

Data Storage Timeline

Teacher Materials

Students will correctly identify and place in proper sequence 12-15 pieces of data storage media used in computer history, observe how the technology has changed and became smaller over time, observe how and why inventions can change the way we live, identify the positive and negative aspects of the Internet blurring the lines between computing and communications and the effects of this technology on our lives.

Acknowledgements and License

This activity was contributed by Randy Henderson, McMillan Magnet School for UNO's TED 8006 course.

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Lesson Details

Grade Level: 6th-10th graders

Activity Length: 10-20 minutes

Format: collaborative

Connection to Standards

This activity contains content and practices addressing elements of the following CSTA K-12 Computer Science Standards (2017):

CSTA Std	Description
1B-IC-18	Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.

This activity contains content and practices addressing elements of the following Nebraska K-12 Technology Scope & Sequence Standards:

NE Tech Standard	Description
Hardware / Software 3	Identify major computer components.
Hardware / Software 4	Describe the components and functions of computers and networks.

Bin Materials Checklist

#	Description
16	Various storage devices (CD-ROM, Magnetic Tape, High Capacity Magnetic Tape, Floppy Disk 3 1/2, Compact Cassette, Mini (pocket) Compact Disc, Hard Disk Drive, USB Flash Drive, Digital Date Stamp Tape, DVD/ DVD-R, Punch Card, "Cloud Storage", Micro SD Card, Zip Disk, Floppy Disk 5 1/4-inch) OR pictures
16	Cards with device history cards
1	Notepad

Lesson Setup / Introduction

This activity will highlight the history and changes of our data storage solution and the way we have managed and stored our data throughout history.

Students will be given the box. Upon opening the box students will unpack the box and find the directions. After reading the directions students will decide on the best way to sort and match the information cards to the hardware storage media. After the students have sorted and matched all of the hardware to the information cards the teacher will check the groups work. If there are any that are mismatched the teacher will inform the students that they have some incorrect matches. The students will then problem-solve to find and correct their answers.

Connection to Computing

Over time the hardware used to store digital information has changed greatly. As storage devices become much smaller, they also store more information thanks to better compression algorithms and smaller transistors we are able to put more data in less space. Hard disks work by magnetizing an area of the disk in a certain polarity - over time, we managed to pack those spots closer together and make them smaller. Flash memories like SD cards, SSDs, etc. have millions of tiny circuits in them that store the information - we also managed to make those components smaller, so more of them fit onto the same area. Transistors are like micro switches that can switch on and off extremely quickly. Generally speaking, computers use these for binary code. i.e., on = 1, off = 0. The more transistors you have the more binary code you can handle. As we get better and better at making them and understanding how they work, we can fit more and more into a smaller space.

Further Related Resources

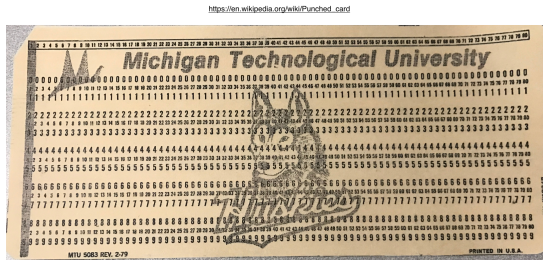
- <http://www.computerhistory.org/timeline/memory-storage/>
- <http://royal.pingdom.com/2008/04/08/the-history-of-computer-data-storage-in-pictures/>
- <http://www.zetta.net/about/blog/history-data-storage-technology>
- <https://www.extremetech.com/computing/90156-the-history-of-computer-storage-slideshow>



Answer Key

1725- Punch Cards

Developed in 1725 by Basile Bouchon as a way to control a textile loom with perforated paper. A punched card or punch card is a piece of stiff paper that can be used to contain digital information represented by the presence or absence of holes in predefined positions. The information might be data for data processing application or used to directly control automated machinery. Punched cards were widely used in the 1970's and through much of the 20th century in what became known as the data processing industry. While punched, cards are now obsolete as a recording medium, as of 2012, some voting machines still use punch cards to record votes.



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1956- Hard Disk Drive

Introduced by IBM, Hard Disk Drives (HDD) became the dominant secondary storage device for general-purpose computers by the early 1960s. A hard disk drive, hard disk, or hard drive is a data storage device used for storing and retrieving digital information using one or more rigid rapidly rotating disks (platters) coated with magnetic material. Hard drives started with a capacity of holding 3.75 MB and today have expanded up to 10 terabytes of storage space.



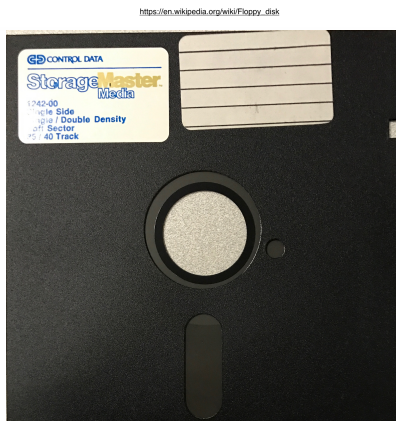
1962- Compact Cassette

The Compact Cassette or Musicassette (MC), also commonly called cassette tape, or simply tape or cassette, is a further development magnetic tape format developed by Philips. Compact cassettes come in two forms, pre-recorded, or as a fully recordable "blank" cassette. The Hewlett Packard HP 9830 was one of the first desktop computers to use automatically controlled cassette tapes for data storage. A rate of 2000-bit/s equates to a capacity of around 660 kB per side of a 90-minute tape.



