Understanding Computers Today and Tomorrow

Chapter 16 (Cont'd):

Societal Issues Related to Computer Use

Learning Objectives

4. Describe some possible physical and emotional health risks associated with the use of computers.

5. Discuss the impact that factors, such as nationality, income, race, education, and physical disabilities, may have on computer access and use.

6. Suggest some ways computer users can practice "green computing" and properly dispose of obsolete computer equipment.

7. Discuss the current status of legislation related to intellectual property rights, ethics, access, and the environment in relation to computers.

Overview

- This chapter covers:
  - The impact of computers on our physical and emotional health
  - Issues related to the access of technology
  - The impact of computers on our environment
  - A look at legislation related to these issues

Computers and Health

- Physical Health
  - Computer use can cause physical injuries
    - Eyestrain
    - Blurred vision
    - Fatigue
    - Headaches
    - Wrist and finger pain
  - Repetitive Stress Injury (RSI)
    - Carpal tunnel syndrome (CTS) (keyboard use)
    - DeQuervain's tendonitis (mobile device keyboard and thumbpad use)

Computers and Health

- Computer vision syndrome (CVS)
- Backaches
- Heat from laptops
- Hearing loss from headphones
  - 60/60 rule
- Text messaging while driving
  - DriveAssist
- Possible radiation risks from wireless devices

FIGURE 16-15

DriveAssist. This product restricts usage of a mobile phone when the car is in motion.

Courtesy of Aegis

Computers and Health

- What is Ergonomics?
  - The science of fitting a work environment to the people who work there
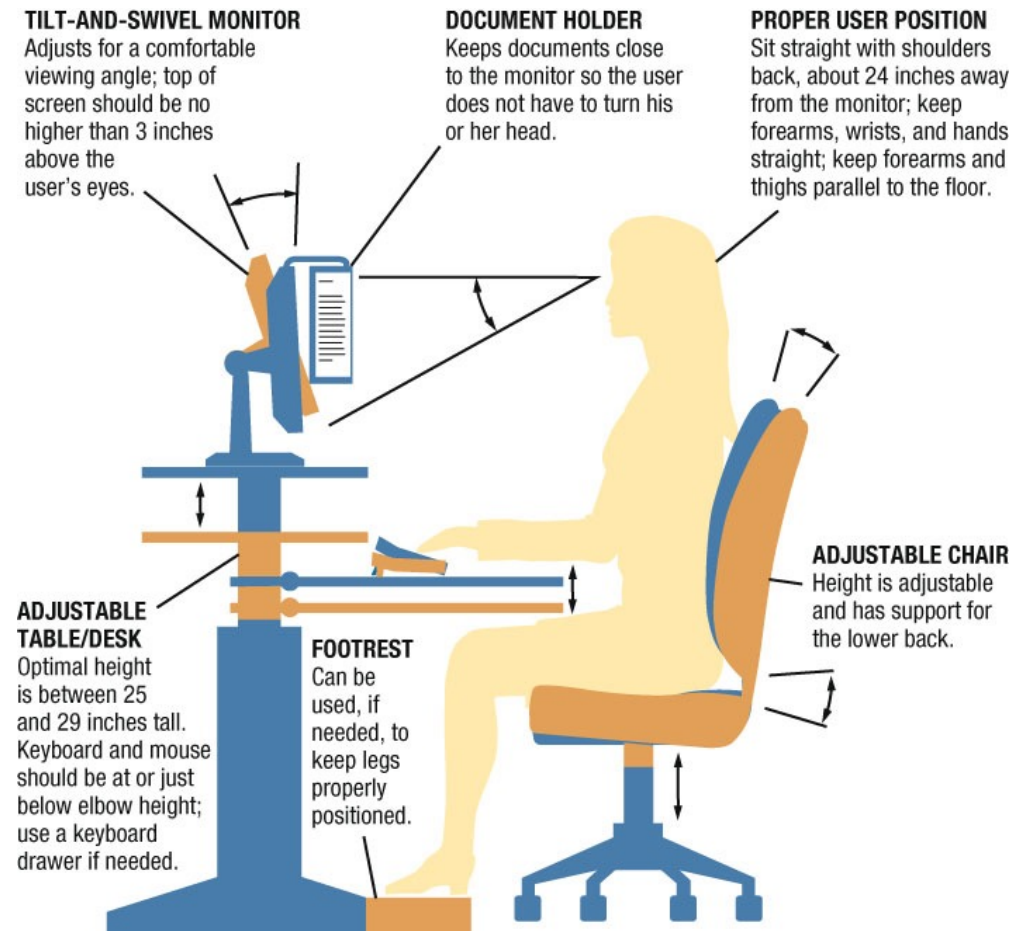 - Using good workspace design principles can help avoid physical problems

