Indiana
Technology Education

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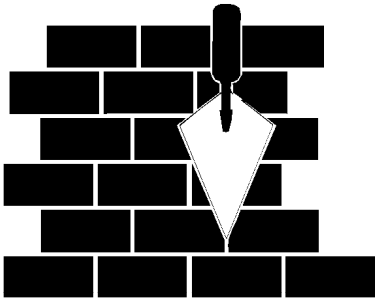
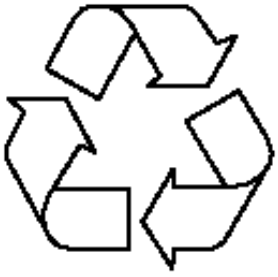
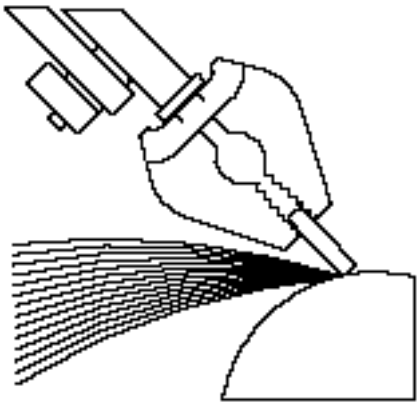




Content Standards Booklet



2004 Edition

INDIANA TECHNOLOGY EDUCATION CURRICULUM STANDARDS

Inside Cover

Technology Education

Content Standards Booklet – 2004 Edition

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Technology - A Perspective

The evolution of humankind is often presented as a series of wars, religious disputes, new laws, and the division of territories into countries. However, in reality, most history is a record of people adapting the natural and human-made environment. It is the story of inventions and innovations; of people developing and using tools and materials in their struggle to make their life easier and more enjoyable.

The early development of technology occurred in several arenas. People learned to tame and use fire, develop stone weapons, process skins into leather, produce ceramic containers, weave cloth, construct dwellings, and develop means of conveyance. This led to the combination of technologies which resulted in rapid change.

These and other developments transformed the face of the earth. While the earliest changes were almost imperceptible, we now live in a human-designed and human-built world. As the national content standards document remind us, technology has led to the "modification of the natural environment to satisfy perceived human needs and wants" (ITEA 2000, p. 242).

Technology Defined

This ever-present, unavoidable, potentially beneficial phenomena, called "technology", is widely misunderstood, misdefined, and often distrusted. To some people, *technology is hardware*. It is computers, the Internet, lasers, and supersonic aircraft. To other people, *technology is organization*. It is the way people structure themselves to produce products and services. To still other people, *technology is process*. It is the actions used in developing, producing, and managing our products or systems.

This last view is the broadest and most descriptive. It suggests that ***technology is a body of knowledge and action, used by people, to apply resources in developing, producing, using, and assessing products, structures and systems in order to control and modifying the natural and human-made (modified) environment.***

The Project 2061 report (Johnson, 1989) captured the essence of technology by suggesting that it is "the application of knowledge, tools, and skills to solve practical problems and extend human capabilities." (p. 1) The report further suggested that technology "is conceived by inventors and planners, raised to fruition by the work of entrepreneurs, and implemented and used by society."

More recently, the *Standards for Technological Literacy* (ITEA, 200) included a simplified notion, stating that technology is "human innovation in action". Modern technology involves many processes and actions, and can help humans solve basic problems while extending human capabilities.

The Actions Of Technology

Wherever there are humans, technology is present. Technology is applied as humans grow and harvest food and fibers, locate and extract natural resources, diagnose and treat illnesses, explore the universe, participate in recreation and entertainment activities, make war, erect dwellings, move cargo, teach each other, investigate the world around them, etc. Without technology, humans could not exist.

