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DEPARTMENT OF ENGLISH

LEARNING RESOURCES

ICT TOOLS IN TEACHING AND LEARNING

HARDWARE ICT TOOLS

Desktops

A desktop computer is a personal computer designed for regular use at a single location or near a desk or table due to its size and power requirements. The most common configuration has a case that houses the power supply, motherboard (a printed circuit board with a microprocessor as the central processing unit (CPU), memory, bus, and other electronic components, disk storage (usually one or more hard disk drives, solid state drives, optical disc drives, and in early models a floppy disk drive); a keyboard and mouse for input; and a computer monitor, speakers, and, often, a printer for output.

Early computers took up the space of a whole room. Minicomputers generally fit into one or a few refrigerator-sized racks. Desktops have been used with the most common configuration for PCs during the mid 2000s when there has been a growth from desktops to laptops.

Notably, while desktops were mainly produced in the United States, laptops had long been produced by contract manufacturers based in Asia, such as Foxconn. This shift led to the closure of the many desktop assembly plants in the United States by 2010. The successive release of new versions of Windows (Windows 95, 98, XP, Vista, 7, 8, 10 and so on) had been drivers for the replacement of PCs in the 1990s, but this slowed in the 2000s due to the poor reception of Windows Vista over Windows XP.

Types:

Full-sized:

Full-sized desktops are characterized by separate display and processing components. These components are connected to each other by cables or wireless connections. They often come in a tower form factor. These computers are easy to customize and upgrade per user requirements.

All-in-one:

An all-in-one desktop computer integrates the system's internal components and occupies a smaller footprint, with fewer cables than desktops. The all-in-one form factor was popular during the early 1980s for personal computers intended for professional use such as the Kaypro II, Osborne 1, TRS-80 Model II and Compaq Portable.

Compact:

Compact desktops are reduced in physical proportions compared to full-sized desktops. They are typically small-sized, inexpensive, low-power computers designed for basic tasks such as web browsing, accessing web-based applications, document processing, and audio/video playback.

Laptops

A laptop, often called a notebook, is a small, portable personal computer (PC). It has a thin LCD or LED computer screen mounted on the inside of the upper lid of the clamshell and an alphanumeric keyboard on the inside of the lower lid. The clamshell is opened up to use the computer. Laptops are folded shut for transportation, and thus are suitable for mobile use. Its name comes from lap, as it was deemed to be placed on a person's lap when being used. Today, laptops are commonly used in a variety of settings, such as at

work, in education, for playing games, web browsing, for personal multimedia, and general home computer use.

Laptops combine all the input/output components and capabilities of a desktop computer, including the display screen, speakers, a keyboard, data storage device, sometimes an optical disc drive, pointing devices (such as a touchpad or trackpad), with a operating system, a processor and memory into a single unit. Most modern laptops feature integrated webcams and built-in microphones, while many also have touchscreens. Laptops can be powered either from an internal battery or by an external power supply from an AC adapter.

The portable micro computer Portal of the French company R2E Micral CCMC officially appeared in September 1980 at the Sicob show in Paris. It was a portable microcomputer designed and marketed by the studies and developments department of R2E Micral at the request of company CCMC specializing in payroll and accounting. It was based on an Intel 8085 processor, 8-bit, clocked at 2 MHz. It was equipped with a central 64 KB RAM, a keyboard with 58 alpha numeric keys and 11 numeric keys (separate blocks), a 32-character screen, a floppy disk : capacity = 140,000 characters, of a thermal printer : speed = 28 characters / second, an asynchronous channel, a synchronous channel, a 220 V power supply. It weighed 12 kg and its dimensions were 45 x 45 x 15 cm. It provided total mobility. Its operating system was the aptly named Prologue.

Displays reached 640x480 (VGA) resolution by 1988 (Compaq SLT/286), and color screens started becoming a common upgrade in 1991, with increases in resolution and screen size occurring frequently until the introduction of 17" screen laptops in 2003. Hard drives started to be used in portables, encouraged by the introduction of 3.5" drives in the late 1980s, and became common in laptops starting with the introduction of 2.5" and smaller drives around 1990; capacities have typically lagged behind physically larger desktop drives. Optical storage, read-only CD-ROM followed by writeable CD and later read-only or writeable DVD and Blu-ray players, became common in laptops early in the 2000s.

Types:

Traditional laptop:

The form of the traditional laptop computer is a clamshell, with a screen on one of its inner sides and a keyboard on the opposite, facing the screen. It can be easily folded to conserve space while traveling. The screen and keyboard are inaccessible while closed. Devices of this form are commonly called a 'traditional laptop' or notebook, particularly if they have a screen size of 11 to 17 inches measured diagonally and run a full-featured operating system like Windows, macOS, or Linux.

Subnotebook:

A subnotebook or an ultraportable, is a laptop designed and marketed with an emphasis on portability. It varies in size, weight and life of the battery. Subnotebooks are usually smaller and lighter than standard laptops, weighing between 0.8 and 2 kg (2-5 lb), with a battery life exceeding 10 hours. One notable example of a subnotebook is the Apple MacBook Air.

Netbook:

The netbook is an inexpensive, light-weight, energy-efficient form of laptop, especially suited for wireless communication and Internet access. Netbooks first became

commercially available around 2008, weighing under 1 kg, with a display size of under 9 inches. This prompted the use of netbooks for education in school systems across the world. The name netbook is used as "the device excels in web-based computing performance".

Desktop replacement computer:

A desktop-replacement laptop is a class of large device which is not intended primarily for mobile use. These devices are bulkier and not as portable as other laptops, and are intended for use as compact and transportable alternatives to a desktop computer. Desktop replacements are larger and typically heavier than other classes of laptops. They are capable of containing more powerful components and have a 15-inch or larger display. Desktop replacement laptops' operation time on batteries is typically shorter than other laptops; in rare cases they have no battery at all.

Business laptop:

A business laptop is a laptop designed for those in a workplace. It has unique consumer-facing features, like high resolution sound and is removed to allow the device to be used for pure productivity. It may sometimes include business-oriented features like Trusted Platform Module, fingerprint scanner, smart card reader and/or a pointing stick.

Projector

A projector or image projector is an optical device that projects an image onto a surface, commonly a projection screen. Most projectors create an image by shining a light through a small transparent lens. But some newer types of projectors can project the image directly, by using lasers. A virtual retinal display, or retinal projector, is a projector that projects an image directly on the retina instead of using an external projection screen.

The most common type of projector used today is called a video projector. Video projectors are digital replacements for earlier types of projectors such as slide projectors and overhead projectors. The newest types of projectors are handheld projectors that use lasers or LEDs to project images. Their projections are hard to see if there is too much ambient light. Movie theaters used a type of projector called a movie projector, nowadays mostly replaced with digital cinema video projectors.

The earliest projection of images was most likely done in primitive shadowgraphy dating back to prehistory. Shadow play usually does not involve a projection device, but can be seen as a first step in the development of projectors. It evolved into more refined forms of shadow puppetry in Asia, where it has a long history in Indonesia, Malaysia, Thailand, Cambodia, China, India and Nepal.

Types:

Projectors can be roughly divided into three categories, based on the type of input. Some of the listed projectors were capable of projecting several types of input.

Real-time

- Camera obscura
- Concave mirror
- Opaque projector
- Overhead projector
- Document camera

Still images

- slide projector
- magic lantern
- magic mirror
- steganographic mirror
- enlarger (not for direct viewing, but for the production of photographic prints)

Moving images

- movie projector
- video projector
- handheld projector
- virtual retinal display

Camera obscura:

Camera obscura (Latin for "dark room") is the natural optical phenomenon that occurs when an image of a scene at the other side of a screen (or for instance a wall) is projected through a small hole in that screen to form an inverted image (left to right and upside down) on a surface opposite to the opening. The oldest known record of this principle is a description by Han Chinese philosopher Mozi. Mozi correctly asserted that the camera obscura image is inverted because light travels in straight lines.

The use of a lens in the opening of a wall or closed window shutter of a darkened room has been traced back to circa 1550. The shared history of camera and projector basically split with the introduction of the magic lantern in the later half of the 17th century.

Chinese magic mirrors:

The oldest known objects that can project images are Chinese magic mirrors. The origins of these mirrors have been traced back to the Chinese Han dynasty (206 BC – 24 AD) and are also found in Japan. The mirrors were cast in bronze with a pattern embossed at the back and a mercury amalgam laid over the polished front. The pattern seen on the back of the mirror is seen in a projection when light is reflected from the polished front onto a wall or other surface. It is very likely that the practice of image projection via drawings or text on the surface of mirrors predates the very refined ancient art of the magic mirrors, but no evidence seems to be available.

Revolving lanterns:

Revolving lanterns have been known in China as "trotting horse lamps". A trotting horse lamp is a hexagonal, cubical or round lantern which on the inside has cut-out silhouettes attached to a shaft with a paper vane impeller on top, rotated by heated air rising from a lamp. The silhouettes are projected on the thin paper sides of the lantern and appear to chase each other. Some versions showed some extra motion in the heads, feet and/or hands of figures by connecting them with a fine iron wire to an extra inner layer that would be triggered by a transversely connected iron wire. The lamp would typically show images of horses and horse-riders.

Fontana's lantern:

The lantern seems to simply have the light of an oil lamp or candle to go through a transparent cylindrical case on which the figure is drawn to project the larger image. So it probably couldn't project an image as clearly defined as Fontana's drawing suggests.

Magic lantern:

By 1659 Dutch scientist Christiaan Huygens had developed the magic lantern. He used a concave mirror to reflect and direct as much of the light of a lamp as possible through a small sheet of glass on which was the image to be projected. From there onward, the light passes into a focusing lens at the front of the apparatus to project the image onto a wall or screen. The magic lantern became a very popular medium for entertainment and educational purposes in the 18th and 19th century.

Opaque projectors:

Swiss mathematician, physicist, astronomer, logician and engineer Leonhard Euler demonstrated an opaque projector, now commonly known as an **Episcope**, around 1756. It could project a clear image of opaque images and (small) objects. French scientist Jacques Charles is thought to have invented the similar "megascop" in 1780. He used it for his lectures. Around 1872 Henry Morton used an opaque projector in demonstrations for huge audiences. His machine did not use a condenser or reflector, but used an oxyhydrogen lamp close to the object in order to project huge clear images.

Digital Camera

A digital camera or digicam is a camera that captures photographs in digital memory. Most cameras produced today are digital. Many more cameras are now incorporated into mobile devices like smartphones. However, high-end, high-definition dedicated cameras are still commonly used by professionals and those who desire to take higher-quality photographs. Digital and digital movie cameras share an optical system, typically using a lens with a variable diaphragm to focus light onto an image pickup device. The diaphragm and shutter admit the correct amount of light to the image, just as with film but the image pickup device is electronic rather than chemical. However, unlike film cameras, digital cameras can display images on a screen immediately after being recorded, and store and delete images from memory. Many digital cameras can also record moving videos with sound. Some digital cameras can crop and stitch pictures and perform other elementary image editing.

The most important compression algorithm is the Discrete Cosine Transform (DCT), a compression technique that was first proposed by Nasir Ahmed while he was working at the University of Texas in 1972. Practical digital cameras were enabled by DCT-based compression standards, including the H.26x and MPEG video coding standards introduced from 1988 onwards, and the JPEG image compression standard introduced in 1992. Nikon was interested in digital photography since the mid-1980s. At Photokina 1988, Fujifilm introduced the FUJIX DS-1P, the first fully digital camera, capable of saving data to a semiconductor memory card.

The two major types of digital image sensor are CCD and CMOS. A CCD sensor has one amplifier for all the pixels, while each pixel in a CMOS active-pixel sensor has its own amplifier. Compared to CCDs, CMOS sensors use less power. Cameras with a small sensor use a back-side-illuminated CMOS (BSI-CMOS) sensor.

Sensor resolution:

The resolution of a digital camera is often limited by the image sensor that turns light into discrete signals. If the image is brighter, then the value of pixel is larger. The number of pixels in the sensor determines the camera's "pixel count". In a typical sensor, the pixel count

is the product of the number of rows and the number of columns. For example, a 1,000 by 1,000 pixel sensor would have 1,000,000 pixels, or 1 megapixel.

Image sharpness:

Final quality of an image depends on all optical transformations in the chain of producing the image. In case of a digital camera, a simplistic way of expressing it is that the lens determines the maximum sharpness of the image while the image sensor determines the maximum resolution. The illustration on the right can be said to compare a lens with very poor sharpness on a camera with high resolution, to a lens with good sharpness on a camera with lower resolution.

Since the first digital backs were introduced, there have been three main methods of capturing the image, each based on the hardware configuration of the sensor and color filters.

Single-shot capture systems use either one sensor chip with a Bayer filter mosaic, or three separate image sensors which are exposed to the same image via a beam splitter.

Multi-shot exposes the sensor to the image in a sequence of three or more openings of the lens aperture. There are several methods of application of the multi-shot technique. The most common originally was to use a single image sensor with three filters passed in front of the sensor in sequence to obtain the additive color information. Another multiple shot method is called Microscanning.

The third method is called **Scanning** because the sensor moves across the focal plane much like the sensor of an image scanner. The linear or tri-linear sensors in scanning cameras utilize only a single line of photosensors, or three lines for the three colors. Scanning may be accomplished by moving the sensor or by rotating the whole camera. A digital rotating line camera offers images of very high total resolution.