TILT-AND-SWIVEL MONITOR
Adjusts for a comfortable viewing angle; top of screen should be no higher than 3 inches above the user's eyes.

DOCUMENT HOLDER
Keeps documents close to the monitor so the user does not have to turn his or her head.

PROPER USER POSITION
Sit straight with shoulders back, about 24 inches away from the monitor; keep forearms, wrists, and hands straight; keep forearms and thighs parallel to the floor.

ADJUSTABLE TABLE/DESK
Optimal height is between 25 and 29 inches tall. Keyboard and mouse should be at or just below elbow height; use a keyboard drawer if needed.

FOOTREST
Can be used, if needed, to keep legs properly positioned.

ADJUSTABLE CHAIR
Height is adjustable and has support for the lower back.

FIGURE 16-16
Workspace design.

Computers and Health

- More difficult with portable computers and mobile devices, but possible to improve work environment
  - Travel mice and travel keyboards can help while on the go
  - Docking stations or notebook stands can be used with portable computer at home or in the office
    - » Docking station connects the computer to permanent hardware, such as a keyboard, mouse, monitor, etc.
    - » Notebook stand raises a notebook up to a better height

Computers and Health

FIGURE 16-17

Docking stations and notebook stands.

Docking station   Ports
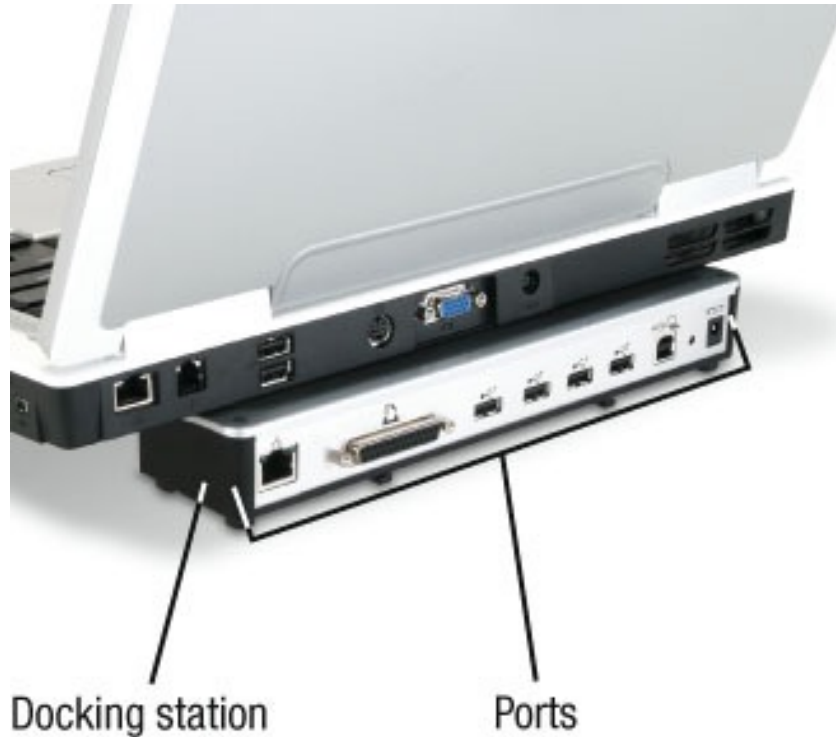
DOCKING STATIONS

Contain a variety of ports; when the portable computer is connected to the docking station, the devices attached to these ports can be used.