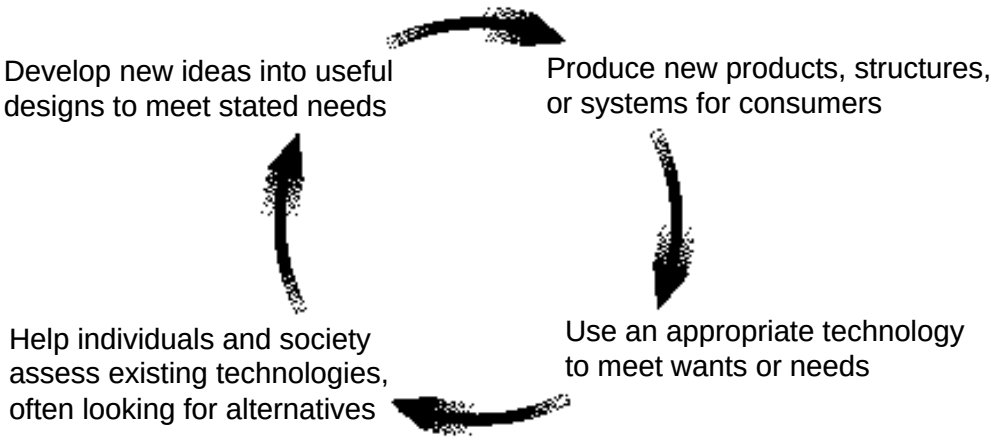
Technology can easily be viewed as a set of unique actions which include:

- **Developing:** Creating brand new or modifying existing devices, structures, and systems to meet human needs and wants.
- **Producing:** Acquiring resources to make products, structures, and systems available for human use.
- **Using:** Applying technology to meet daily needs and wants.
- **Assessing:** Determining the appropriateness of technological actions by evaluating their impacts on individuals, society, and the environment.

These actions are often displayed using a systems model. The Jackson's Mill work (Hales and Snyder, n.d.) described a system as a combination of elements or parts that work in an orderly, predictable way to accomplish a desired goal. The document presented the "universal systems model" as having inputs, processes, outputs, and a feedback loop. This model suggests that labor, materials, energy, and other resources are used in technological systems to solve problems and address opportunities. These resources are applied through various technological processes to provide desired outputs (but often include ancillary outputs, as well). The outputs of the systems are evaluated and information obtained is used as feedback to control the operation of the system.

TECHNOLOGICAL ACTIONS

Based on human needs & wants, technological resources are required to . . . .



. . . . when solving problems or addressing opportunities.

Technology Education

Human knowledge can be grouped into four categories. *Scientific knowledg*e describes the natural world and the laws that govern it. *Technological knowledg*e describes how the human-built world is designed and created and how people can use it to extend their potential. The knowledge referred to as the *humanities* describe the values and beliefs of people. Finally *descriptive knowledge* allows people to communicate information and ideas (e.g., math and language arts). Schools are the societal institution responsible for helping young people develop fundamental knowledge and abilities in these four realms.

Technology education, a fairly recent addition to the school curriculum, focuses on this technological knowledge and competence. It is designed to help students understand and to participate in the technological society today and tomorrow. As outlined in the *Standards for Technological Literacy*, technology education "provides an opportunity for students to learn about the processes and knowledge related to technology".

Technology education provides the understanding and problem solving skills needed by people throughout their lives. Any individual who has completed a technology education program should be able to participate as an **active citizen** through understanding and expressing positions on technological issues such as nuclear power generation, traffic engineering, solid waste disposal, and natural resource management. In addition, after studying in a technology-based program, each person should be able to make wise **consumer choices** including selecting appropriate technology, using it correctly, and disposing of it properly after it has served its purpose. Finally, technology education helps people make informed **career choices** by allowing students to participate in a wide array of informative and interesting activities which have unique career ramifications.

To meet these challenges, a technology education program has been developed for Indiana. It is described as:

An action-based program for all students to learn how to develop, produce, use, and assess the impacts of products and services that extend the human potential to improve and control the natural and human-made environment.