Table of sensor sizes			
Type	Width (mm)	Height (mm)	Size (mm ²)
1/3.6"	4.00	3.00	12.0
1/3.2"	4.54	3.42	15.5
1/3"	4.80	3.60	17.3
1/2.7"	5.37	4.04	21.7
1/2.5"	5.76	4.29	24.7
1/2.3"	6.16	4.62	28.5
1/2"	6.40	4.80	30.7
1/1.8"	7.18	5.32	38.2
1/1.7"	7.60	5.70	43.3
2/3"	8.80	6.60	58.1
1"	12.8	9.6	123
4/3"	18.0	13.5	243
APS-C	25.1	16.7	419

35 mm	36	24	864	
Back	48	36	1728	

Types:

Compact:

Compact cameras are intended to be portable and are particularly suitable for casual "snapshots". In most models, an auto actuating lens cover protects the lens from elements. Compact cameras are usually designed to be easy to use. A few high end compact digital cameras have a hotshoe for connecting to an external flash. Live preview is almost always used to frame the photo on an integrated LCD. In addition to being able to take still photographs almost all compact cameras have the ability to record video.

Action cameras:

GoPro and other brands offer action cameras which are rugged, small and can be easily attached to helmet, arm, bicycle, etc. Most have wide angle and fixed focus, and can take still pictures and video, typically with sound.

360-degree camera:

The 360-degree camera can take picture or video 360 degrees using two lenses back-to-back and shooting at the same time. Nico360 was launched in 2016 and claimed as the world's smallest 360-degree camera with size 46 x 46 x 28 mm (1.8 x 1.8 x 1.1 in) and price less than \$200.

Bridge cameras:

Bridge cameras physically resemble DSLRs, and are sometimes called DSLR-shape or DSLR-like. They provide some similar features but, like compacts. They use a fixed lens and a small sensor. Most use live preview to frame the image. Their usual autofocus is by the same contrast-detect mechanism as compacts, but many bridge cameras have a manual focus mode and some have a separate focus ring for greater control. Big physical size and small sensor allow superzoom and wide aperture. Bridge cameras generally include an image stabilization system to enable longer handheld exposures, sometimes better than DSLR for low light condition.

Modular cameras:

While most digital cameras with interchangeable lenses feature a lens-mount of some kind. There are also a number of modular cameras, where the shutter and sensor are incorporated into the lens module. There are also a number of add-on camera modules for smartphones. They are called lens-style cameras. They contain all the essential components of a digital camera, but lack any sort of viewfinder and most controls of a regular camera. Instead, they are connected wirelessly and/or mounted to a smartphone to be used as its display output and operate the camera's various controls.

Lens-style cameras include:

- Sony Cyber-shot QX series, Kodak PixPro smart lens camera series, ViviCam IU680 smart lens camera, Olympus Air A01 lens camera, and all compatible Micro Four Thirds lenses can then be attached to the built-in lens mount of the camera's sensor module.

Stand alone camera:

Stand alone cameras can be used as remote camera. One kind weighs 2.31 ounces (65.5 g), with a periscope shape, IPx7 water-resistance and dust-resistance rating and can be enhanced to IPx8 by using a cap. They have no viewfinder or LCD. Lens is a 146 degree wide angle or standard lens, with fixed focus. It can have a microphone and speaker. It can take photos and video. As a remote camera, a phone app using Android or iOS is needed to send live video, change settings, take photos, or use time lapse.

Superzoom Cameras:

Digital superzoom cameras are digital cameras that can zoom in very far. These superzoom cameras are suitable for people who have nearsightedness. The HX series is a series containing Sony's superzoom cameras like HX20V, HX90V and the newest HX99. HX stands for HyperXoom.

Connectivity:

Many digital cameras can connect directly to a computer to transfer data:-

- USB is now the most widely used method.
- Other cameras use wireless connections, via Bluetooth or IEEE 802.11 Wi-Fi, such as the Kodak EasyShare One. Wi-Fi integrated Memory cards (SDHC, SDXC) can transmit stored images, video and other files to computers or smartphones. Mobile operating systems such as Android allow automatic upload and backup or sharing of images over Wi-Fi to photo sharing and cloud services.
- Cameraphones and some high-end stand-alone digital cameras also use cellular networks to connect for sharing images. The most common standard on cellular networks is the MMS Multimedia Messaging Service, commonly called "picture messaging". The second method with smartphones is to send a picture as an email attachment.

Printers

In computing, a printer is a peripheral device which makes a persistent representation of graphics or text, usually on paper. The different types of printers include 3D printer, inkjet printer, laser printer, thermal printer, etc.

The first computer printer designed was a mechanically driven apparatus by Charles Babbage for his difference engine in the 19th century; however, his mechanical printer design was not built until 2000. The first electronic printer was the EP-101, invented by Japanese company Epson and released in 1968. The first commercial printers generally used mechanisms from electric typewriters and Teletype machines. The demand for higher speed led to the development of new systems specifically for computer use.

Types:

Personal printers are primarily designed to support individual users, and may be connected to only a single computer. These printers are designed for low-volume, short-turnaround print jobs, requiring minimal setup time to produce a hard copy of a given document. However, they are generally slow devices ranging from 6 to around 25 pages per minute (ppm), and the cost per page is relatively high. However, this is offset by the on-demand convenience. Some printers can print documents stored on memory cards or from digital cameras and scanners.

Networked or shared printers are "designed for high-volume, high-speed printing". They are usually shared by many users on a network and can print at speeds of 45 to around 100 ppm. The Xerox 9700 could achieve 120 ppm.

A **virtual printer** is a piece of computer software whose user interface and API resembles that of a printer driver, but which is not connected with a physical computer printer. A virtual printer can be used to create a file which is an image of the data which would be printed, for archival purposes or as input to another program. For example to create a PDF or to transmit to another system or user.

A **barcode printer** is a computer peripheral for printing barcode labels or tags that can be attached to, or printed directly on, physical objects. Barcode printers are commonly used to label cartons before shipment, or to label retail items with UPCs or EANs.

A **3D printer** is a device for making a three-dimensional object from a 3D model or other electronic data source through additive processes in which successive layers of material. It is called a printer by analogy with an inkjet printer which produces a two-dimensional document by a similar process of depositing a layer of ink on paper.

Modern print technology:

The following printing technologies are routinely found in modern printers:

Laser printer:

A laser printer rapidly produces high quality text and graphics. As with digital photocopiers and multifunction printers (MFPs), laser printers employ a xerographic printing process but differ from analog photocopiers in that the image is produced by the direct scanning of a laser beam across the printer's photoreceptor.

LED Printer:

Another toner-based printer is the LED printer which uses an array of LEDs instead of a laser to cause toner adhesion to the print drum.

Inkjet printers:

Inkjet printers operate by propelling variably sized droplets of liquid ink onto almost any sized page. They are the most common type of computer printer used by consumers.

Solid ink printers:

Solid ink printers, also known as phase-change printers, are a type of thermal transfer printer. They use solid sticks of CMYK-coloured ink, similar in consistency to candle wax, which are melted and fed into a piezo crystal operated print-head. The printhead sprays the ink on a rotating, oil coated drum. The paper then passes over the print drum, at which time the image is immediately transferred, or transfixed, to the page. Solid ink printers are most commonly used as colour office printers and are excellent at printing on transparencies and other non-porous media. Solid ink printers can produce excellent results. Previously, solid ink printers were manufactured by Tektronix, but Tek sold the printing business to Xerox in 2001.

Thermal printers:

Thermal printers work by selectively heating regions of the special heat-sensitive paper. Monochrome thermal printers are used in cash registers, ATMs, gasoline dispensers and some older inexpensive fax machines. Colours can be achieved with special papers and different temperatures and heating rates for different colours.

Teleprinter:

The common teleprinter could easily be interfaced with the computer and became very popular except for those computers manufactured by IBM. Some models used a "typebox" that was positioned, in the X- and Y-axes, by a mechanism, and the selected letter form was struck by a hammer. Others used a type cylinder in a similar way as the Selectric typewriters used their type ball. In either case, the letter form then struck a ribbon to print the letterform. Most teleprinters operated at ten characters per second although a few achieved 15 CPS.

Daisy wheel printers:

Daisy wheel printers operate in much the same fashion as a typewriter. A hammer strikes a wheel with petals, the "daisy wheel", each petal containing a letter form at its tip. The letter form strikes a ribbon of ink, depositing the ink on the page and thus printing a character. By rotating the daisy wheel, different characters are selected for printing. These printers were also referred to as letter-quality printers because they could produce a text which was as clear and crisp as a typewriter. The fastest letter-quality printers printed at 30 characters per second.

Dot-matrix printers:

The term dot matrix printer is used for impact printers that use a matrix of small pins to transfer ink to the page. The advantage of dot matrix over other impact printers is that they can produce graphical images in addition to text; however the text is generally of poorer quality than impact printers that use letterforms.

Dot-matrix printers can be broadly divided into two major classes:

- Ballistic wire printers
- Stored energy printers

Dot matrix printers can either be character-based or line-based (that is, a single horizontal series of pixels across the page), referring to the configuration of the print head.

Printing speed:

The speed of early printers was measured in units of characters per minute (cpm) for character printers, or lines per minute (lpm) for line printers. Modern printers are measured in pages per minute (ppm). These measures are used primarily as a marketing tool, and are not as well standardised as toner yields. Usually pages per minute refers to sparse monochrome office documents, rather than dense pictures which usually print much more slowly, especially colour images. Speeds in ppm usually apply to A4 paper in most countries in the world, and letter paper size, about 6% shorter, in North America.

Printing mode:

The data received by a printer may be:

- A string of characters
- A bitmapped image
- A vector image
- A computer program written in a page description language, such as PCL or PostScript

Photocopier

A photocopier is also known as a copier or copy machine. It is a machine that makes copies of documents and other visual images onto paper or plastic film quickly and cheaply. Most modern photocopiers use a technology called xerography, a dry process that uses

electrostatic charges on a light-sensitive photoreceptor to first attract and then transfer toner particles (a powder) onto paper in the form of an image. Heat, pressure or a combination of both is then used to fuse the toner onto the paper. Copiers can also use other technologies such as ink jet, but xerography is standard for office copying. Earlier versions included the Gestetner stencil duplicator, invented by David Gestetner in 1887.

Commercial xerographic office photocopying was introduced by Xerox in 1959. Photocopying is widely used in the business, education, and government sectors. While there have been predictions that photocopiers will eventually become obsolete as information workers increase their use of digital document creation, storage and distribution, and rely less on distributing actual pieces of paper, as of 2015, photocopiers continue to be widely used. In the 1980s, there is a convergence in some high-end machines between the roles of a photocopier, a fax machine, a scanner, and a computer network-connected printer into a multi-function printer. Lower-end machines that can copy and print in color have increasingly dominated the home-office market as their prices fell steadily through 1999. Higher-end color photocopiers capable of handling heavy duty cycles and large-format printing remain a costlier specialty for print and design shops.

Some devices sold as photocopiers have replaced the drum-based process with inkjet or transfer film technology.

Among the key advantages of photocopiers over earlier copying technologies are their ability:

- to use plain (untreated) office paper;
- to implement duplex (or two-sided) printing;
- to scan several pages automatically with an ADF; and,
- eventually, to sort and/or staple output.

Color photocopiers:

Colored toner became available in the 1950s, although full-color copiers were not commercially available until 3M released the Color-in-Color copier in 1968, which used a dye sublimation process rather than conventional electrostatic technology. The first electrostatic color copier was released by Xerox (the 6500) in 1973. Color photocopying is a concern to governments, as it facilitates counterfeiting currency and other documents.

Digital technology:

There is an increasing trend for new photocopiers to adopt digital technology, thus replacing the older analog technology. With digital copying, the copier effectively consists of an integrated scanner and laser printer. This design has several advantages, such as automatic image quality enhancement and the ability to "build jobs". It means scanning page images independently of the process of printing them. Some digital copiers can function as high-speed scanners; such models typically offer the ability to send documents via email or to make them available on file servers.

A great advantage of digital copier technology is "automatic digital collation". For example, when copying a set of 20 pages 20 times, a digital copier scans each page only once, then uses the stored information to produce 20 sets. In an analog copier, either each page is scanned 20 times (a total of 400 scans), making one set at a time, or 20 separate output trays are used for the 20 sets.

How does it work?

1. **Charging:** cylindrical drum is electrostatically charged by a high voltage wire called a corona wire or a charge roller. The drum has a coating of a photoconductive material. A photoconductor is a semiconductor that becomes conductive when exposed to light.
2. **Exposure:** A bright lamp illuminates the original document, and the white areas of the original document reflect the light onto the surface of the photoconductive drum. The areas of the drum that are exposed to light become conductive and therefore discharge to the ground. The area of the drum not exposed to light (those areas that correspond to black portions of the original document) remains negatively charged.
3. **Developing:** The toner is positively charged. When it is applied to the drum to develop the image, it is attracted and sticks to the areas that are negatively charged (black areas), just as paper sticks to a balloon with a static charge.
4. **Transfer:** The resulting toner image on the surface of the drum is transferred from the drum onto a piece of paper that has an even greater negative charge than the drum has.
5. **Fusing:** The toner is melted and bonded to the paper by heat and pressure rollers.