NOTEBOOK STANDS

Elevate a notebook's display screen; if the notebook stand does not contain USB ports, devices will connect directly to the notebook stand.

Computers and Health

OCCASIONAL USERS	FULL-TIME USERS
Sit with the computer on a table and position it for comfortable wrist posture. If no table is available, use a laptop desk or notebook cooling stand to protect your legs from the computer's heat.	Sit with the computer on a desk or table and position it for comfortable wrist posture if you won't be using a separate keyboard and mouse.
Adjust the screen to a comfortable position, so you can see the screen as straight on as possible. If you have a portable notebook stand, use it to elevate the display screen for easier viewing.	Elevate the computer so the screen is at the proper height, or connect the computer to a stand-alone monitor instead of using the computer's built-in display; consider using a docking station or notebook stand.
Bring a travel keyboard and mouse to use with the computer, whenever possible.	Use a separate keyboard and mouse, either attached directly to the computer or to a docking station or notebook stand.
When purchasing a portable computer, pay close attention to the total weight of the system (computer, power supply, additional hardware, etc.) if you will be using the computer primarily while traveling; purchase a lightweight system to avoid neck and shoulder injuries when carrying the computer from one location to another.	When purchasing a portable computer, pay close attention to the size and clarity of the monitor, unless you will be using a separate stand-alone monitor, and pay close attention to the keyboard design, unless you will be using a separate keyboard.

FIGURE 16-18
Ergonomic tips for portable computer users.

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Computers and Health

– Ergonomic Hardware
  - Ergonomic keyboards
  - Trackballs
  - Document holders
  - Antiglare screens
  - Keyboard drawers
  - Wrist supports
  - Computer gloves

Computers and Health

ERGONOMIC KEYBOARDS

TRACKBALLS

DOCUMENT HOLDERS

ANTIGLARE SCREENS

KEYBOARD DRAWERS

WRIST SUPPORTS

COMPUTER GLOVES

FIGURE 16-19
Ergonomic devices.

Computers and Health

– Good User Habits and Precautions

CONDITION	PREVENTION
Wrist/arm/hand soreness and injury	➤ Use a light touch on the keyboard. ➤ Rest and gently stretch your fingers and arms every 15 minutes or so. ➤ Keep your wrists and arms relaxed and parallel to the floor when using the keyboard. ➤ When using a device with a small keyboard, type short messages, take frequent breaks, and use a separate keyboard whenever possible. ➤ Use an ergonomic keyboard, ergonomic mouse, computer gloves, and other ergonomic devices if you begin to notice wrist or hand soreness.
Eyestrain	➤ Cover windows or adjust lighting to eliminate glare. ➤ Concentrate on blinking your eyes more often. ➤ Rest your eyes every 15 minutes or so by focusing on an object in the distance (at least 20 feet away) for one minute and then closing your eyes for an additional minute. ➤ Make sure your monitor's brightness and contrast settings are at an appropriate level. ➤ Use a larger text size or lower screen resolution, if needed. You should be able to read what is displayed on your monitor from three times the distance at which you normally sit.
Sore or stiff neck	➤ Use good posture. ➤ Place the monitor and any documents you need to refer to while using your computer directly in front of you. Use a document holder if possible. ➤ Adjust your monitor to a comfortable viewing angle with the top of the screen no higher than 3 inches above your eyes. ➤ Use a telephone headset if you spend a significant amount of time each day on the telephone.

FIGURE 16-20

Good user habits. These preventative measures can help avoid discomfort while working on a computer.

Computers and Health

Backache; general fatigue	➤ Use good posture and adjust your chair to support your lower back; use an ergonomic chair, if needed. ➤ Use a footrest, if needed, to keep your feet flat on the floor. ➤ Walk around or stretch briefly at least once every hour. ➤ Alternate activities frequently. ➤ When traveling with a computer, bring a lightweight notebook or netbook computer and carry only the essentials with you.
Ringing in the ears; hearing loss	➤ Turn down the volume when using headphones (you should be able to hear other people's voices). ➤ Wear over-the-ear-headphones instead of earbuds. ➤ Limit the amount of time you use headphones or earbuds. ➤ Use external speakers instead of headphones when possible.
Leg discomfort or burns	➤ Use a laptop desk, cooling stand, or other barrier between a portable computer and your legs when using a computer on your lap.

