

Technology Standards

Knows the characteristics and uses of computer hardware and operating systems

Grades K-2

1. Identifies basic computer hardware (e.g., keyboard and mouse, printer, monitor, output, hard and floppy disk, case for the cpu [central processing unit])
2. Powers-up computer, monitor, and starts a computer program (e.g., checks that printer is switched on and on-line; reboots the computer when necessary)
3. Knows the alphanumeric keys and special keys (e.g., function keys, escape key, space bar, delete/backspace, return/enter)
4. Knows proper finger placement on the home row keys
5. Handles diskettes and other computer equipment with care

Grades 3-5

1. Knows the basic functions of hardware (e.g., keyboard and mouse provide input; printer and monitor provide output; hard and floppy disk provide storage; the cpu processes information)
2. Uses proper fingering for all keys, beginning from the homerow, maintaining proper posture while using the keyboard
3. Knows potential hazards to computer media (e.g., the damage caused to floppies by magnetic fields, dirt, and dust; caused to computers by excessive heat, smoke, and moisture)
4. Knows basic facts about networked computers (e.g., computers can connect to each other via modem and telephone line, or through local network systems, or internet and intranet)

Grades 6-8

1. Knows the differing capacities and trade-offs for computer storage media, such as CD-ROMs, floppy disks, hard disks, and tape drives
2. Types with some facility, demonstrating some memorization of keys
3. Connects via modem to other computer users via the internet, an on-line service, or bulletin board system
4. Knows basic characteristics and functions of an operating system

Grades 9-12

1. Knows of significant advances in computers and peripherals (e.g., data scanners, digital cameras)
2. Uses a variety of input devices (e.g., keyboard, scanner, voice/sound recorders, mouse, touch screen)

3. Knows limitations and trade-offs of various types of hardware (e.g., laptops, notebooks, modems)
4. Identifies malfunctions and problems in hardware (e.g., hard drive crash, monitor burn-out)
5. Knows features and uses of current and emerging technology related to computing (e.g., optical character recognition, sound processing, cable TV, cellular phones, ABS brakes)

Knows the characteristics and uses of computer software programs

Grades K-2

1. Types on a computer keyboard, using correct hand and body positions
2. Knows basic distinctions among computer software programs, such as word processors, special purpose programs, and games
3. Uses menu options and commands

Grades 3-5

1. Uses a word processor to edit, copy, move, save, and print text with some formatting (e.g., centering lines, using tabs, forming paragraphs)
2. Makes back-up copies of stored data, such as text, programs, and databases
3. Trouble-shoots simple problems in software (e.g., re-boots, uses help systems)
4. Knows the common features and uses of data bases (e.g., data bases contain records of similar data, which is sorted or organized for ease of use; data bases are used in both print form, such as telephone books, and electronic form, such as computerized card catalogs)
5. Uses data base software to add, edit, and delete records, and to find information through simple sort or search techniques
6. Knows how formats differ among software applications (e.g., word processing files, database files) and hardware platforms (e.g., Macintosh, Windows)

Grades 6-8

1. Uses advanced features and utilities of word processors (e.g., uses clip art, a spell-checker, grammar checker, thesaurus, outliner)
2. Knows the common features and uses of desktop publishing software (e.g., documents are created, designed, and formatted for publication; data, graphics, and scanned images can be imported into a document using desktop software)
3. Knows the common features and uses of spread sheets (e.g., data is entered in cells identified by row and column; formulas can be used to update solutions automatically; spreadsheets are used in print form, such as look-up tables, and electronic form, such as to track business profit and loss)

4. Uses a spread sheet to update, add, and delete data, and to write and execute valid formulas on data
5. Uses boolean searches to execute complex searches on a data base

Grades 9-12

1. Understands the uses of listservs, usenet newsreaders, and bulletin board systems
2. Knows how to import, export, and merge data stored in different formats (e.g., text, graphics)
3. Knows how to import and export text, data, and graphics between software programs
4. Identifies some advanced features of software products (e.g., galleries, templates, macros, mail merge)
5. Uses desktop publishing software to create a variety of publications

Understands the relationships among science, technology, society, and the individual

Grades K-2

4. Knows ways that technology is used at home and school (e.g., paging systems, telephones, VCRs)
5. Knows that new tools and ways of doing things affect all aspects of life, and may have positive or negative effects on other people
6. Understands that when an individual creates something on a computer, the created work is that person's property, and only that person has the right to change it

Grades 3-5

1. Knows that technologies often have costs as well as benefits and can have an enormous effect on people and other living things
2. Knows areas in which technology has improved human lives (e.g., transportation, communication, nutrition, sanitation, health care, entertainment)
3. Knows that new inventions often lead to other new inventions and ways of doing things
4. Understands the concept of software piracy (i.e., illegally copying software), and that piracy is a violation of copyright laws

Grades 6-8

1. Knows that scientific inquiry and technological design have similarities and differences (e.g., scientists propose explanations for questions about the natural world that are always tentative and evolving, and engineers propose solutions relating to human problems, needs, and aspirations; both science and technology depend on accurate scientific information and they cannot contravene scientific laws)

2. Knows that science cannot answer all questions and technology cannot solve all human problems or meet all human needs
3. Knows ways in which technology has influenced the course of history (e.g., revolutions in agriculture, manufacturing, sanitation, medicine, warfare, transportation, information processing, communication)
4. Knows that technology and science are reciprocal (e.g., technology drives science, as it provides the means to access outer space and remote locations, collect and treat samples, collect, measure, store, and compute data, and communicate information; science drives technology, as it provides principles for better instrumentation and techniques, and the means to address questions that demand more sophisticated instruments)
5. Knows ways in which technology and society influence one another (e.g., new products and processes for society are developed through technology; technological changes are often accompanied by social, political, and economic changes; technology is influenced by social needs, attitudes, values, and limitations, and cultural backgrounds and beliefs)
6. Knows examples of copyright violations and computer fraud (e.g., computer hacking, computer piracy, intentional virus setting, invasion of privacy) and possible penalties (e.g., large fines, jail sentences)