A negative photocopy inverts the colors of the document when creating a photocopy, resulting in letters that appear white on a black background instead of black on a white background. Negative photocopies of old or faded documents sometimes produce documents that have better focus and are easier to read and study.

Health Issues:

Exposure to ultraviolet light is a concern. In the early days of photocopiers, the sensitizing light source was filtered green to match the optimal sensitivity of the photoconductive surface. This filtering conveniently removed all ultraviolet. Currently, a variety of light sources are used. As glass transmits ultraviolet rays between 325 and 400 nanometers, copiers with ultraviolet-producing lights such as fluorescent, tungsten halogen, or xenon flash, expose documents to some ultraviolet. Concerns about emissions from photocopy machines have been expressed by some in connection with the use of selenium and emissions of ozone and fumes from heated toner.

Tablet Computer

A tablet computer, commonly shortened to tablet, is a mobile device, typically with a mobile operating system and touch screen display processing circuitry, and a rechargeable battery in a single, thin and flat package. Tablets, being computers, do what other personal computers do, but lack some input/output (I/O) abilities that others have. Modern tablets largely resemble modern smartphones, the only differences being that tablets are relatively larger than smartphones, with screens 7 inches (18 cm) or larger, measured diagonally, and may not support access to a cellular network.

The touchscreen display is operated by gestures executed by finger or digital pen (stylus), instead of the mouse, trackpad, and keyboard of larger computers. Portable computers can be classified according to the presence and appearance of physical keyboards. Two species of tablet, the slate and booklet, do not have physical keyboards and usually accept text and other input by use of a virtual keyboard shown on their touchscreen displays.

To compensate for their lack of a physical keyboard, most tablets can connect to independent physical keyboards by Bluetooth or USB; 2-in-1 PCs have keyboards, distinct from tablets.

The form of the tablet was conceptualized in the middle of the 20th century (Stanley Kubrick depicted fictional tablets in the 1968 science fiction film *A Space Odyssey*) and prototyped and developed in the last two decades of that century. In 2010, Apple released the iPad, the first mass-market tablet to achieve widespread popularity. Thereafter tablets rapidly rose in ubiquity and soon became a large product category used for personal, educational and workplace applications.

Modern tablets:

Android was the first of the 2000s-era dominating platforms for tablet computers to reach the market. In 2008, the first plans for Android-based tablets appeared. The first products were released in 2009. Among them was the Archos 5, a pocket-sized model with a 5-inch touchscreen, that was first released with a proprietary operating system and later (in 2009) released with Android 1.4. The Camangi WebStation was released in Q2 2009. The first LTE Android tablet appeared late 2009 and was made by ICD for Verizon. This unit was called the Ultra, but a version called Vega was released around the same time. Ultra had a 7-inch display while Vega's was 15 inches. Many more products followed in 2010. Several manufacturers waited for Android Honeycomb, specifically adapted for use with tablets, which debuted in February 2011.

Types:

Tablets can be loosely grouped into several categories by physical size, kind of operating system installed, input and output technology, and uses.

Slate:

The size of a slate varies, but slates begin at 6 inches (approximately 15 cm). Some models in the larger than 10-inch (25 cm) category include the Samsung Galaxy Tab Pro 12.2 at 12.2 inches (31 cm), the Toshiba Excite at 13.3 inches (33 cm) and the Dell XPS 18 at 18.4 inches (47 cm). On September 9, 2015, Apple released the iPad Pro with a 12.9 inches (33 cm) screen size, larger than the regular iPad.

Mini tablet:

Mini tablets are smaller and weigh less than slates, with typical screen sizes between 7–8 inches (18–20 cm). The first commercially successful mini tablets were introduced by Amazon.com (Kindle Fire), Barnes & Noble (Nook Tablet), and Samsung (Galaxy Tab) in 2011; and by Google (Nexus 7) in 2012. They operate identically to ordinary tablets but have lower specifications compared to them.

2-in-1 PC:

A 2-in-1 PC is a hybrid or combination of a tablet and laptop computer that has features of both. Distinct from tablets, 2-in-1 PCs all have physical keyboards, but they are either concealable by folding them back and under the touchscreen ("2-in-1 convertible") or detachable ("2-in-1 detachable"). 2-in-1s typically also can display a virtual keyboard on their touchscreens when their physical keyboards are concealed or detached. Some 2-in-1s have processors and operating systems like those of laptops, such as Windows 10, while having the flexibility of operation as a tablet.

There are two species of 2-in-1s:

- Convertibles have a chassis design by which their physical keyboard may be concealed by flipping/folding the keyboard behind the chassis. Examples include 2-in-1 PCs of the Lenovo Yoga series.
- Detachables or Hybrids have physical keyboards that may be detached from their chassis, even while the 2-in-1 is operating. Examples include 2-in-1 PCs of the Asus Transformer Pad and Book series, the iPad Pro, and the Microsoft Surface Book and Surface Pro.

Gaming tablet:

Some tablets are modified by adding physical gamepad buttons such as D-pad and thumb sticks for better gaming experience combined with the touchscreen and all other features of a typical tablet computer. Most of these tablets are targeted to run native OS games and emulator games. Nvidia's Shield Tablet, with an 8-inch (200 mm) display, and running Android, is an example. It runs Android games purchased from Google Play store. PC games can also be streamed to the tablet from computers with some higher end models of Nvidia-powered video cards. _____

Popplet

Popplet is a tool that allows users to visualize ideas. Teachers and students can create graphic organizers, timelines, and many other forms of visual organization. Popplet's strength is that it is a collaborative brainstorming tool.

Getting Started:

Registering with Popplet takes only a few minutes and includes a tutorial that guides new users in understanding the basic features. Once registered, users can begin developing their first projects by creating a popple: a balloon or textbox. By double-clicking on the Popplet canvas, text can be added, aligned, and resized in each new popple. Likewise, videos and images can be imported via Facebook, Flickr, or YouTube, or from any file saved on the computer. Users can also use the drawing tool to freely write notes or sketch a diagram. A comment function allows other users to leave feedback on individual popples. Finally, users can take advantage of color coding to group and organize their Popplet canvases. In addition to these simple features, other tools offer added flexibility—which can be accessed by clicking on the wheel in the top menu. Users can edit entries and organize popples in a variety of way: either horizontally and vertically. Aside from Flickr, Facebook, and YouTube, Popplet also allows users to directly embed from Google Maps and Amazon. One helpful feature for teachers is found in the labs functions, where a "timewarp" displays a sliding timeline of the popplet's creation process. Finished popplets can be exported as JPG and PDF files, as well as saved and printed. A new feature is a desktop application that can be downloaded and allows popplets to be saved for offline presentations.

Examples

A short history of Coke bottles is a good example of how visual displays can show change over time, or diversity, within a specific subject matter. Similarly, another example on the Popplet site focuses on Napoleon's career, mixing images with textual information.

Teachers can use Popplet to create a variety of templates for student use of graphic organizers, timelines, or storyboards. For formal presentations, educators can develop Popplet displays that model historical timelines, hierarchal social systems, and other forms of organization that historians often rely on for their work. Popplet is also a valuable tool for

collaborative planning among history faculty through its comments feature and multiple-user interface. Students will also find Popplet as a useful tool for initiating ideas for history projects or for displaying research.

Pen Drive

Introduction:

Pen Drive also referred as USB flash drive is a portable device which allows user to transfer data (text, images, videos etc) to and from computer quickly. Users can easily read and write the data on the Pen Drive by plugging it into the USB port on the computer. Pen Drives are quite compact and can fit easily into the pocket; they run without battery and draw power from the USB connection itself. Both Floppy disks and CDs are now being gradually replaced by Pen Drive as a preferred means of data storage. It is because latter offers mass data transfer and storage capability and at a much faster rate. Storage capacity of the Pen Drive can vary from few megabytes to over 100 GB.

Architecture:

Pen drive consists of an electronic circuit board and a USB connector connects the drive to the computer. Pen Drive also known as a Flash memory is an example of NAND style storage device. It is a memory chip which holds the data. Data output is controlled by Crystal oscillator which produces 12 MHz clock signal in the device. Most Pen Drives are covered with plastic, metal or rubber casing for insulation.

Advantages:

Pen Drives are robust and scratch free thus ensuring maximum security for your data as compared to other traditional means of data storage. Many available PC software suites permit the launch of an operating system from the bootable pen drive. Moreover companies selling Pen Drives nowadays also couple it with other devices like MP3 music player, LED's or Swiss Knife etc.

What Are the Functions of a Pen Drive?

The Pen drive, more commonly known today as a USB drive, serves as a mobile storage for computing systems. Designed off of a non-volatile memory type, these small memory units are praised for their use in small electronics such as cameras and MP3 players. Praised for their solid state nature and ease of mobility, pen drives have become a common and inexpensive form of computer storage.

The first flash drives were designed and marketed through a joint venture between the IBM and Trek technologies corporation. These initial drives were released in last quarter of the year 2000 as "Thumb Drives" and featured an 8MB storage capacity that easily surpassed the floppy drive's 1.44MB storage capacity.

Function:

Pen drives act as permanent storage drives that interface with the computer through a USB or Firewire port. These Pen drives store information for any of the same uses an internal hard drive. The Pen drives use flash memory modules that hold data in a NAND memory configuration, which have increased sequential read and write speeds but reduced random access times.

Benefits:

Pen drives today come in capacities of 128GB and higher and often weigh less than 1 ounce. This high-density storage is perfect for large scale data back up and retrieval. Also, the plug and play connectivity of USB and Firewire coupled with their diminutive size of often less than 2 inches provides for easy mobility of large data sets.

Considerations:

Though Pen drives offer large data capacity and mobility, they are not well suited for intensive memory applications. Pen drive flash memory technology has a much shorter MTBF (Mean Time Before Failure) than standard internal mechanical hard drives. The memory cells can only be written to and read from so many times before they fail completely and are ignored by the memory module.

Potential:

Recently, the so-called solid state drives, which are built off the same technology as Pen drives, have been released for use as internal hard drives. These drives use an advanced memory architecture that maintains of record of the reads and writes to each memory cell and staggers them appropriately to increase the life of the drive. These hard drives boast impressive access times; however, due to their foundation as Pen drive derivatives, they still lack random access efficiency, which leads to decreased multitasking ability when used as a computer's main storage device.

HARDWARE ICT TOOLS

I-Pods

The iPod was released in late 2001. The iPod line came from Apple's "digital hub" category, when the company began creating software for the growing market of personal digital devices. Digital cameras, camcorders, and organizers had well-established mainstream markets, but the company found existing digital music players.

Audio

The third-generation iPod had a weak bass response, as shown in audio tests. The combination of the undersized DC-blocking capacitors and the typical low impedance of most consumer headphones form a high-pass filter, which attenuates the low-frequency bass output. Similar capacitors were used in the fourth-generation iPods. The problem is reduced when using high-impedance headphones and is completely masked when driving high-impedance (line level) loads, such as an external headphone amplifier.

Connectivity

The third generation began including a 30-pin dock connector, allowing for FireWire or USB connectivity. This provided better compatibility with non-Apple machines, as most of them did not have FireWire ports at the time. Eventually, Apple began shipping iPods with USB cables instead of FireWire, although the latter was available separately. As of the first-generation iPod Nano and the fifth-generation iPod Classic, Apple discontinued using FireWire for data transfer (while still allowing for use of FireWire to charge the device) in an attempt to reduce cost and form factor. As of the second-generation iPod Touch and the fourth-generation iPod Nano, FireWire charging ability has been removed. The second-, third-, and fourth-generation iPod Shuffle uses a single 3.5 mm minijack phone connector which acts as both a headphone jack or a USB data and charging port for the dock/cable. The dock connector also allowed the iPod to connect to accessories, which often

supplement the iPod's music, video, and photo playback. Bluetooth connectivity was added to the last model of the iPod Nano, and Wi-Fi to the iPod Touch.

Games

Video games are playable on various versions of iPods. The original iPod had the game *Brick* included as an easter egg hidden feature; later firmware versions added it as a menu option. Later revisions of the iPod added three more games: *Parachute*, *Solitaire*, and *Music Quiz*. The games are in the form of .ipg files, which are actually .zip archives in disguise. When unzipped, they reveal executable files along with common audio and image files, leading to the possibility of third party games. Apps produced with the iPhone SDK are compatible only with the iOS on the iPod Touch and iPhone, which cannot run click wheel-based games.

File storage and transfer

All iPods except for the iPod Touch can function in "disk mode" as mass storage devices to store data files. If an iPod is formatted on a Mac OS computer, it uses the HFS+ file system format, which allows it to serve as a boot disk for a Mac computer. If it is formatted on Windows, the FAT32 format is used. With the release of the Windows-compatible iPod, the default file system used on the iPod line switched from HFS+ to FAT32, although it can be reformatted to either file system (excluding the iPod Shuffle which is strictly FAT32).

iPad

iPad is a line of tablet computers designed, developed and marketed by Apple Inc., which run the iOS and iPadOS mobile operating systems. The first iPad was released on April 3, 2010; the most recent iPad models are the seventh-generation iPad, released on September 25, 2019; the fifth-generation iPad mini, released on March 18, 2019; the third-generation iPad Air, released on March 18, 2019; and the second-generation 11-inch (280 mm) and fourth-generation 12.9-inch (330 mm) iPad Pro, released on March 25, 2020. The user interface is built around the device's multi-touch screen, including a virtual keyboard. All iPads can connect using Wi-Fi; some models also have cellular connectivity. iPads can shoot video, take photos, play music, and perform Internet functions such as web-browsing and emailing. Other functions – games, reference, GPS navigation, social networking, etc. – can be enabled by downloading and installing apps. As of March 2016, the App Store has more than 1 million apps for the iPad by Apple and third parties.