FIGURE 16-20

Good user habits.

These preventative measures can help avoid discomfort while working on a computer.

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Computers and Health

- Emotional Health
  - Stress of Ever-Changing Technology
    - Knowledge of and ability to use technology is becoming a necessity in many jobs
    - Technology changes at a rapid pace
    - Workers must regularly learn new skills which can create stress for many individuals

Computers and Health

POLICE OFFICERS

RESTAURANT SERVERS

CONSTRUCTION WORKERS

PHYSICIANS

FIGURE 16-21

Computer-related jobs. Many jobs that did not require computer use in the past require computer use today.

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Computers and Health

– Impact of our 24/7 Society

- Ability to be in touch constantly can be a source of great stress for some people

  – "On call 24/7" and can never get away

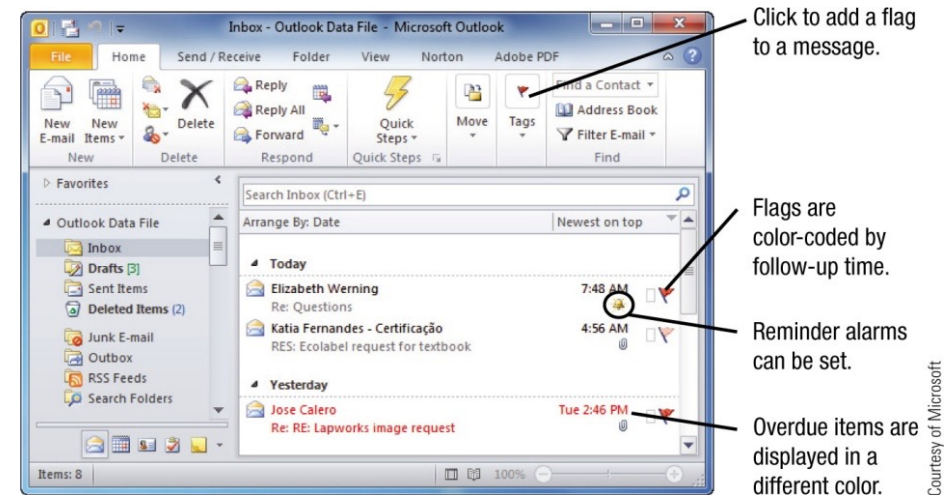 – Hard to relax when on vacation and available 24/7

FIGURE 16-22
Our 24/7 society.
With mobile phones and portable computers, many individuals are available 24/7.

Computers and Health

- Information Overload
  - Good searching techniques are essential
    - Do not try to read everything written on a subject
  - Effectively manage your e-mail
    - Use e-mail filters and flags
    - Check messages only periodically

FIGURE 16-23

Outlook reminder flags can help you organize your Inbox.

Click to add a flag to a message.

Flags are color-coded by follow-up time.

Reminder alarms can be set.

Overdue items are displayed in a different color.

Courtesy of Microsoft

Computers and Health

– Burnout
- A state of fatigue or frustration brought on by overwork
- Early Signs
  – Feelings of emotional and physical exhaustion
  – No longer caring about a project that was once exciting
  – Irritability
  – Feelings of resentment about amount of work to be done

Computers and Health

- Suggested Solutions
  - Reevaluate schedule, priorities, and lifestyle
  - Take a break or get away for a day
  - Say no to additional commitments
  - Develop healthy food and exercise routines
- Internet and Technology Addiction
  - Problem of overusing, or being unable to stop using, the Internet
    - Interferes with normal living
    - Causes severe stress to family and other loved ones

Computers and Health

Courtesy of Dr. Kimberly Young, Director of the Center for Internet Addiction Recovery

Do you feel preoccupied with the Internet (think about previous online activity or anticipate next online session)?