1978- Floppy Disk 5 1/4- inch

A floppy disk, also called a floppy, diskette or just disk, is a type of disk storage composed of a disk of thin and flexible magnetic plastic, sealed in a rectangular plastic enclosure. Floppy disks are read and written by a floppy disk drive (FDD). Floppy disks were available in 8-inch, 5 1/4-inch, and 3 1/2-inch sizes. A 5 1/4-inch single-sided floppy could hold from around 110 kB to 1.2 MB of data.



1982- Floppy Disk 3 1/2-inch

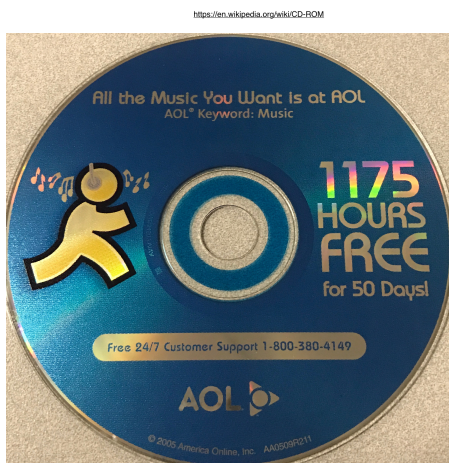
The 3 1/2-inch size of floppy disks continued to be a universal form of magnetic disk data storage and exchange, furthering the magnetic storage medium. All 3 1/2-inch disks have a rectangular hole in one corner which, if closed, would "lock" the disk. A sliding piece of metal can be moved to block or cover the "doughnut" or disk of magnetic tape where information is read/written. Data capacities of 3 1/2-inch floppy disks range from 265 kB to 1.44 MB.



1984- CD-ROM

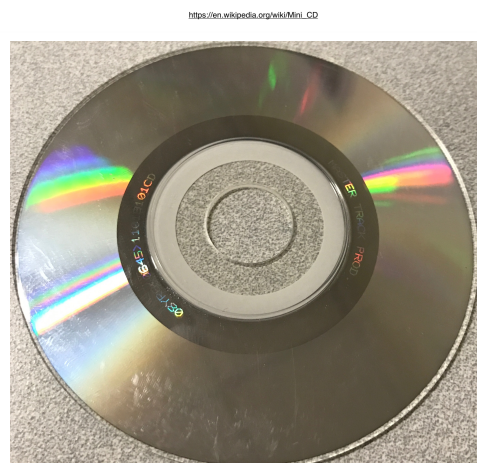
A CD-ROM is a pre-pressed optical compact disc which contains data. The name is an acronym which stands for "Compact Disc Read-Only Memory". Computers can read CD-ROMs, but cannot write to CD-ROMs which are not writable or erasable.

From the mid-1990s until the mid-2000s, CD-ROMs were popularly used to distribute software for computers and video game consoles. Early CD-ROMs had a capacity of 540 MB but was standardized by Sony and Philips in 1988, with a capacity of 650-700 MB.



1988- Mini (pocket) Compact Disc

Mini CDs, or "pocket CDs", are CDs with a smaller diameter and one third the storage capacity of a standard Compact Disc. Originally designed to hold music or single songs, an 80-mm disc can hold up to 24 minutes of music, or 210 MB of data.



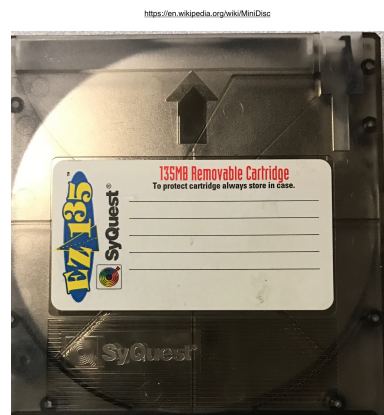
1989- Digital Data Storage (DDS) Tape

DDS is a format for storing computer data derived from Digital Audio Tape (DAT) developed by Sony. Similar in appearance to a Compact Cassette, the magnetic tape is enclosed in a protective shell, which is roughly half the size of the standard compact cassette tape. DDS uses the small micro cassette tape to store data with capacities from 1.3 to 160 GB. Initially, the tape was available in two lengths: 60 meters (197 feet) or 90 meters (295 feet) long.