There have been ten versions of the iPad. The first generation established design precedents, some of which have persisted through all models. The second generation (iPad 2) introduced a new thinner design, a dual-core Apple A5 processor, and VGA front-facing and 720p rear-facing cameras designed for FaceTime video calling. The third generation added a Retina Display, the new Apple A5X processor with a quad-core graphics processor, a 5-megapixel camera, HD 1080p video recording, voice dictation, and 4G (LTE). The fourth generation added the Apple A6X processor and replaced the 30-pin connector with an all-digital Lightning connector. The iPad Air added the Apple A7 processor and the Apple M7 motion coprocessor, and reduced the thickness for the first time since the iPad 2. The iPad Air 2 added the Apple A8X processor, the Apple M8 motion coprocessor, an 8-megapixel camera, and the Touch ID fingerprint sensor; and further

reduced the thickness. The fifth generation added the Apple A9 processor, while sacrificing some of the improvements the iPad Air 2 introduced in exchange for a lower launch price. The sixth generation has a Apple A10 Fusion processor and Apple Pencil support. The third-generation iPad Air has a 10.5-inch display, Apple A12 Bionic processor, and support Apple Pencil and Apple Smart Keyboard. The seventh generation features a bigger 10.2-inch display with the same Apple A10 Fusion processor and supports Apple Smart Keyboard.

There have been four generations of the iPad Pro. All generations have included a 12.9" screen size option, with the other being 9.7" in first, 10.5" in second, 11" in third and fourth generations.

Screen and input

The iPad's (first two generations) touchscreen display is a 1,024 by 768 pixel, 7.75×5.82 in (197×148 mm) liquid-crystal display (diagonal 9.7 in (246.4 mm)), with fingerprint- and scratch-resistant glass. There are four physical switches on the iPad, including a home button near the display that returns the user to the main menu, and three plastic physical switches on the sides: *wake/sleep* and *volume up/down*, plus a software-controlled switch whose function has changed with software updates.

Camera

The first generation iPad had no camera. The other generation iPads contain cameras with various resolutions and also supporting autofocus, image stabilization and video stabilization. The fifth, sixth, and seventh-generation iPad have the same camera features as the iPad Air 2, with the addition of Live Photos and Retina Flash that is found on the 9.7 inch iPad Pro and later models.

Audio and output

The iPad has two internal speakers reproducing left and right channel audio located on the bottom-right of the unit. In the original iPad, the speakers push sound through two small sealed channels leading to the three audio ports carved into the device, while the iPad 2 has its speakers behind a single grill. A volume switch is on the right side of the unit. A 3.5-mm TRRS connector audio-out jack on the top-left corner of the device provides stereo sound for headphones with or without microphones and/or volume controls. The iPad also contains a microphone that can be used for voice recording. The built-in Bluetooth 2.1 + EDR interface allows wireless headphones and keyboards to be used with the iPad.

Battery

The iPad uses an internal rechargeable lithium-ion polymer (LiPo) battery. The batteries are made in Taiwan by Simplo Technology (60%) and Dynapack International Technology. The iPad is designed to be charged with a high current of 2 amperes using the included 10 W USB power adapter and USB cord with a USB connector at one end and a 30-pin dock connector at the other end. While it can be charged by a standard USB port from a computer, these are limited to 0.5 amps. As a result, if the iPad is running while powered by a normal USB computer port, it may charge very slowly, or not at all. High-power USB ports found in newer Apple computers and accessories provide full charging capabilities.

Storage

The iPad was released with three capacity options for storage: 16, 32, or 64 GB of internal flash memory. On January 29, 2013, Apple announced a 128 GB model of the fourth generation iPad, which was released on February 5. On March 21, 2016, Apple announced a

256 GB model of the iPad Pro, which was released on March 31. In 2017, Apple released a 10.5-inch iPad Pro and a revised 12.9-inch iPad Pro with a 512 GB option, the first of its kind on an iOS device. In 2018, Apple released a 11-inch and 12.9-inch iPad Pro, both with a 1 TB option. All data is stored on the internal flash memory, with no option to expand storage.

Internet connectivity

The iPad can use Wi-Fi network trilateration from Skyhook Wireless to provide location information to applications such as Google Maps. The 3G model supports A-GPS to allow its position to be calculated with GPS or relative to nearby cellphone towers; it also has a black strip on the back to aid 3G reception.

Applications

The iPad comes with several applications, including Safari, Mail, Photos, Video, iPod, iTunes, App Store, Apple Books, Maps, Notes, Calendar, and Contacts.^[116] Several are improved versions of applications developed for the iPhone or Mac. The apps currently missing are the weather, calculator, and health apps.

Education and healthcare

The iPad has several uses in the classroom, and has been praised as a valuable tool for homeschooling. Soon after the iPad was released, it was reported that 81% of the top book apps were for children. The iPad has also been called a revolutionary tool to help children with autism learn how to communicate and socialize more easily.

Scanners

An **image scanner**—often abbreviated to just **scanner**, is a device that optically scans images, printed text, handwriting or an object and converts it to a digital image. Commonly used in offices are variations of the desktop *flatbed scanner* where the document is placed on a glass window for scanning. *Hand-held scanners*, where the device is moved by hand, have evolved from text scanning "wands" to 3D scanners used for industrial design, reverse engineering, test and measurement, orthotics, gaming and other applications. Mechanically driven scanners that move the document are typically used for large-format documents, where a flatbed design would be impractical.

Modern scanners typically use a charge-coupled device (CCD) or a contact image sensor (CIS) as the image sensor, whereas *drum scanners*, developed earlier and still used for the highest possible image quality, use a photomultiplier tube (PMT) as the image sensor. A *rotary scanner*, used for high-speed document scanning, is a type of drum scanner that uses a CCD array instead of a photomultiplier. Non-contact planetary scanners essentially photograph delicate books and documents. All these scanners produce two-dimensional images of subjects that are usually flat, but sometimes solid; 3D scanners produce information on the three-dimensional structure of solid objects.

Digital cameras can be used for the same purposes as dedicated scanners. When compared to a true scanner, a camera image is subject to a degree of distortion, reflections, shadows, low contrast, and blur due to camera shake (reduced in cameras with image stabilization). Resolution is sufficient for less demanding applications.

Types:

Drum:

Drum scanners capture image information with photomultiplier tubes (PMT), rather than the charge-coupled device (CCD) arrays found in flatbed scanners and inexpensive film scanners. The drum scanner gets its name from the clear acrylic cylinder, the drum, on which the original artwork is mounted for scanning. Depending on size, it is possible to mount originals up to 20 by 28 inches (510 mm × 710 mm), but maximum size varies by manufacturer.

Flatbed:

This type of scanner is sometimes called a reflective scanner because it works by shining white light onto the object to be scanned and reading the intensity and color of light that is reflected from it, usually a line at a time. They are designed for scanning prints or other flat, opaque materials but some have available transparency adapters, which for a number of reasons, in most cases, are not very well suited to scanning film.

Film:

This type of scanner is sometimes called a slide or transparency scanner and it works by passing a narrowly focused beam of light through the film and reading the intensity and color of the light that emerges. Film scanners vary a great deal in price and quality."

Roller scanner:

Scanners are available that pull a flat sheet over the scanning element between rotating rollers. They can only handle single sheets up to a specified width (typically about 210 mm, the width of many printed letters and documents), but can be very compact, just requiring a pair of narrow rollers between which the document is passed. Some are portable, powered by batteries and with their own storage, eventually transferring stored scans to a computer over a USB or other interface.

Portable:

Image scanners are usually used in conjunction with a computer which controls the scanner and stores scans. Small portable scanners, either roller-fed or "glide-over" hand-operated, operated by batteries and with storage capability, are available for use away from a computer; stored scans can be transferred later. Many can scan both small documents such as business cards and till receipts, and letter-sized documents.

Smartphone scanner apps:

The higher-resolution cameras fitted to some smartphones can produce reasonable quality document scans by taking a photograph with the phone's camera and post-processing it with a scanning app, a range of which are available for most phone operating systems, to whiten the background of a page, correct perspective distortion so that the shape of a rectangular document is corrected, convert to black-and-white, etc. Many such apps can scan multiple-page documents with successive camera exposures and output them either as a single file or multiple page files. Some smartphone scanning apps can save documents directly to online storage locations, such as Dropbox and Evernote, send via email or fax documents via email-to-fax gateways.

Smartphone scanner apps can be broadly divided into three categories:

1. Document scanning apps primarily designed to handle documents and output PDF, and sometimes JPEG, files
2. Photo scanning apps that output JPEG files, and have editing functions useful for photo rather than document editing,^[9]

3. Barcode-like QR code scanning apps that then search the internet for information associated with the code.^[10]

Infrared cleaning:

Infrared cleaning is a technique used to remove the effects of dust and scratches on images scanned from film; many modern scanners incorporate this feature. It works by scanning the film with infrared light; the dyes in typical color film emulsions are transparent to infrared light, but dust and scratches are not, and block infrared; scanner software can use the visible and infrared information to detect scratches and process the image to greatly reduce their visibility, considering their position, size, shape, and surroundings.

Microphones

A **microphone**, colloquially named **mic** or **mike** is a device – a transducer – that converts sound into an electrical signal. Microphones are used in many applications such as telephones, hearing aids, public address systems for concert halls and public events, motion picture production, live and recorded audio engineering, sound recording, two-way radios, megaphones, radio and television broadcasting, and in computers for recording voice, speech recognition, VoIP, and for non-acoustic purposes such as ultrasonic sensors or knock sensors.

Several types of microphone are in use, which employ different methods to convert the air pressure variations of a sound wave to an electrical signal. The most common are the dynamic microphone, which uses a coil of wire suspended in a magnetic field; the condenser microphone, which uses the vibrating diaphragm as a capacitor plate; and the piezoelectric microphone, which uses a crystal of piezoelectric material. Microphones typically need to be connected to a preamplifier before the signal can be recorded or reproduced.

Components:

The sensitive transducer element of a microphone is called its *element* or *capsule*. Sound is first converted to mechanical motion by means of a diaphragm, the motion of which is then converted to an electrical signal. A complete microphone also includes a housing, some means of bringing the signal from the element to other equipment, and often an electronic circuit to adapt the output of the capsule to the equipment being driven. A wireless microphone contains a radio transmitter.

Dynamic:

The **dynamic microphone** (also known as the **moving-coil microphone**) works via electromagnetic induction. They are robust, relatively inexpensive and resistant to moisture. This, coupled with their potentially high gain before feedback, makes them ideal for on-stage use. Dynamic microphones use the same dynamic principle as in a loudspeaker, only reversed.

Speakers as microphones:

A loudspeaker, a transducer that turns an electrical signal into sound waves, is the functional opposite of a microphone. Since a conventional speaker is constructed much like a dynamic microphone (with a diaphragm, coil and magnet), speakers can actually work "in reverse" as microphones. Speakers are sometimes used as microphones in applications where

high quality and sensitivity are not needed such as intercoms, walkie-talkies or video game voice chat peripherals, or when conventional microphones are in short supply.

The most common connectors used by microphones are:

- Male XLR connector on professional microphones
- ¼ inch (sometimes referred to as 6.35 mm) phone connector on less expensive musician's microphones, using an unbalanced 1/4 inch (6.3 mm) TS (tip and sleeve) phone connector. Harmonica microphones commonly use a high impedance 1/4 inch (6.3 mm) TS connection to be run through guitar amplifiers.
- 3.5 mm (sometimes referred to as 1/8 inch mini) TRS (tip, ring and sleeve) stereo (also available as TS mono) mini phone plug on prosumer camera, recorder and computer microphones.
- USB allows direct connection to PCs. Electronics in these microphones powered over the USB connection performs preamplification and ADC before the digital audio data is transferred via the USB interface.

Interactive Whiteboard

An **interactive whiteboard (IWB)** also commonly known as Interactive board or Smart boards is a large interactive display in the form factor of a whiteboard. It can either be a standalone touchscreen computer used independently to perform tasks and operations, or a connectable apparatus used as a touchpad to control computers from a projector. The first interactive whiteboards were designed and manufactured for use in the office. They were developed by PARC around 1990. This board was used in small group meetings and round-tables.

A device driver is usually installed on the attached computer so that the interactive whiteboard can act as a Human Input Device (HID), like a mouse. The computer's video output is connected to a digital projector so that images may be projected on the interactive whiteboard surface.

The user then calibrates the whiteboard image by matching the position of the projected image in reference to the whiteboard using a pointer as necessary. After this, the pointer or other device may be used to activate programs, buttons and menus from the whiteboard itself, just as one would ordinarily do with a mouse. If text input is required, user can invoke an on-screen keyboard or, if the whiteboard software provides for this, utilize handwriting recognition. This makes it unnecessary to go to the computer keyboard to enter text.