Do you feel the need to use the Internet with increasing amounts of time in order to achieve satisfaction?

Have you repeatedly made unsuccessful efforts to control, cut back, or stop Internet use?

Do you feel restless, moody, depressed, or irritable when attempting to cut down or stop Internet use?

Do you stay online longer than originally intended?

Have you jeopardized or risked the loss of a significant relationship, job, educational, or career opportunity because of the Internet?

Have you lied to family members, a therapist, or others to conceal the extent of involvement with the Internet?

Do you use the Internet as a way of escaping from problems or of relieving a dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, depression)?

FIGURE 16-24

Signs of Internet addiction. You may be addicted to the Internet if you answer "yes" to at least five of these questions.

Computers and Health

- Growing problem in many countries
- Often related to e-mail, IM, shopping, gaming, social networking, and pornography
- Can be addicted to other types of technology (video games, etc.)
- Can result in loss of relationships, job loss, academic failure, health problems, financial consequences, child custody, suicide, and more
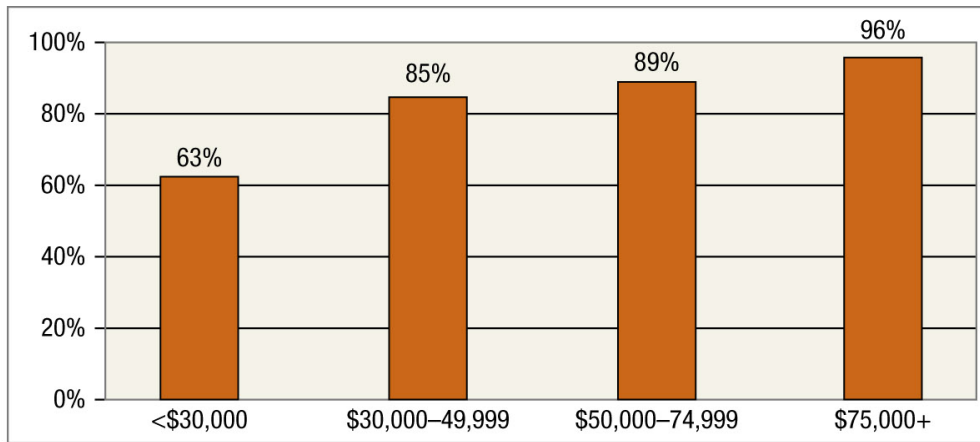- Can be treated similar to other addictions

Access to Technology

- The Digital Divide
  - The gap between those who have access to technology and those who don't
  - Can have digital divide within a country, as well as between countries
  - The U.S. Digital Divide
    - Differences in technology use by income, race, geographical area, education, broadband Internet use, etc.
    - Reducing the U.S. digital divide is important to ensure all citizens have an equal chance of being successful
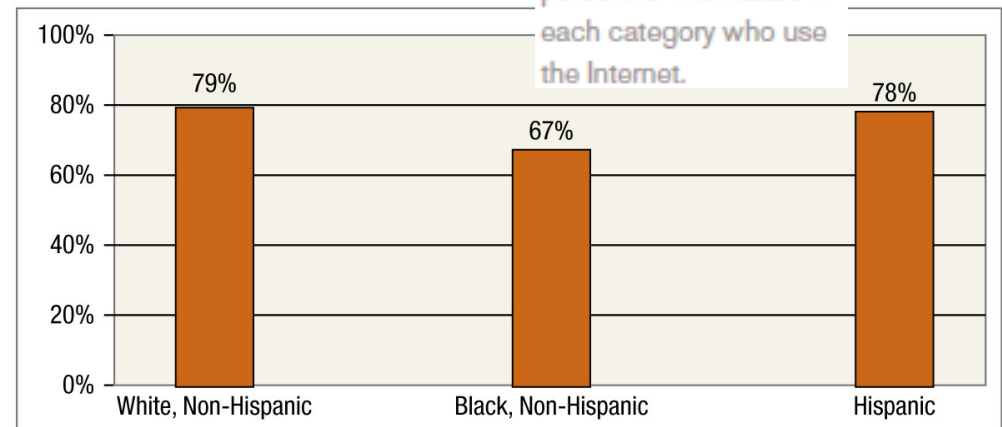   - Some people choose not to use technology