Grades 9-12

1. Knows that science and technology are pursued for different purposes (scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans; technology is driven by the need to meet human needs and solve human problems)
2. Knows ways in which social and economic forces influence which technologies will be developed and used (e.g., personal values, consumer acceptance, patent laws, availability of risk capital, the federal budget, local and national regulations, media attention, economic competition, tax incentives)
3. Knows that alternatives, risks, costs, and benefits must be considered when deciding on proposals to introduce new technologies or to curtail existing ones (e.g., Are there alternative ways to achieve the same ends? Who benefits and who suffers? What are the financial and social costs and who bears them? How serious are the risks and who is in jeopardy? What resources will be needed and where will they come from?)
4. Knows that technological knowledge is often not made public because of patents and the financial potential of the idea or invention; scientific knowledge is made public through presentations at professional meetings and publications in scientific journals
5. Knows examples of advanced and emerging technologies (e.g., virtual environment, personal digital assistants, voice recognition software) and how they could impact society
6. Observes common courtesies and acceptable use policies while telecomputing

7. Knows that mathematics, creativity, logic, and originality are all needed to improve technology
8. Identifies the role of technology in a variety of careers

Understands the nature of technological design

Grades K-2

7. Knows that objects occur in nature; but people can also design and make objects (e.g., to solve a problem, to improve the quality of life)
8. Knows that tools can be used to observe, measure, make things, and do things better or more easily
9. Knows that people are always inventing new ways to solve problems and get work done (e.g., computer is a machine that helps people work and play)

Grades 3-5

1. Categorizes items into groups of natural objects and designed objects
2. Identifies a simple problem that can be solved using technology
3. Knows constraints that must be considered when designing a solution to a problem (e.g., cost, materials, time, space, safety, scientific laws, engineering principles, construction techniques, appearance, environmental impact, what will happen if the solution fails)
4. Implements proposed solutions using appropriate tools, techniques, and quantitative measurements
5. Evaluates a product or design (e.g., considers how well the product or design met the challenge to solve a problem; considers the ability of the product or design to meet constraints), and makes modifications based on results
6. Knows that people have invented and used tools throughout history to solve problems and improve ways of doing things

Grades 6-8

1. Identifies appropriate problems for technological design (e.g., identifies a specific need, considers its various aspects, considers criteria for a suitable product)
2. Designs a solution or product, taking into account needs and constraints (e.g., cost, time, trade-offs, properties of materials, safety, aesthetics)
3. Implements a proposed design (e.g., organizes materials and other resources, plans one's work, makes use of group collaboration when appropriate, chooses suitable tools and techniques, works with appropriate measurement methods to ensure accuracy)
4. Evaluates the ability of a technological design to meet criteria established in the original purpose (e.g., considers factors that might affect acceptability and suitability for intended users or beneficiaries; develop measures of quality with respect to these factors), suggests improvements, and tries proposed modifications

Grades 9-12

1. Proposes designs and chooses between alternative solutions (e.g., models, simulations)
2. Implements a proposed solution (e.g., constructs artifacts for intended users or beneficiaries)
3. Evaluates a designed solution and its consequences based on the needs or criteria the solution was designed to meet

Understands the nature and operation of systems

Grades K-2

10. Knows that most things are made of parts and they may not work if some parts are missing
11. Knows that when parts are put together, they can do things that they couldn't do by themselves
12. Understands how some elements or components of simple systems work together (e.g., parts of a bicycle)
13. Creates and tests a simple linear system (e.g., a production line process for making sandwiches)

Grades 3-5

1. Knows that when things are made up of many parts, the parts usually affect one another
2. Knows that things that are made of parts may not work well if a part is missing, broken, worn out, mismatched, or misconnected
3. Identifies the relationships between elements (i.e., components, such as people or parts) in systems
4. Assembles, disassembles, and tests systems (e.g., in logo programming, using paper and pencil designs)

Grades 6-8

1. Knows that a system can include processes as well as components
2. Knows how part of a system can provide feedback when its output (in the form of material, energy, or information) becomes input for another part of the system
3. Identifies the elements, structure, sequence, operation, and control of systems
4. Assembles and disassembles systems to manage, control, and improve their performance (e.g., a computer program, a simple machine based on a pulley mechanism)
5. Knows that systems are usually linked to other systems, both internally and externally, and can contain subsystems as well as operate as subsystems

Grades 9-12

1. Knows that a system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts
2. Knows that understanding how things work and designing solutions to problems of almost any kind can be facilitated by systems analysis
3. Knows that in defining a system, it is important to specify its boundaries and subsystems, indicate its relation to other systems, and identify what its input and its output are expected to be
4. Knows how feedback can be used to help monitor, control, and stabilize the operation of a system
5. Knows that even in simple systems, accurate prediction of the effect of changing some part of the system is not always possible
6. Constructs and operates systems (e.g., organizes and adjusts subsystems)
7. Knows that complex systems are subject to failure and are designed with various elements and procedures (e.g., performance testing, overdesign, redundancy, more controls) that help reduce system failure

Information Sources

*Office of Educational Research and Improvement,
Department of Education.*

Project 2061: Benchmarks for Science Literacy

AED: Australian Technology Standards

CDE: Science Framework for California Public Schools

NAEP: 1996 Science Framework

International Baccalaureate: Environmental Systems

ITEA: Technology for All Americans

NBEA: National Standards for Business Education

International Baccalaureate: Informational Technology

North Carolina Computer Standards

Texas Technology Application Standards