Thus, an IWB emulates both a mouse and a keyboard. The user can conduct a presentation or a class almost exclusively from the whiteboard.

In addition, most IWBs are supplied with software that provides tools and features specifically designed to maximize interaction opportunities. These generally include the ability to create virtual versions of paper flipcharts, pen and highlighter options, and possibly even virtual rulers, protractors, and compasses—instruments that would be used in traditional classroom teaching.

Uses for interactive whiteboards may include:

- Running software that is loaded onto the connected PC, such as a web browsers or other software used in the classroom.

- Capturing and saving notes written on a whiteboard to the connected PC
- Capturing notes written on a graphics tablet connected to the whiteboard
- Controlling the PC from the white board using click and drag, markup which annotates a program or presentation
- Using OCR software to translate cursive writing on a graphics tablet into text
- Using an Audience Response System so that presenters can poll a classroom audience or conduct quizzes, capturing feedback onto the whiteboard

The various types of operation of an interactive board are an infrared scan technology; a resistive, touch-based board; an electromagnetic pen and associated software; and an ultrasonic pen.

Operation of an infrared scan (IR touch) whiteboard

An infrared interactive whiteboard is a large interactive display that connects to a computer and projector. The board is typically mounted to a wall or floor stand. Movement of the user's finger, pen, or other pointer over the image projected on the whiteboard is captured by its interference with infrared light at the surface of the whiteboard. When the whiteboard surface is pressed, software triangulates the location of the marker or stylus.

Operation of a resistive touch-based interactive whiteboard

A touch-based IWB also involves a simple pointing device. In this case, the material of the board is important. In the most common resistive system, a membrane stretched over the surface deforms under pressure to make contact with a conducting backplate. The touch point location can then be determined electronically and registered as a mouse event.

Operation of an electromagnetic pen-based interactive whiteboard

An electromagnetic pen-based interactive whiteboard involves an array of wires embedded behind the solid board surface that interacts with a coil in the stylus tip to determine the horizontal and vertical coordinates of the stylus. The pen itself usually is passive, i.e., it contains no batteries or other power source; it alters the electrical signals produced by the board.

One of the benefits of Interactive Whiteboard is Group interaction. Interactive whiteboards promotes collaboration among students and group discussion and participation. They can be an effective tool for brainstorming due to the fact that notes can be taken on the board and saved to be shared and distributed to students later.

The following are associated with the interactive whiteboards:

- Mobile stand — Allows the interactive whiteboard to be moved between rooms. Many are height adjustable as well.
- Personal Response System — Allows students to answer test questions posted on the whiteboard or take part in polls and surveys.
- Printer — Allows copies of the whiteboard notes to be made.
- Remote control — Allows the presenter to control the board from different parts of the room and eliminates on-screen toolbars.
- Slate or tablet — Allows students control of the whiteboard away from the front of the room.
- Track — Allows the whiteboard to be placed over a traditional whiteboard or tackboard to provide additional wall space at the front of the room. Some tracks provide power and data to the whiteboard as well.

- Video projector — Allows a computer display to be projected onto the whiteboard. ‘Short Throw’ projectors are available from some manufacturers that mount directly above the board minimizing shadow effects. ‘Ultra Short Throw’ projectors are even more effective.
- Wireless unit — Allows the interactive whiteboard to operate without wires to the computer, e.g. Bluetooth.

DVDs and CDs

What is the major difference between a CD and a DVD?

CDs and DVDs are similar in composition and usage, however DVDs offer more data storage capacity compared to CDs. CDs are also commonly used for audio and program files, while DVDs are used for video and program files.

CDs and DVDs have become a common technology in our world today and these two words have often become synonymous for meaning a compact disc. However, these two words actually mean different things. CDs and DVDs are made with a different purpose in mind.

Compact Disc (CD) is an optical disc that is used to store data. These are actually made to replace floppy disks that were used to store files and programs from the computer. The CDs eventually caused the floppy disks to become obsolete. CDs were invented by Philips and Sony independently, but they did collaborate to create a standard format and related player technology (CD player) in 1982. CDs can hold up to 700 MB worth of data, which is approximately 80 minutes of audio. Mini CDs have also been created that can store approximately 24 minutes of audio or program drivers.

DVDs are similar to CDs and are also an optical disc storage device. These were developed independently by Philips, Sony, Toshiba, and Panasonic in 1995. Prior to this, video and film were being recorded on Video CD (VCD) that was available in the market in 1993. Other formats that came out in the same year included Multimedia Compact Disc (MMCD) and Super Density (SD) disc. The difference in formats caused the companies to come together and set up standards for maintaining one type of format, which resulted in the formation of DVD. As prices of DVDs went down, it caused VHS tapes to become obsolete by offering better technology.

There are also various different types of DVDs including DVD-ROM, DVD-R and DVD-RW, Blu-ray. When DVD players were created, they had backward capability, which allowed CDs to be read on them. However, many CD-players could not read DVDs, which meant that people would specifically have to go and buy these players. DVDs allowed users to hold data up to 17.08 GB on a dual-layer, dual-sided disc. A single layered, single-sided disc holds approximately 4.7 GB of data. Though, these were initially used to store videos and films; these are also used to store and distribute big programs that cannot fit on to a disk.

Architecture:

CDs and DVDs are generally made using some of the same materials and manufacturing methods, with the major difference being the data capacity between the two. CDs and DVDs are made using polycarbonate plastic, which is approximately four one-hundredths ($\frac{4}{100}$) of an inch or 1.22 mm thick. The plastic is an injection-molded piece of

clear polycarbonate plastic, which then has microscopic bumps that are arranged as a single, continuous, extremely long spiral track of data. The plastic is then followed by a clear reflective aluminum layer, then a thin acrylic layer to protect the aluminum. This is followed by label that is printed onto to the acrylic layer. The CD and DVD have a single track of data in the form of a spiral, which starts as the center going outwards. The data is stored on the bumps or pits which are then read by the CD/DVD layer. The bumps/pits on a DVD are much smaller than on CD, allowing the DVD to store more data. DVD also comes with more storage layers compared to CDs.

SPECIAL ICT TOOLS FOR TEACHING AND LEARNING

Text Magnifier

Available in Android 9 (API level 28) and higher, the magnifier widget is a virtual magnifying glass that displays an enlarged copy of a chosen View through an overlay pane that represents the lens. The feature improves the text insertion and selection user experience: when applying the magnifier to text, a user can precisely position the cursor or the selection handles by viewing the magnified text in a pane that follows their finger. The magnifier APIs are not tied to text, and this widget can be used in a variety of use cases, such as reading small type or enlarging hard-to-see place names on maps.

The magnifier is already integrated with platform widgets such as TextView, EditText, or WebView. It provides consistent text manipulation across applications. The widget comes with a simple API and can be used to magnify any View depending on your application's context.

A common use case for the magnifier is to allow the user to enlarge a view region by touching it. For the platform text widgets, it's important to understand specific magnifier behaviors and to enable the magnifier for your custom text view in a consistent way across the entire Android platform. Consider the following:

- The magnifier is triggered immediately when the user grabs an insertion or selection handle.
- The magnifier always smoothly follows the user's finger horizontally, while vertically it is fixed to the center of the current text line.
- When moving horizontally, the magnifier moves only between the left and right bounds of the current line. Moreover, when the user's touch leaves these bounds and the horizontal distance between the touch and the closest bound is larger than half of the original width of the magnifier content, the magnifier is dismissed, as the cursor would no longer be visible inside the magnifier.
- The magnifier is never triggered when the text font is too large. Specifically, text is considered too large when the difference between the font's descent and ascent is larger than the height of the content that fits in the magnifier. Triggering the magnifier in this case does not add value.

What it does:

When reading information on a screen sometimes text can appear small and difficult to read. Magnifying or zooming text can make it easier and more comfortable to read written content.

CHAIR'S INTRODUCTION

It is an objective that is both honourable and necessary on so many fronts: promoting fairness, mitigating poverty and eliminating exclusion. At its core, the work of this Commission is about creating a better future for all and in this way it resonates with Scotland's egalitarian traditions.

Given the importance of the task, I am delighted that it is in the good and wise hands of the experienced and talented individuals we have around the Commission table, all of whom share a strong commitment to meeting the challenge we have been set.

Though our task is primarily about higher education, from the outset it has been our stance that people, and particularly the young, should have the opportunity to pursue an academic or vocational route that best matches their interests, abilities and aptitudes, irrespective of background.

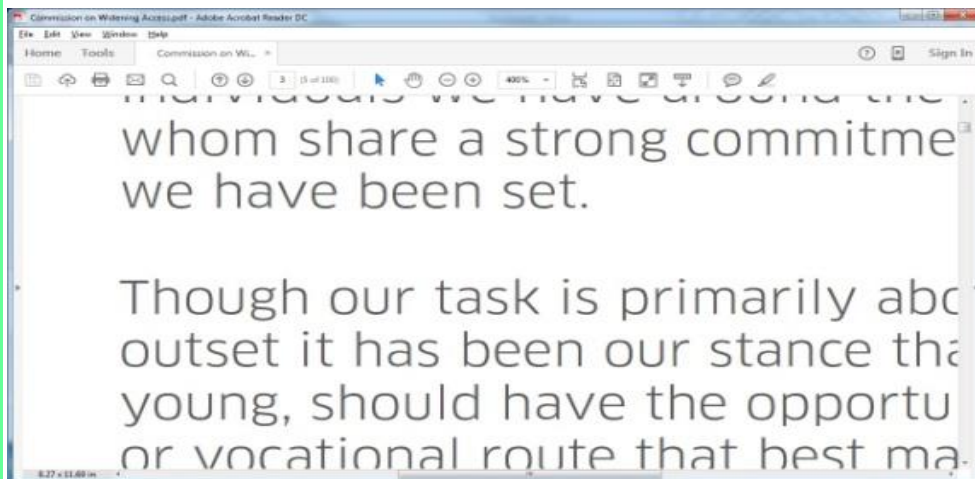
At this halfway point in our enquiry there is a growing sense in the Commission that, on the issue of equal access, Scotland is a nation, and an experienced education system, that is ripe for development. Commitment and innovative practice are essential to ensure the introduction of a comprehensive

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What it helps with:

Magnifying or zooming text can make it easier and more comfortable to make sense of information, and there are some simple ways of enlarging text to help make it reading easier.



The good news is that this is easily rectified, and the guidance below will show how to magnify text and have it reflow to make it easier to read.

What it works with:

Adobe Reader and Microsoft Word both provide ways of magnifying text and making sure that it does not go out of view and is never wider than the screen when zoomed in.

Time commitment:

Learning how to magnify/zoom text and learning how to action the reflow feature is easy and takes 2 or 3 minutes to learn how to do in both Microsoft Word and in Adobe Reader for PDF documents. Once you know how to do it this feature can be quickly accessed on both.

Head Wand



The head wand is a great assistive technology device for people with limited to no arm movement, but they have at least some movement in their head. The head wand is a device that is attached to a head piece that is very thin and long and usually has a rubber piece at the end to prevent slipping on keys. The device requires very little movement of the head to be used. The purpose of this device is to assist individuals with being able to type on a computer or other devices. This device allows students to still type on a computer and they can use the head wand to operate a mouse too. All the person has to do is aim their head/device at the keys of the letters or other keys on keyboard to type or navigate through a website. To assist them with typing the student or adult may need an adaptive keyboard and/or mouse too. Students can type their name with the wand to typing an essay and adults can use it in the workplace to assist them with using a computer or even with Ipad's or other communication devices that require buttons to be pushed. Depending on the quality and type of head wand, it can cost from \$40 to almost \$3000.

Head wand



Head wands are very similar in function to mouth sticks, except the stick is strapped to the head. A person moves the head to make the head wand type characters, navigate through web documents, etc. Fatigue can be an issue when a lot of keystrokes are required in order to accomplish a task.

Keyboard for Cerebral Palsy

Alternative Keyboards



Many types of keyboards are available today to accommodate someone with limited mobility, decreased sensation in the hands, and visual or cognitive disabilities.

Enlarged keyboards were designed for use by persons with severe motor disabilities, such as cerebral palsy. There have been product changes over the years. The Intellikeys keyboard had a strong presence in schools. This keyboard has a smooth programmable membrane surface. It uses interchangeable overlays which serve the purpose of simplifying the number of keys or size of the area that must be touched, or placing the keys in alphabetical order for young children unfamiliar with the traditional qwerty layout. Intellikeys could also be used for mouse movement or totally customized with words to pair with special software. The production of Intellikeys ceased. However, there is new interest in providing the driver source code to users to make the keyboard functional again.

Other larger keyboards like **Big Keys** provide large keys in either standard layout, ABC order or colored for improved visibility. **Maltron** in the UK makes a large keyboard complete with a metal keyguard to withstand heavy use.

Some **traditional keyboards** are available with large, bold letter identification (36 point) or high contrast colors such as black letters on yellow backgrounds. **KEYS-U-SEE** has a keyboard 18.5" X 7.5" with large print letters, black letters on yellow, standard grey or white letters on black. The **VisionBoard2** is similar to KEYS-U-SEE. Stickers or overlays can be purchased also to place on keyboard keys and improve the visibility of the keys for those with low vision. Braille labels can also be obtained.