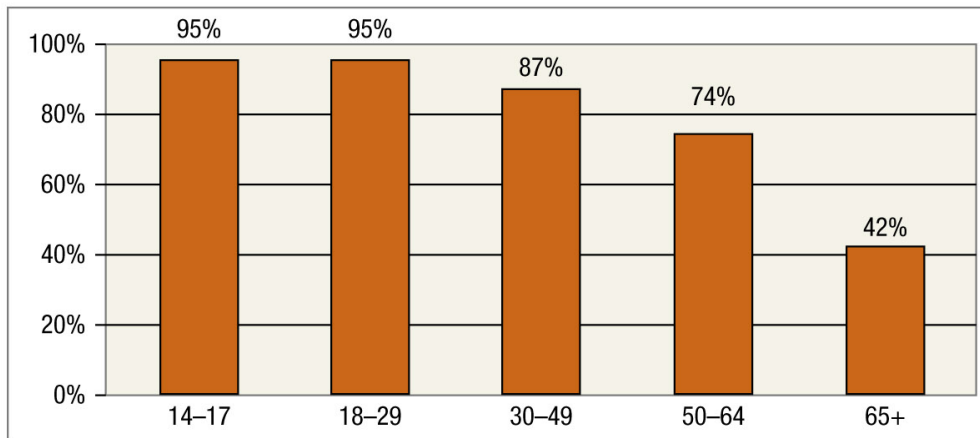# Access to Technology

FIGURE 16-25

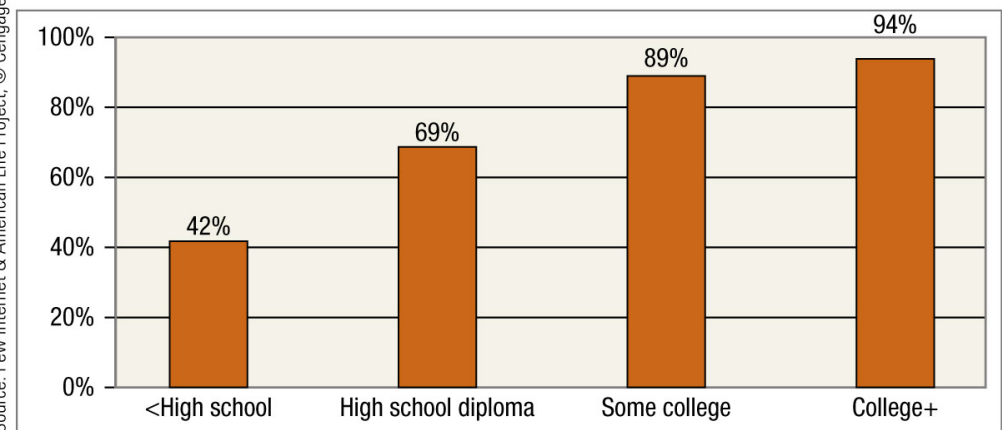**Key U.S. Internet use statistics.** Shows the percent of individuals in each category who use the Internet.

Source: Pew Internet & American Life Project; © Cengage Learning

INCOME chart: <$30,000: 63%, $30,000–49,999: 85%, $50,000–74,999: 89%, $75,000+: 96%

RACE chart: White, Non-Hispanic: 79%, Black, Non-Hispanic: 67%, Hispanic: 78%

AGE chart: 14–17: 95%, 18–29: 95%, 30–49: 87%, 50–64: 74%, 65+: 42%

HIGHEST LEVEL OF EDUCATION OBTAINED chart: <High school: 42%, High school diploma: 69%, Some college: 89%, College+: 94%

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Computers and Health

- The Global Digital Divide
  - Some countries have access to technology and others do not have the same level of access
  - Perhaps more dramatic than the U.S. digital divide
    - More than 2 billion people world-wide are online (30% of the world's population)
    - 78% of the North American population is online
    - 11% of Africa's population is online
  - Technology can provide telemedicine and education to remote areas

Computers and Health

- New projects are emerging that may help to reduce the global digital divide
  - Extending Wi-Fi to remote areas
  - One Laptop Per Child (OLPC) program
    - » Every child in the worl ages 6-12 has access to a personal laptop computer by 2015

FIGURE 16-26
The OLPC XO laptop.