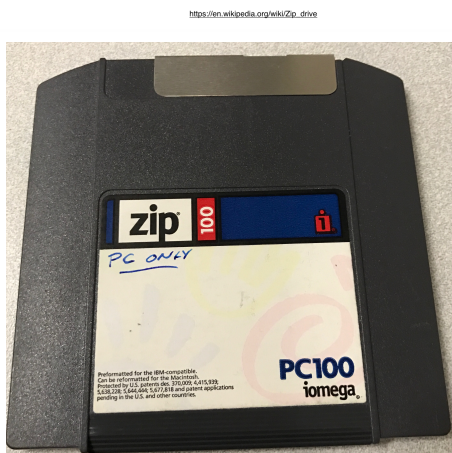
1992- Mini Disc

Targeted to replace the compact cassette, the Mini Disc (MD) is a magneto-optical disc-based data storage device developed by Sony. A predecessor to the compact disc, the MD used a newly developed mini compact disk housed in a protective plastic shell. The MD offered a capacity of 1 GB data storage.



1994- Zip Disk

The Zip disk is a medium-to-high-capacity removable floppy magnetic disk storage system that was introduced by Iomega. Zip disks launched with capacities of 100 MB, but later versions increased this to first 250 MB and then 750 MB. The Zip disk became the most popular of the super-floppy products which filled a niche in the late 1990s portable storage market. However, it was never popular enough to replace the 3.5-inch floppy disk. Later versions of the disk matched the capacity of CDs but was surpassed by the later rewritable CDs and DVDs.



1995- High Capacity Magnetic Tape

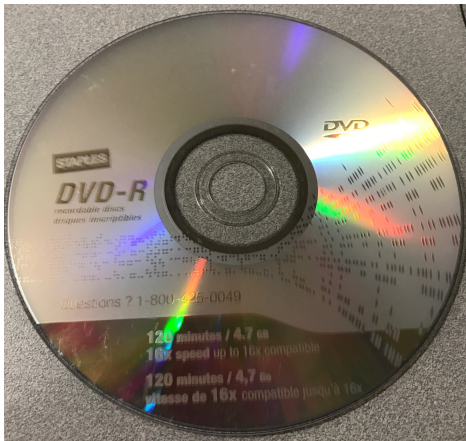
Travan is an 8-mm high capacity magnetic tape cartridge design developed by the 3M company, used for the storage of data in computer backups and mass storage. Travan cartridges have been developed in capacities of 400 MB to 40 GB capacity when compressed.



1995- DVD/ DVD-R

DVD ("digital versatile disc" or "digital video disc") is a digital optical disc storage format invented and co-developed by Philips, Sony, Toshiba, and Panasonic in 1995. The medium can store any kind of digital data and is widely used for software and other computer files as well as video programs watched using DVD players. The DVD-R format was developed by Pioneer. DVDs provided a storage capacity of 4.7 GB for a single layered and 8.5 for a dual-layered, single-sided disc.

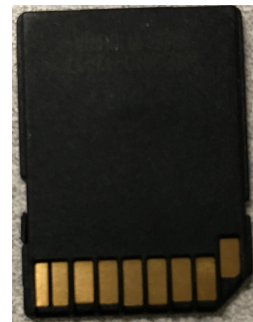
<https://en.wikipedia.org/wiki/DVD>



1999- Micro SD Card

Secure Digital (SD) card is a non-volatile memory card format developed by the SD Card Association for use in portable devices (Cameras, Tablets, Laptops, etc.). The second-generation SD card was developed to improve on the MultiMediaCard (MMC) standard, which continues to evolve. Current capacities of SD cards range from the basic 2 GB to 512 GBs.

https://en.wikipedia.org/wiki/Secure_Digital



2000- USB Flash Drive

A USB flash drive, also variously known as a USB drive, USB stick, thumb drive, or pen drive is a data storage device that includes flash memory with an integrated uSB interface. USB flash drives are typically removable and rewritable, and physically much smaller than an optical disc. As of March 2016, flash drives with storage capacities from 8 GB to 1 TB have increased in popularity and are frequently sold.

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2013- Cloud Storage

Cloud Storage is a data storage model in which digital data is stored in logical groups, the physical storage spans multiple servers (and often locations), and the physical environment is typically owned and managed by a hosting company. These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment protected and running. People and organizations buy or lease storage capacity from the providers to store user, organization, or application data. Plans start at 5 GB of data and range to virtually unlimited space.

Cloud computing is believed to have been invented by J. C. R. Licklider in the 1960s with his work on ARPANET to connect people and data from anywhere at any time.

In 1994, AT&T launched PersonLink Services, an online platform for personal and business communication and entrepreneurship. The storage was one of the first to be all web-based, and referenced in their commercials as, "you can think of our electronic meeting place as the cloud."

Even though Cloud Storage may have been invented in the 1960s and commercially available in 1994, it did not come into widespread use until 2013.

https://en.wikipedia.org/wiki/Cloud_storage



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Student Instructions

Use the hardware information cards to correctly identify, sort and match the cards to the correct data storage hardware device. When completed ask your teacher to check your solution.

Now you should decide on a criteria and resort the cards. It could be by the amount of data each holds, the usefulness of each, the popularity of each, whatever you want. Once you've sorted them, explain your criteria to your teacher and why you placed the cards in the order you did.

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Resupply

- Make sure all devices (16) or pictures are in bin.