Smaller, more compact keyboards (about 20% smaller) can be obtained. Many of these are wireless like this one from **Logitech**, and use a wireless receiver that you plug into your computer's USB port and requiring no special software. The **Super-Mii keyboard** is 8.5" X 5.91" and has a touchpad.

The **Magic Wand Keyboard** from In Touch Systems is a miniature keyboard and mouse that allows people with little or no arm movement to access any computer. Both the keyboard and built-in mouse use zero-force electronic keys that work with the touch of a wand, either a mouth stick or a hand-held wand. No strength is required, only contact.

Maltron Single-Hand Keyboards enable those who have use of only one hand to access computers. The ergonomic design and special letter layout reduces hand and finger

movement and users are able to use single-hand keyboards more quickly and efficiently than conventional keyboards. Left- and right- hand models are available. An ergonomic two-handed keyboard is also available.

Maltron also makes a curved keyboard designed for use with a mouth or head stick. Not only does this have a unique curved design but the most frequently used letters are placed centrally to minimize the amount of movement necessary when typing.

Key-X is the world's first keypad that gives people with Cerebral Palsy and other motor, physical and intellectual disabilities autonomy to use and control any computer, smartphone or tablet to work, write, study or play. Key-X has been highlighted by the Singularity University as a device that can leverage exponential technologies to address the world's most intractable problems.

However, despite the fact that there are literally hundreds of millions of people with physical, motor and intellectual disabilities all over the world, the truth is that, up until now, these people didn't have any specialized tool that allowed them to autonomously and efficiently use a computer or even a smartphone.



The Key-X was designed by Key2Enable to be the perfect special education resource for students with Cerebral Palsy and many other disabilities and the perfect keypad for adults with Cerebral Palsy or any motor impairment. With the Key-X, a person with any disability can efficiently and autonomously write, work, study and play with a computer, tablet or smartphone without any barriers.

MAIN FEATURES

Makes typing easy, through the activation of iconographic keys in double sequences; the optional software FluentIX speeds up the typing by intelligently completing words

Large, well-spaced and touch-sensitive keys allow the use of the panel without needing much force, but robust enough to resist rough touches, and can even be used with the feet

It does not require an installation of any specific software, being able to be used for internet browsing, social networks, text editors and even games

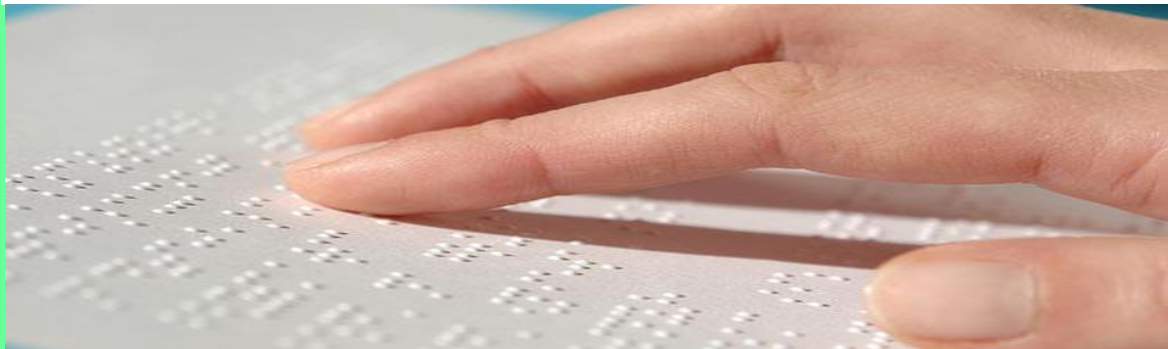
It allows typing every alphanumeric character, accentuation characters, punctuation, symbols, and commands available in a conventional keyboard

It allows a precise control of the cursor on the screen, with every resource of a common mouse (left and right click, double click, click and drag, and vertical scrolling)

It provides an alternative mode of operation for games and special software, such as Simplix, that allows interaction without the need to combine keys

Braille

What Is Braille?



Braille is a system of raised dots that can be read with the fingers by people who are blind or who have low vision. Teachers, parents, and others who are not visually impaired ordinarily read braille with their eyes. Braille is not a language. Braille is used by thousands of people all over the world in their native languages, and provides a means of literacy for all.

What Does Braille Look Like?

Braille symbols are formed within units of space known as braille cells. A full braille cell consists of six raised dots arranged in two parallel rows each having three dots. The dot positions are identified by numbers from one through six. Sixty-four combinations are possible using one or more of these six dots. A single cell can be used to represent an alphabet letter, number, punctuation mark, or even a whole word. This braille alphabet and numbers page illustrates what a cell looks like and how each dot is numbered.

How Is Braille Written?

When every letter of every word is expressed in braille, it is referred to as uncontracted braille. Some books for young children are written in uncontracted braille although it is less widely used for reading material meant for adults. However, many newly blinded adults find uncontracted braille useful for labeling personal or kitchen items when they are first learning braille.

The standard system used for reproducing most textbooks and publications is known as contracted braille. In this system cells are used individually or in combination with others

to form a variety of contractions or whole words. For example, in uncontracted braille the phrase *you like him* requires twelve cell spaces. It would look like this:

you like him

 The image shows the uncontracted Braille for the words 'you', 'like', and 'him'. 'you' is represented by three cells: the first cell has dots 1, 2, 3, 4, 5, 6; the second cell has dots 1, 2, 3, 4; the third cell has dots 1, 2, 3, 4, 5, 6. 'like' is represented by three cells: the first cell has dots 1, 2, 3, 4, 5, 6; the second cell has dots 1, 2, 3, 4; the third cell has dots 1, 2, 3, 4, 5, 6. 'him' is represented by three cells: the first cell has dots 1, 2, 3, 4, 5, 6; the second cell has dots 1, 2, 3, 4; the third cell has dots 1, 2, 3, 4, 5, 6.

If written in contracted braille, this same phrase would take only six cell spaces to write. This is because the letters *y* and *l* are also used for the whole words *you* and *like* respectively. Likewise, the word *him* is formed by combining the letters *h* and *m*. It would look like this:

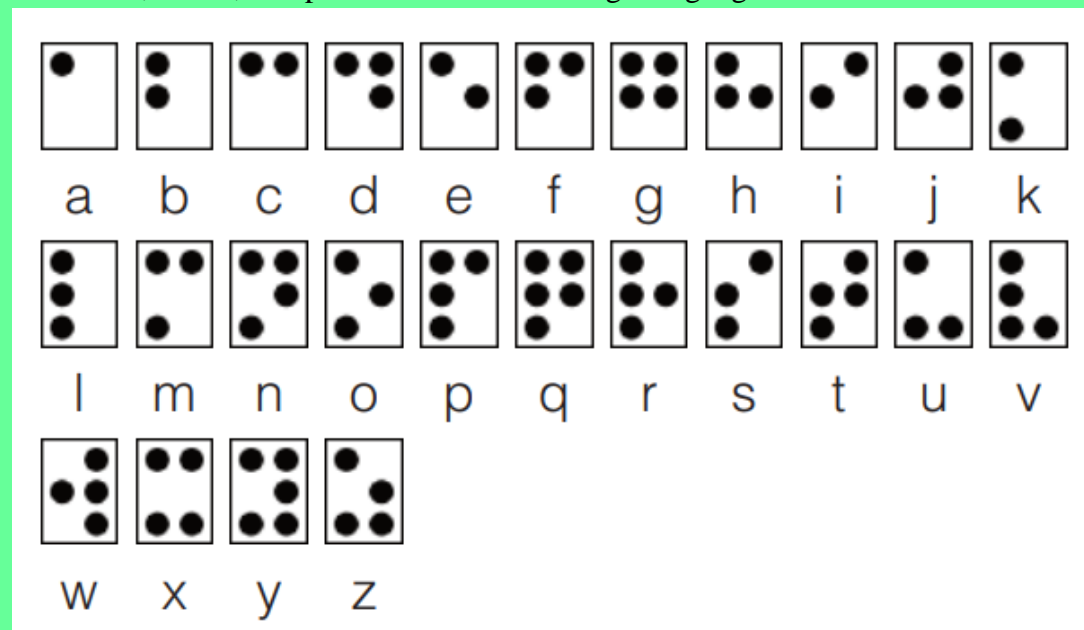
you like him

 The image shows the contracted Braille for the words 'you', 'like', and 'him'. 'you' is represented by one cell with dots 1, 2, 3, 4, 5, 6. 'like' is represented by two cells: the first cell has dots 1, 2, 3, 4, 5, 6; the second cell has dots 1, 2, 3, 4, 5, 6. 'him' is represented by one cell with dots 1, 2, 3, 4, 5, 6.

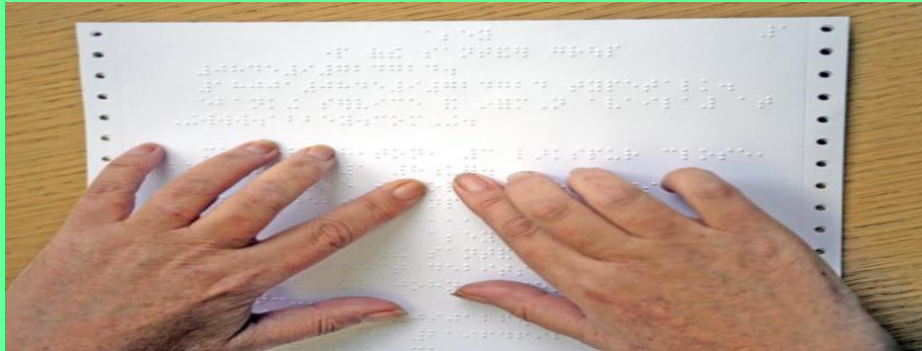
There are 180 different letter contractions used in contracted braille (including 75 shortform words like "him" shown above, which are simple abbreviations). These "short cuts" are used to reduce the volume of paper needed for reproducing books in braille and to make the reading process easier. Most children learn contracted braille from kindergarten on, and contracted braille is considered the standard in the United States, used on signs in public places and in general reading material.

Braille is also produced by a machine known as a braillewriter. Unlike a typewriter which has more than fifty keys, the braillewriter has only six keys, a space bar, a line spacer, and a backspace. The six main keys are numbered to correspond with the six dots of a braille cell. Because most braille symbols contain more than a single dot, combinations of the braillewriter keys can be pushed at the same time.

Braille is a tactile reading and writing system used by blind and visually impaired people who cannot access print materials. It uses raised dots to represent the letters of the print alphabet. It also includes symbols to represent punctuation, mathematics and scientific characters, music, computer notation and foreign languages.



alphabet, number, punctuation, part of a word or even a whole word.



Computers provide and continue to expand additional avenues of literacy for braille users. Software programs and portable electronic braille note takers allow users to save and edit their writing, have it displayed back to them either audibly or tactually and produce a hard copy via a desktop computer-driven braille embosser.

Typing / Keyboarding Aids

Typing and keyboarding can be difficult for individuals with fine motor limitations or limited dexterity in their hands. Products are available that assist individuals with using a keyboard and depressing the keys.

Attached to a soft depressor, the aid allows users to type easier. The hand clip is useful for keyboards, calculators, telephones, or anything that uses typing. In order to fit the user's hand, the clip can be rebent.

Type Ability 4.3.4

Type Ability is a program that teaches the entire computer keyboard in 99 user-friendly lessons. By the end of the lessons, the student will have mastered all the letters, numbers, punctuation, as well as navigation and editing in dialogs and text documents.

Large Print

Large Print Keyboard's offered by Logic Keyboard is perfect for those individuals who are having a hard time seeing the existing commands on their keyboards. By offering a bigger and bolder typeface, the keys become easier to see. These keyboards are designed to assist the user who has a vision loss condition.

Audiobooks

An **audiobook** (or a **talking book**) is a recording of a book or other work being read out loud. A reading of the complete text is described as "unabridged", while readings of a shorter version are an abridgement.

Spoken audio has been available in schools and public libraries and to a lesser extent in music shops since the 1930s. Many spoken word albums were made prior to the age of cassettes, compact discs, and downloadable audio, often of poetry and plays rather than

books. It was not until the 1980s that the medium began to attract book retailers, and then book retailers started displaying audiobooks on bookshelves rather than in separate displays.

Production:

Producing an audiobook consists of a narrator sitting in a recording booth reading the text, while a studio engineer and a director record and direct the performance. With recent advancements in recording technology, many audiobooks are also now recorded in home studios by narrators working independently. Audiobooks produced by major publishing houses undergo a proofing and editing process after narration is recorded.

Audiobooks are distributed on any audio format available, but primarily these are records, cassette tapes, CDs, MP3 CDs, downloadable digital formats (e.g., MP3 (.mp3), Windows Media Audio (.wma), Advanced Audio Coding (.aac)), and solid state preloaded digital devices in which the audio content is preloaded and sold together with a hardware device.

In 1955, a German inventor introduced the *Sound Book* cassette system based on the Tefifon format where instead of a magnetic tape the sound was recorded on a continuous loop of grooved vinylite ribbon similar to the old 8-track tape. Even though the original Tefifon upon which it was based ran at 19 CPS and could hold a maximum of 4 hours, one Sound Book could hold eight hours of recordings as it ran at half the speed or 9.5 CPS. However, just like the Tefifon, the format never became widespread in use.