Courtesy of One Laptop Per Child

Computers and Health

- Assistive Technology
  - Hardware and software designed for use by individuals with physical disabilities
  - Much improvement in assistive technology has occurred in recent years
    - Demand from disabled individuals and disability organizations
    - American with Disabilities Act
      - Requires companies with 15 or more employees to make reasonable accommodations for known physical or mental limitations of otherwise qualified individuals, unless doing so results in undue hardship for the company

Computers and Health

– Assistive Input Systems

- Braille keyboards
- Keyguards
- One-handed keyboards
- Voice input systems
- Switches
- Feet mice
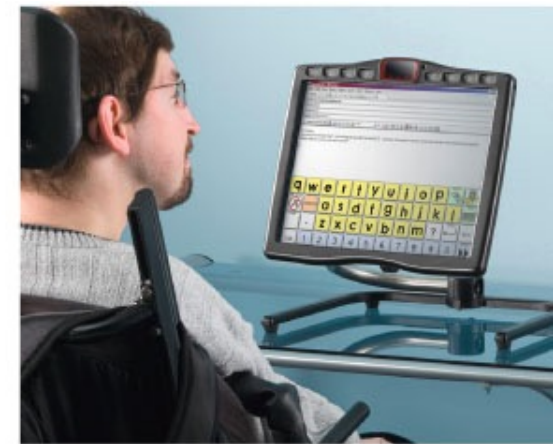- Head pointing systems
- Eye pointing systems

Computers and Health

BRAILLE KEYBOARDS
The keys on this keyboard contain Braille overlays.

ONE-HANDED KEYBOARDS
Each key on this half keyboard contains two letters (one set for the keys typically on the right half of the keyboard and one set for the keys typically on the left half) so all keys can be reached with one hand.

EYE TRACKING SYSTEMS
Cameras track the user's eye movements, which are used to select icons and other objects on the screen.

FIGURE 16-27
Assistive input devices.

Computers and Health

– Assistive Output Systems

- Screen readers

- Braille displays

- Braille printers

- Windows and Mac OS include a screen reader, on-screen keyboard, speech recognition capabilities, and settings that can magnify the screen, change text size and color, and convert audio cues into written text

Computers and Health

SCREEN READER SOFTWARE

BRAILLE DISPLAYS

BRAILLE PRINTERS

FIGURE 16-28

Assistive output devices.

Environmental Concerns

- Green Computing
  – The use of computers in an environmentally friendly manner
  – Energy consumption and heat are key concerns today
  – ENERGY STAR Program
    - Developed to encourage the development of energy-saving devices
    - Eco-labels also used in other countries

FIGURE 16-29
Eco-labels.

ENERGY STAR
UNITED STATES

EU Ecolabel
www.ecolabel.eu
EUROPEAN UNION

KOREA ECO-LABEL
KOREA

QUALIDADE-ABNT-AMBIENTAL
BRAZIL

ENVIRONMENTAL CHOICE
AUSTRALIA
AUSTRALIA

Environmental Concerns

- Energy Consumption and Conservation
  - Power consumption and heat generation by computers are key concerns for businesses
    - More powerful computers use more energy and run hotter, which makes increases cooling costs
    - Servers are especially power-hungry
  - Energy-saving tactics
    - Consolidating servers
    - Powering down computers when not in use
    - Using desktop virtualization
    - Using cloud computing

Environmental Concerns

- Energy-saving features on computer hardware
  - Computers and printers that go into a very low-power sleep mode when idle
  - Low-power consumptive chips and boards
  - High-efficiency power supplies
  - Energy-efficient flat-panel displays
  - Liquid cooling systems

FIGURE 16-30
Energy usage monitors. This monitor displays in real time the amount of electricity (in kilowatt-hours or approximate cost) a connected device is using.

