant additional features.

Mice

Until the invention of graphical operating systems, the keyboard was the only way that most people input information into their PCs. Mice are used in graphical environments to let users provide simple "point and click" instructions to the computer. The main advantage of a mouse over the keyboard is simplicity. There are also some operations that are much easier to perform with a mouse than a keyboard (such as picking an item on a screen or choosing from a list of options).

THE COMPUTER'S PRIMARY JOBS

All computers, from the first room-sized mainframes, to today's powerful desktop, laptop, and even hand-held PCs, perform the same general operations on information.

Information Processing (Computation)

One special form of computation the computer processes is its *instructions*. These are the commands that programmers give the computer to tell it what to do. Every time you do something with a computer, you are really talking to a program which is talking to the computer. The language that computers speak, which is called *machine language*, is very complex and hard to understand, which is why it is hidden from all but most technically-proficient engineers. Even most programmers never use machine language directly.

The key part of the computer that processes information is of course, the *processor*.

Information Storage

The computer stores different types of information in different ways, depending on what the information is, how much storage space it requires, and how quickly it needs to be accessed. This information is stored in its “short term” memory and its “long term” memory.

Your system memory or (RAM) holds the information that you or the computer are working with right now. This is the computer’s “short term” memory, and is designed to be able to feed the information to the processor at high speed so the processor isn’t slowed down too much while waiting for it. However, this short term memory disappears when the computer is turned off. This is why you must always save a file that you are working on before turning off the machine.

Longer-term storage is provided by your *hard disk drive*, *floppy drive*, and other devices, where information is stored permanently in the form of files, ready for you to retrieve when you need it. When you want to use your spreadsheet program, for example, the computer loads the instructions that are stored on the hard disk that tell the computer how to run it, from long term storage (your hard disk) into short term memory.

Information Movement and Communication

The computer also controls the movement of information from place to place. It reads the information you type on the keyboard moves it into memory and eventually displays it on the screen or stores it in a file. This movement is called input/output or I/O, and is how the computer talks to you as well as other devices that are connected to it.

Moving information between machines is also an important part of modern computing. The computer uses networking components, modems and cables to allow it to communicate with other machines. This is often called, unsurprisingly, communications.

COMPUTER COMMUNICATIONS

Ping:

Ping is a utility, or a small program used to carry out a specific task, or to find information stored on a computer.

Ping is used to determine if a computer is communicating with other computers on a network.

IPCONFIG:

This is a utility like Ping. However, it is used to find the identity of a specific computer. Using the IPCONFIG will return the following information about a computer, which can be used in other utilities or programs, like PING.

- Host Name
- Physical Address (MAC address)
- IP Address (Internet Protocol)

Computer names and subnet masks cannot be used to return information about a specific computer.

INTERNET BASICS

What is the Internet?

The internet is a worldwide matrix of interconnected computer networks that includes the World Wide Web, databases, e-mail, newsgroups, chat rooms, bulletin boards, and discussion lists.

URL's

URL stands for Uniform Resource Locator. The URL, also known as the address, describes the location and access method of a resource on the internet.

Examples include:

- WWW (World Wide Web):
<http://www.uky.edu>
- FTP (File Transfer Protocol):
<ftp://metalab.unc.edu/pub/docs/books/gutenberg>
- Email:
<mailto:sbcook2@uky.edu>
- Telnet:
<telnet://innopac.artic.edu>
- Search engines:
<http://www.google.com>

Anatomy of a URL:

<http://www.uky.edu/IT/Training/Descriptions.html>

- http:// = Hypertext Transfer Protocol – Tells the software what protocol to use
- www.uky.edu = Host computer/ Domain – This is the host computer (server on which the page resides) and type of site.
- /IS/Training/ = Folders found on the server – Specifies the path to the page you want to look at. Each forward slash separates the name of the folders, or directions.
- Descriptions/html = File document name – This is the document or page being requested and the language.

Domains:

<i>Domain Names</i>	<i>Examples</i>
.com = commercial organization	http://www.yahoo.com
.edu = educational institution	http://www.uky.edu
.gov = U.S Government	http://www.census.gov
.org = nonprofit organization	http://www.greenpeace.org
.mil = U.S military	http://www.amy.mil
.net = network provider	http://www.att.net
.xx = country code	http://www.nia.gov.au
.int = International organization	http://www.un.int/

Cookies:

A cookie is a small text file sent to your browser by a web server and used to record your activities on a site and remind you when you return. Cookies can remember personal information, such as passwords, so you don't have to retype them each time you visit a web site.

Internet Programming Languages:

Most programming languages are used to create web pages and web applications. The most popular are:

- **HTML** (Hypertext Markup Language)
- **ASP** (Active Server Page)
- **XML** (eXtensible Markup Language)
- **SOAP** (Simple Object Access Protocol)

ACTIVITY:

Part A:

Students are to manipulate the computer as various parts are introduced. After the lecture allow time for exploration.

Part B:

Ask the following questions and allow time for discussion.

Share

What part of the computer are you most familiar with?

Process

Is the information gathered from a computer always accurate?
Explain.

Generalize

Why is it important to have an understanding of how a computer works?

Apply

How can a computer be helpful to scientists?