Uses:

Audiobooks have been used to teach children to read and to increase reading comprehension. They are also useful for the blind. About 40 percent of all audiobook consumption occurs through public libraries, with the remainder served primarily through retail book stores. Libraries are also popular places to check out audio books in the CD format.

Audiobooks are considered a valuable tool because of their format. Unlike traditional books or a video program, one can listen to an audiobook while doing other tasks. Such tasks include doing the laundry, exercising, weeding and similar activities. The most popular general use of audiobooks by adults is when commuting with an automobile or while traveling with public transport, as an alternative to radio.

Common practices include:

- **Replaying:** Depending upon one's degree of attention and interest, it is often necessary to listen to segments of an audiobook more than once to allow the material to be understood and retained satisfactorily. Replaying may be done immediately or after extended periods of time.
- **Learning:** People may listen to an audiobook (usually an unabridged one) while following along in an actual book. This helps them to learn words that they may not learn correctly if they were only to read the book. This can also be a very effective way to learn a new language.
- **Multitasking:** Many audiobook listeners choose the format because it allows multitasking during otherwise mundane or routine tasks such as exercising, crafting, or cooking.
- **Entertainment:** Audiobooks have become a popular form of travel entertainment for families or commuters.

EDUCATION TECHNOLOGY RESOURCES

Office 365 for vs G-Suite for Education

Many schools have started considering adding a cloud productivity application suite for staff and students to use. The top two providers for cloud-based productivity tools are Google and Microsoft. Specifically, Google offers its platform to education providers as Google Apps for Education. Microsoft offers its MicroSoft Office 365 for education.

Features for productivity, communication, and collaboration:

When evaluating Google Apps For Education (also referred to as GAE) vs Microsoft Office 365 for education, a very similar feature is found to have set at the end-user level for productivity, communication, and collaboration.

Feature	Google Apps for Edu	Microsoft Office 365
Browser	Chrome	Internet Explorer / Edge
Word processing	Docs	Word
Spreadsheets	Sheets	Excel
Presentations	Slides	Powerpoint / Sway
Email	Gmail	Exchange / Outlook
Pages	Sites	Office 365 Sites / SharePoint
Drive storage	Drive	OneDrive
Instant messaging	Talk	Lync / Skype / Yammer
Video conferencing	Hangouts	Lync / Skype
Social networks	Google+ / Groups	Yammer / So.cl
Notes	Keep	OneNote
Native search engines	Google search	Bing / Fast Search

8 key differences between Google Apps for Education and Office 365

1. Mac vs. Windows Operating System

With locally installed versions of the productivity software, a user is able to work with local Microsoft tools – even without having internet access. Google simply does not provide offline application support, as everything runs in the browser.

2. Directory services

Microsoft clearly has an edge with its lengthy tenure as an enterprise environment. This starts with Active Directory and directory services for identity and permission management at a very granular policy level. Google, of course, has never experienced life as a traditional IT infrastructure layer within enterprise, and launched as a cloud service outgrowth from the original search services stack.

3. Information architecture

4. While Google indeed has a strong search capability combined with rudimentary Google Drive storage for document storage and support, Microsoft's legacy enterprise IT expertise brings an interesting edge.

4. Workflow automation

Because of this SharePoint foundation, Microsoft opens up ad hoc database development, data connectivity services, and in particular, workflow automation capabilities for customization.

5. Cloud hosting / application services

Additionally, the direct interface between Office 365 and Microsoft's Azure cloud hosting framework provides a platform for unlimited scalability and application integration as a native technology stack. Whereas Google has yet to launch cloud host services in the same vein as Microsoft or Amazon AWS.

6. Mobile access

Google kicked Microsoft's back side when it came to mobile. Google clearly has a native advantage being the originator of the Android mobile operating system, controlling not only the operating system itself, but largely influencing the application development ecosystem through the Google Play Store.

7. Forms

Another area where Google may have an advantage is an ad hoc form builder with Forms. Forms are a great tool for schools to use in gathering and sharing information. From in-class applications like creating cheat-proof quizzes, to results or student elections or parent surveys, forms have far-reaching uses in and around the school.

8. Education-specific third-party extensions

Another comparison is the way each platform can be tailored to meet the use cases of education-specific customization through third-party extensions of the native platform. These extensions are usually offered by a third-party development partner of each platform.

Google Classroom / Hapera

Google offers Google Classroom as a native feature to the Google Apps for Education suite. It has features like collaboration, assignment tracking, and many more features useful to teachers within the classroom environment.

A specific customization for the Google Classroom environment is a third-party extension from Hapera. Hapera further extends Google Classroom to add a teaching rubric wrapper and management system for other 3rd-party resources as exercises and assignments within the Google Classroom environment.

Teacher Dashboard for Office 365

Microsoft has a rich tradition of building and maintaining a third-party partner ecosystem of developers around vertical market-specific applications of the native platforms. One such partner is Axis, who offers a fairly robust extension to Office 365 called Teacher Dashboard.

Teacher Dashboard provides its own suite of robust collaboration offerings designed specifically for teachers to use in classrooms. It also provides direct connectivity to many SIS systems, which could be valuable to school IT teams.

Google Meet for Online Teaching

Start a video meeting for education

With Google Meet, you can start class video meetings in Classroom, Meet, Google Calendar, and Gmail on your computer or mobile device.

Recent updates

Approve requests to join—During a video meeting, only the meeting creator can see and approve requests to join from people who are outside of the school's G Suite domain (external guests). Make sure the meeting creator stays in the meeting to approve external guests.

Premium Meet features—For a limited time, the following premium features are available to all G Suite for Education and G Suite Enterprise for Education users: live stream, recordings, and 250-participant meetings.

Manage participants— Only the meeting creator can mute or remove participants.

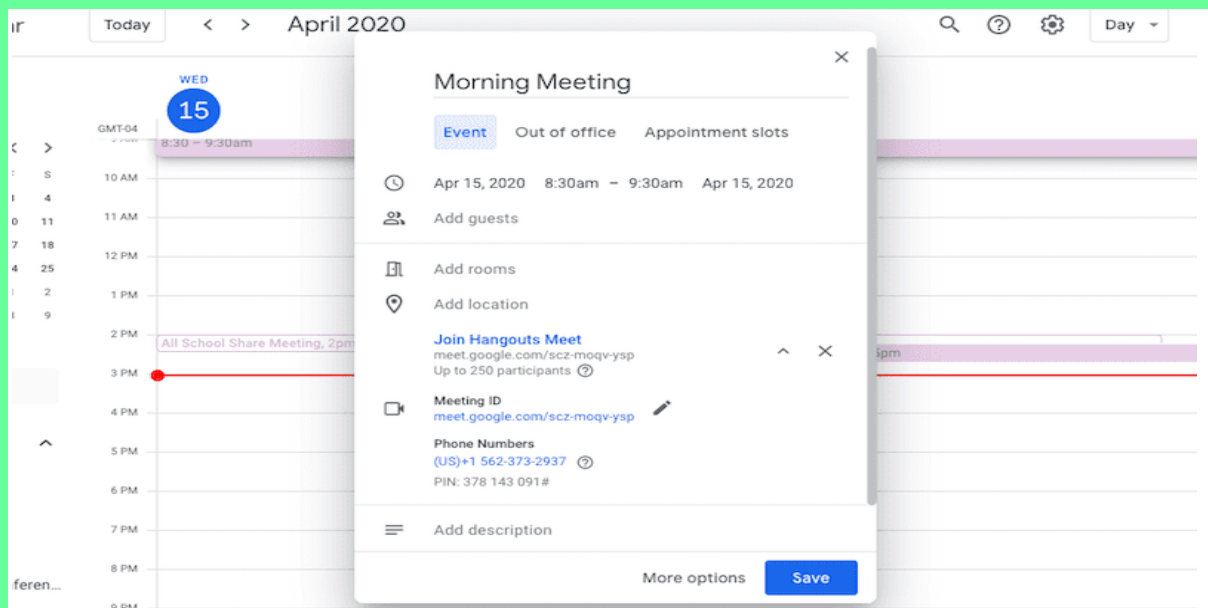
Prevent meeting reuse—Students can't rejoin the meeting if a teacher is the last participant to leave a nicknamed meeting.

Before you begin: Video meeting tips

- See best practices for distance learning at the Google for Education Teacher Center.
- Make sure that you meet the requirements for Meet.
- If internet speed is slow, turning off your camera can improve video meeting quality. If audio quality is poor, you can use a phone for audio.
- To help students who are deaf or hard of hearing, turn on live captions in Meet.
- If you're using a mobile device, install the Google Meet app.
- There is a limit to the number of people you can have in a video meeting.
- Charge your device before the meeting. On some fanless devices, such as tablets and laptops, charging during the meeting can reduce video quality.

During any video meeting, only the meeting creator can approve external requests to join.

The image shows two screenshots from a Google Workspace interface. The top screenshot is a Google Meet 'Meeting ready' screen. On the left is a video feed of a woman with blonde hair, smiling. On the right, the text reads 'Meeting ready' with a link 'meet.google.com/nqm-webs-qt'. Below this are 'Join now' and 'Present' buttons, and a section for 'Other options' including 'Join and use a phone for audio'. The bottom screenshot is a Google Calendar interface for April 2020. A modal window titled 'Morning Meeting' is open, showing event details: 'Event', 'Apr 15, 2020 8:30am - 9:30am', and 'Apr 15, 2020'. The modal includes options to 'Add guests', 'Add rooms', 'Add location', 'Add conferencing', and 'Add description'. A contact named 'Vicki B' is listed as the organizer. A 'Save' button is at the bottom right of the modal.



Record your Google Meet

You will probably want to hit the record button so students can access the session later. Some school districts even require recording the video for child safety considerations. Teachers can record when signed in to their G Suite account (such as Gmail). Students cannot record.

Important things to note about recording your Google Meet:

- Recordings include the active speaker and anything that is presented.
- Recordings are saved to the organizer's *Meet Recordings* folder in My Drive.
- An email with the recording link is automatically sent to the meeting organizer and the person who started the recording.
- The recorded link is automatically added to the Calendar event.
- If a participant turns on live captions during recording, the captions won't be recorded and don't appear when you play the recording.

Google classroom for Online Assignment Submissions

Turn in an assignment


You turn in your work online in Classroom. Depending on the type of assignment and attachments, you'll see Turn in or Mark as Done.

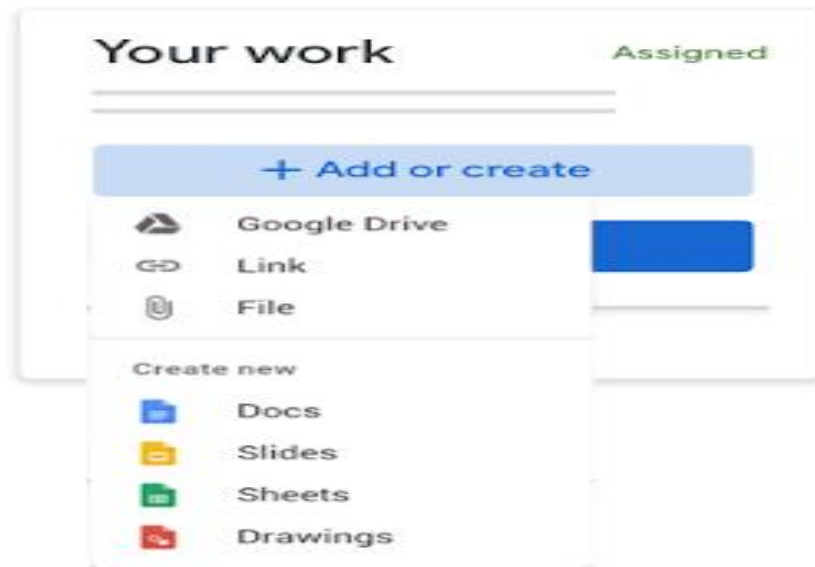
If you need to edit work that you turned in, you can unsubmit the assignment before the due date, make your changes, and resubmit. However, any assignment turned in or marked done after the due date is recorded as late.

Turn in an assignment

You can attach one or more files to your work. You can also open new files in Google Docs, Slides, Sheets, and Drawings, work in them, and then attach them to your assignment. However, you can't attach a file that you don't own.