Each student who participates in the program will develop an understanding of technology as a system in the global context by developing an ability to . . . .

- Develop technological products and services.
- Use tools, machines, materials, and energy to produce products and services.
- Select appropriate technology to solve problems and meet opportunities.
- Appropriately use technology to extend human potential to improve and control our environment.
- Assess the impacts of technology on individuals, society, and the environment.
- Use appropriate personal and interpersonal skills to participate in a technological society.

To reach these goals, the program is based on the technological actions that are universal for all technologies. The total curriculum addresses these two key aspects:

- The specific actions used in developing, producing, using, and assessing all technologies.
- The contexts where technology is developed and used. This includes the areas documented in the national content standards document for the profession (i.e., the *Standards for Technological Literacy*, ITEA 2000).

Technology Education In The State Of Indiana

The Indiana Board of Education has approved a series of formal course titles under the major heading of Technology Education. Descriptions for the levels and the 21 courses in the Indiana T.E. curriculum (see model on the page nine) are as follows:

Introductory Level Experience

TECHNOLOGY
(36 total weeks of instruction at the Middle School or Junior High School level — course content is divided into three 12-week or two 18-week classes)

An introductory activity-based course in which students are introduced to the importance of technology and the principles used to develop, produce, use and assess it. The students develop both individual and group abilities that are needed to participate in and contribute to society.

Technology Systems Level

COMMUNICATION SYSTEMS
(18 weeks)

A broad course that explores the application of tools, materials, and energy in designing, producing, using and assessing communication systems. Students will produce graphic and electronic media as they explore techniques used to apply technology in communicating information and ideas.

CONSTRUCTION SYSTEMS
(18 weeks)

A broad course that explores the application of tools, materials, and energy in developing, producing, using and assessing constructed works. Students will explore techniques used to apply technology in producing residential, commercial, and industrial buildings and a variety of civil structures.

MANUFACTURING SYSTEMS
(18 weeks)

A broad course that explores the application of tools, materials, and energy in developing, producing, using and assessing manufactured products. Students will explore techniques used to apply technology in obtaining resources and in changing them into industrial materials and finished products.

TRANSPORTATION SYSTEMS
(18 weeks)

A broad course that explores the application of tools, materials, and energy in developing, producing, using and assessing transportation systems. Students will explore systems and techniques used to apply technology to move people and cargo in vehicles and by other means on

land, in and on water, and through both air and space.

Technology Processes

COMMUNICATION PROCESSES
(18 or 36 weeks)

A specialized course that explores the technological processes used to produce and deliver graphic and electronic communication media.

CONSTRUCTION PROCESSES
(18 or 36 weeks)

A specialized course that explores the technological processes used to produce residential, commercial, and industrial buildings and a variety of civil structures.

DESIGN PROCESSES
(18 or 36 weeks)

A specialized course that explores the technological processes and employs creative problem solving in developing, engineering, testing, and communicating designs for products, structures, and systems.

MANUFACTURING PROCESSES
(18 or 36 weeks)

A specialized course that explores the technological processes used to obtain resources and change them into industrial materials and finished industrial and consumer products.

TRANSPORTATION PROCESSES
(18 or 36 weeks)

A specialized course that explores the technological processes used to move people and cargo in vehicles and by other means on land and in water, air, and space.

Technology Applications

COMPUTERS IN DESIGN AND PRODUCTION SYSTEMS
(18 or 36 weeks)

This course focuses on using computer systems in producing drawings and related documentation for products and structures and in controlling automated production systems. The emphasis is placed on using modern computer applications rather than on developing job skills. NOTE: This course is to be locally developed (i.e., tailored to each school).

FUNDAMENTALS OF ENGINEERING
(18 weeks)

This course will focus on the actions and processes of engineering as found in the design and application of materials, products, structures, and systems.