Courtesy of P3 International Corporation

Environmental Concerns

– Alternate Power

- Solar power
  - Solar panels convert sunlight into direct current (DC) electricity, which is then stored in a battery
  - Solar panels to be built into covers of notebook computers will be both solar-powered and hand-powered chargers and can be used with portable computers, mobile phones, and other small portable devices
- Portable fuel-cell chargers

Environmental Concerns

Charger can attach to backpacks, bicycles, and other objects.

SOLAR-POWERED CHARGERS

Solar panels are built into the bag.

SOLAR COMPUTER BAGS

HAND-POWERED CHARGERS

FIGURE 16-31
Alternate power.
Solar and hand power can be used to power mobile phones, portable digital media players, GPS devices, portable computers, and other devices.

Environmental Concerns

– Green Components

- Computers run quieter and cooler

- More recyclable hardware and packaging being used

- Amount of toxic chemicals in personal computers being reduced

- Recycled plastics being used in some mobile phones

Environmental Concerns

- Recycling and Disposal of Computing Equipment
  - Paper-based trash
    - Paperless office basically a myth
    - Almost one-billion pieces of paper a year generated by printers world wide
    - Utilities designed to reduce paper consumption
      - GreenPrint, PrintWhatYouLike.com
        - » Eliminate images, blank pages, non-critical content in order to print on the least amount of paper as possible

Environmental Concerns

- – E-trash (e-waste)
  - Disposable products (used toner cartridges, discarded CDs and DVDs, other storage media, disposable digital cameras)
  - Discarded hardware (old computers, mobile phones, TVs, etc.)

FIGURE 16-32

E-waste. E-waste exported to developing countries (such as Nigeria shown here) that cannot be repaired is typically dumped and burned.

Environmental Concerns

- Many elements found in hardware are dangerous
  - Arsenic, lead, mercury, cadmium
  - Much ends up in municipal landfills not designed for toxic waste
- Much e-waste from developed countries is shipped to developing countries such as Nigeria, China, and India
- Many organizations are working to find ways to protect people and the environment from future contamination

Environmental Concerns

- Proper recycling is essential
  - Some recycling centers will accept computer equipment
- Many computer manufacturers have voluntary take-back programs
- Expired toner and ink cartridges can sometimes be returned to manufacturer or exchanged when purchasing new cartridges
- Using recharged printer cartridges saves consumers' money and helps reduce e-waste in landfills

Environmental Concerns

- Donate obsolete equipment to schools and other organizations
- For security and privacy reasons, all data should be completely removed before disposal or donation

Courtesy of the U.S. Marines

FIGURE 16-33

Operation Homelink. Computers donated to this organization are used to help soldiers (such as this soldier in Iraq) communicate with their loved ones.

Related Legislation

- There is legislation to protect intellectual property rights, such as:
  - Family Entertainment and Copyright Act of 2005 (FECA)
  - U.S. Anticybersquatting Consumer Protection Act
  - Digital Millennium Copyright Act (DMCA)
- Ethical legislation is more difficult to pass
  - The 1998 amendment to Section 508 of the Rehabilitation Act requires federal agency information be accessible to persons with disabilities

Related Legislation

- Currently, no federal computer recycling laws are in effect in the U.S.
  - Federal agencies are required to purchase energy-efficient electronic products
- The Sarbanes-Oxley Act and HIPAA established privacy and data protection standards

Quick Quiz

1. Which of the following is NOT an assistive input device?
    a. Braille display
    b. Head-pointing system
    c. One-handed keyboard

2. True or False: E-trash is no longer a concern today since modern computers contain very few toxic materials.

3. A device designed to connect a portable computer to conventional hardware such as a keyboard, mouse, and printer is called a(n) _____.

Answers:
1) a; 2) False; 3) docking station

Summary

- Intellectual Property Rights
- Ethics
- Computers and Health
- Access to Technology
- Environmental Concerns
- Related Legislation