1. Go to classroom.google.com.
2. Click the class Classwork.
3. Click the assignment View assignment.
4. To attach an item:

1. Under Your work, click Add or create select Google Drive , Link , or File .

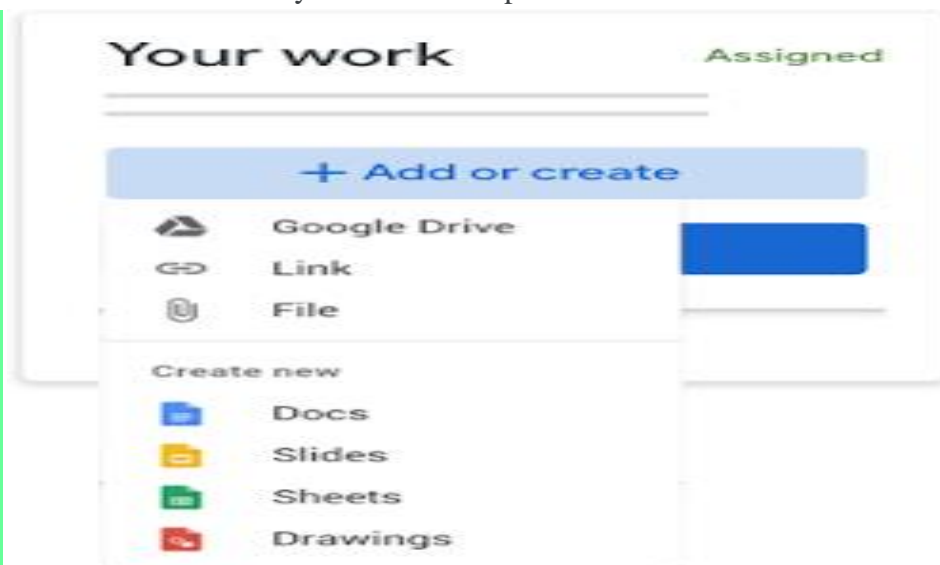


2. Select the attachment or enter the URL for a link and click Add.

5. To attach a new document:

1. Under Your work, click Add or create Docs , Slides , Sheets , or Drawings .

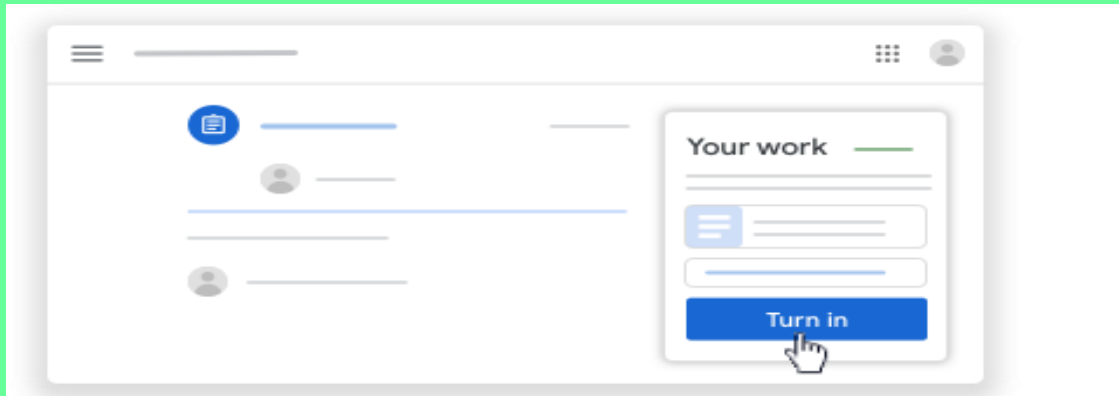
A new file attaches to your work and opens.



2. Click the file and enter your information.

6. (Optional) To remove an attachment, next to the attachment's name, click Remove .
7. (Optional) To add a private comment to your teacher, under Private comments, enter your comment and click Post .
8. Click Turn In and confirm.

The status of the assignment changes to Turned in.



Important: If you get an error message when you click Turn in, let your instructor know.

Turn in a quiz assignment

1. Go to classroom.google.com.
2. Click the class **Classwork**.
3. Click the assignment **View assignment**.
4. Click the form and answer the questions.
5. Click Submit.

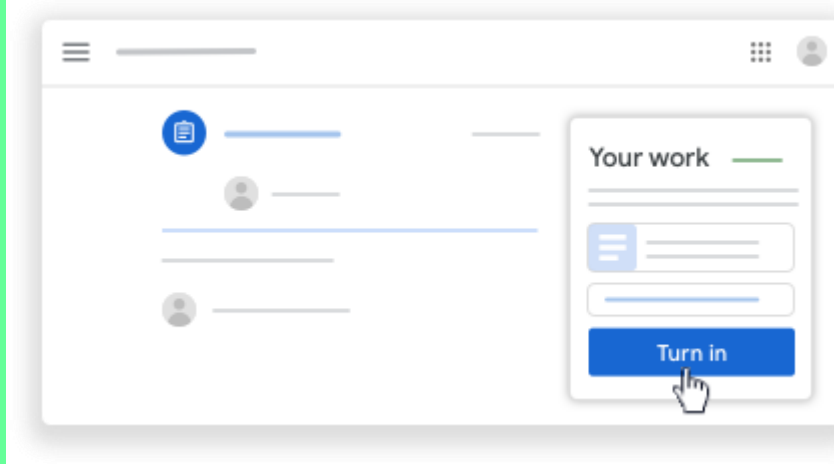
If the form is the only work for the assignment, the status of the assignment changes to Turned in.

6. If there's more work to do for the assignment, click Open assignment.

Turn in an assignment with a doc assigned to you

If your teacher attached a document with your name in the title, it's your personal copy to review and edit. As you work, your teacher can review your progress before you click Turn in.

1. Go to classroom.google.com.
2. Click the class **Classwork**.
3. Click the assignment **View assignment**.
4. Click the image with your name to open the assigned file.
5. Enter your work.
6. On the document or in Classroom, click Turn in and confirm.



The status of the assignment changes to Turned in.
Important: If you get an error message when you click Turn in, let your instructor know.

Mark an assignment done

Important: Any assignment turned in or marked done after the due date is recorded as late, even if you previously submitted the work before the due date.

1. Go to classroom.google.com.
2. Click the class Classwork.
3. Click the assignment View assignment.
4. (Optional) To add a private comment to your teacher, under Private comments, enter your comment and click Post .
5. Click Mark as done and confirm.

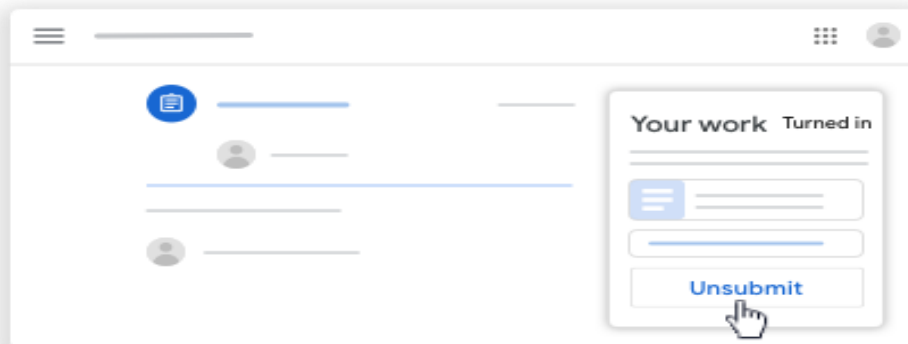
The status of the assignment changes to Turned in.

Unsubmit an assignment

Important: Any assignment turned in or marked done after the due date is marked late, even if you previously submitted the work before the due date. If you unsubmit an assignment, be sure to resubmit it before the due date.

1. Go to classroom.google.com.
2. Click the class Classwork.
3. Click the assignment View assignment.
4. Click Unsubmit and confirm.

Note: This assignment is now unsubmitted. Turn it in again before the due date.



Plagiarism checking software

Plagiarism checker can detect plagiarism from billions of web pages and academic databases. Plagiarism detector checks and highlights passages that require citations and gives you the resources you need to properly credit your sources.

Writing Enhancements:

The plagiarism checker is part of a robust writing app that offers advanced feedback on writing mechanics like grammar and spelling as well as more complex stylistic issues like word choice, conciseness, tone, and more.

Why Use a Plagiarism Checker?

Using someone else's text without attribution is plagiarism, whether you meant to do it or not. Unintentional plagiarism of even a sentence or two can have serious consequences.

For students, plagiarism often means a failing grade, academic probation, or worse. Fortunately, there is a tool that can help. Online plagiarism checker can help to ensure that you have properly identified and cited anything in your text that isn't 100 percent original.

How Does Plagiarism Checker Work?

When part of your text matches something written online or in a database, you'll get a plagiarism alert. The report in the plagiarism detector tells you whether or not plagiarism was found and how many grammar and writing issues are present in your document. The plagiarism checker flags specific sentences and provides reference information about the source, calculates an overall originality score for your document, and offers advanced writing feedback and corrections across several dimensions.

Who Benefits from Plagiarism Checker?


Whether you're a student writing an essay, a teacher grading papers, or a writer working on original content for the web, a plagiarism scan will not only save you time, but also help you avoid writing mistakes.


Tools for Checking Grammar errors Online

In the online as well as the offline world, it is important to write without making silly grammar mistakes, English syntax errors or punctuation mistakes. We all know how communication is a key skill for success. For example, in the corporate world it is hard to get a job without good written communication skills, even if the candidate excels in his or her field. In the academic world, error-free English writing is strongly correlated with achieving better results. In the online world, bloggers need to write grammatically correct and fluent texts to make sure that the message they are trying to convey is properly reaching their audience. If you have an online service, then proper, error-free content is crucial. The bottom line is, a grammar check before you submit your writing could make the difference between success and failure.

How it Works

First, write out your text as usual in any word processing program that you prefer. Review it yourself first to catch any stray words or thoughts and bring them into order.

Press the  **Free Check** button. If you see an underlined spelling error, style suggestion, or grammar suggestion in your text, click on them to see more options. Apply corrections where you need them. Then, the system will automatically check grammar usage and spelling and give you the final verdict. Lastly, make the suggested changes to your text before you send it on its way. Make a final read-through to make sure that you've caught everything, and that you agree with the changes.

Meanwhile, the  **Deep Check** button checks your text the same way the "Free Check" button does. The difference is the Deep Check button is capable of detecting even more difficult-to-spot mistakes, such as run-on sentences or dangling modifiers, and up to ten times more mistakes than popular word processors.*

This software autocorrects all types of grammatical mistakes, including topics that are not addressed by any other grammar correction program. Here are some examples:

Subject verb agreement

The smell of flowers **bring** back memories. → The smell of flowers **brings** back memories.

Singular/Plural nouns

Six people lost their **life** in the accident → Six people lost their **lives** in the accident.

Consecutive nouns

Sheryl went to the **tickets** office → Sheryl went to the **ticket** office.

Misused words correction

The misused words in any sentence and replaces them with the correct ones are replaced.

I was wandering if there's any news. → I was wondering if there's any news.

Contextual spelling correction

The same misused word will have a different correction based on the context:

The marble statue **hed** a big **hed** → The marble statue **had** a big **head**.

Phonetic spelling mistakes are corrected:

I like books, **exspecaley** the classics → I like books, **especially** the classics

Irregular verb conjugations are corrected as well:

He **flyed** to Vancouver → He **flew** to Vancouver

ASSESSMENT

Answer the following questions:

1. A _____ is a personal computer designed for regular use at a single location. (desktop)
2. _____ computers are easy to customize and upgrade per user requirements. (Full-sized desktop)
3. _____ is a laptop designed for those in a workplace. (business laptop)
4. _____ is an inexpensive, light-weight, energy-efficient form of laptop, especially suited for wireless communication and Internet access. (netbook)
5. Which type of projector is inverted as the light travels in straight lines? (camera obscura)
6. Opaque projectors are commonly known as an _____. (Episcope)
7. What are the two major types of digital image sensors? (CCD and CMOS)
8. Which kind of HX series contain zoom cameras? (Sony's superzoom cameras)
9. A _____ rapidly produces high quality text and graphics. (Laser printer)
10. _____ printers are used in cash registers, ATMs, gasoline dispensers and some older inexpensive fax machines. (Monochrome thermal)
11. _____ is a machine that makes copies of documents and other visual images onto paper or plastic film. (photocopier)
12. In a photocopier, glass transmits ultraviolet rays between _____. (325 and 400 nanometers)
13. _____ was the first of the 2000s-era dominating platforms for tablet computers to reach the market. (Android)
14. What is the strength of a Popplet? (it is a collaborative brainstorming tool)
15. Teachers can use Popplet to create _____. (graphic organizers, timelines, or storyboards)
16. Pen Drive is also known as a _____. (Flash memory)

17. The pen drives that were released in last quarter of the year 2000 is known as _____. (Thumb Drives)
18. How many versions are there in iPad? (Ten)
19. Flatbed is sometimes called a _____. (reflective scanner)
20. In a scanner, _____ technique is used to remove the effects of dust and scratches on images. (Infrared cleaning)
21. The dynamic microphone works through _____. (electromagnetic induction)
22. What is the most important use of a whiteboard? (conduct a presentation or a class)
23. _____ is an optical disc that is used to store data. (Compact Disc (CD))
24. _____ is a virtual magnifying glass that displays an enlarged copy of a chosen text. (Magnifier)
25. The _____ is a great assistive technology device for people with limited to no arm movement. (head wand)
26. _____ is the world's first keypad that gives people with Cerebral Palsy and other motor, physical and intellectual disabilities. (Key-X)
27. _____ is a system of raised dots that can be read with the fingers by people who are blind or who have low vision. (Braille)
28. Braille is also produced by a machine known as a _____. (braillewriter)
29. An audiobook is also called as a _____. (talking book)
30. One Sound Book could hold _____ hours of recordings. (eight)
31. Which is the search engine of google? (Google search)
32. Which is the storage of Microsoft? (One drive)
33. _____ provides its own offerings designed specifically for teachers to use in classrooms. (Teacher Dashboard)
34. In G-Meet, who can mute or remove participants? (Creator)
35. In google drive, a student can do assignments in _____. (slides, sheets and docs)
36. What is Plagiarism? (Using someone else's text without attribution)
37. _____ can help to ensure that the work is original or not. (Online plagiarism checker)
38. Which software autocorrects all types of grammatical mistakes in a document? (Grammar checker)