TECHNOLOGY AND SOCIETY
(18 weeks)

This course is designed to provide students with an opportunity to understand the interactions of science, technology, and society and use the knowledge gained as a guide to responsible decision making.

TECHNOLOGY ENTERPRISE
(18 weeks)

A synthesis course that allows students to apply technological and managerial principles in organizing, financing, and operating a company to produce a product, structure, or service.

TECHNOLOGY SYSTEMS
(18 or 36 weeks)

A study of the technologies used in indus-

trial, business, and human service occupations. Creative problem solving activities address current, real world conditions. Computer experiences incorporate simulation and control systems.

Project Lead The Way™

COMPUTERS INTEGRATED MANUFACTURING
(36 weeks)

This Project Leads The Way course applies principles of rapid prototyping, robotics and automation. Students use CNC equipment to produce actual models of their three-dimensional designs. Fundamental concepts of robotics used in automated manufacturing and design analysis are included.

INTRODUCTION TO ENGINEERING DESIGN
(36 weeks)

This Project Lead The Way course develops student problem-solving skills using a design development process. Models of product solutions are created, analyzed and communicated using solid modeling computer design software.

PRINCIPLES OF ENGINEERING
(36 weeks)

This Project Leads The Way course helps students understand the field of engineering / engineering technology by exploring various technology systems and manufacturing processes. Students learn how engineers and technicians use math, science and technology in an engineering problem solving process to benefit people. The course also includes concerns about social and political consequences of technological change.

CIVIL ENGINEERING AND ARCHITECTURE
(36 weeks)

This Project Leads The Way course will introduce students to the fundamental design and development aspects of civil engineering and architectural planning. Computer software will allow students to design, simulate, and evaluate the construction of buildings and communities.

BIOTECHNOLOGY
(36 weeks)

This PLTW course will introduce the fundamental aspects of biotechnology and the processes related to this emerging field. Engineering principles will be used in conjunction with scientific knowledge to explore and investigate such areas as biomedical devices, pharmaceutical and medical therapies, and agricultural research and development.

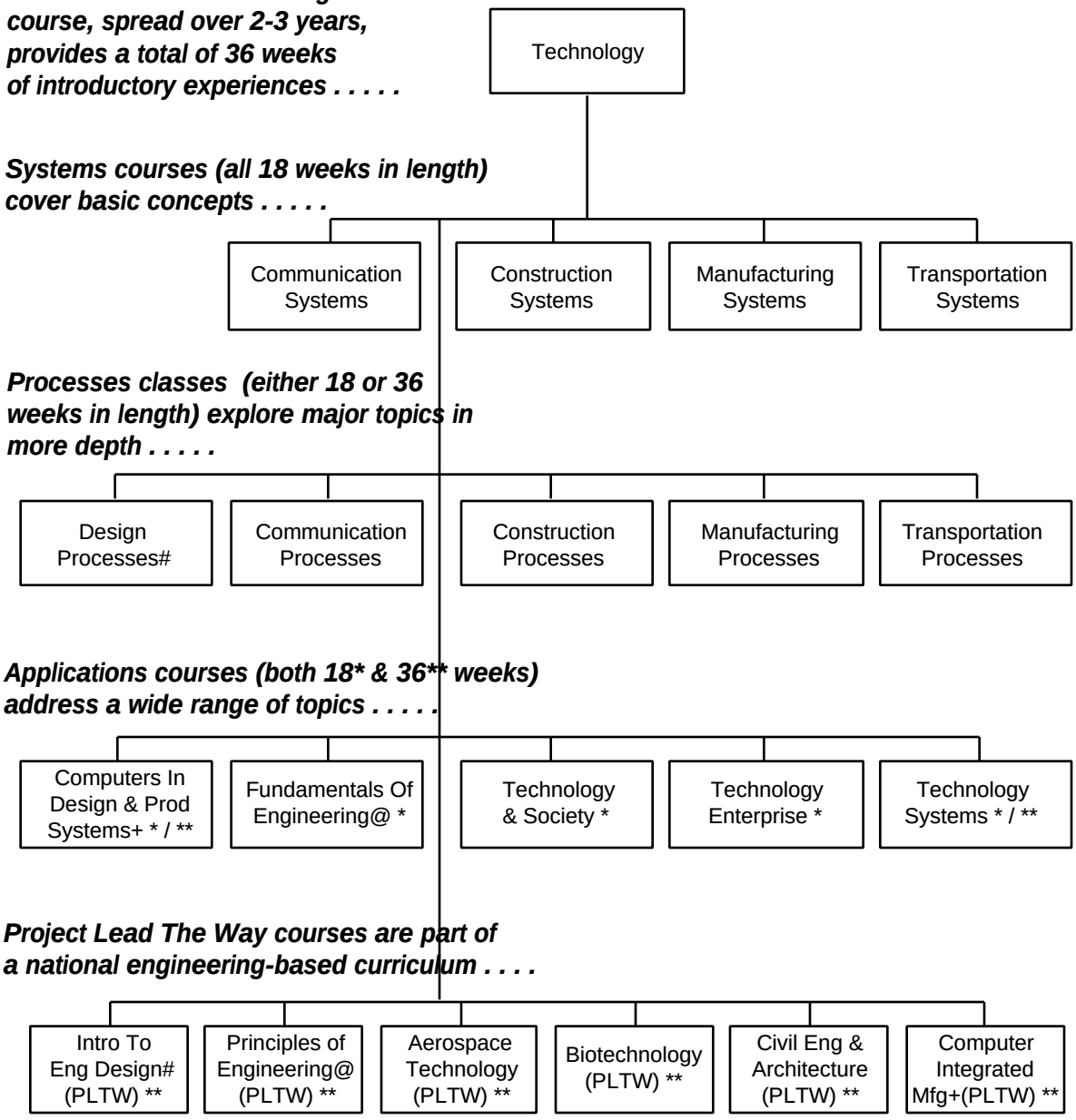
AEROSPACE TECHNOLOGY
(36 weeks)

This course will provide students with the knowledge and experience to apply mathematical, scientific, and engineering principles to the design, development, and evaluation of aircraft and space vehicles, and their operating systems. Emphasis should include the investigation of flight characteristics, analysis of aerodynamic design, and the impact of this technology on the environment.

DIGITAL ELECTRONICS & ENGINEERING DESIGN AND DEVELOPMENT
(Both 36-week courses)
These two PLTW course titles have been approved for Indiana's schools (under the guidelines for Multidisciplinary classes).

INDIANA TECHNOLOGY EDUCATION CURRICULUM

This Middle School / Jr. High course, spread over 2-3 years, provides a total of 36 weeks of introductory experiences . . . . .



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IMPORTANT NOTES: All six Project Lead The Way (PLTW) courses are full year (36 week) experiences. Students may earn credit for either a PLTW course in Design#, Engineering@, and Computers+ or the equivalent Indiana T.E. course, but not both. In addition, PLTW course titles of **Digital Electronics** and **Engineering Design and Development** are approved titles for Indiana schools (and appear under the Multidisciplinary Category of the Indiana Dept. of Education guidelines).

Content Standards for Indiana's Technology Education Program

In today's public schools, locally and nationally–approved academic standards help drive instruction. That is especially true for the profession of technology education. A project funded by NSF and NASA led to creation of the Technology For All Americans (TFAA) project in the mid-1990s. TFAA officials released the *Standards for Technological Literacy (ITEA)* in April 2000. This document outlines 20 standards for the study of technology (refer to the chart below for the respective themes).

The TFAA publication includes content standards for students in grades K-12 with specific benchmarks at the K-2, 3-5, 6-8, and 9-12 levels. Technology education is not an official subject area in Indiana's elementary schools, but all teachers, administrators, and students are encouraged to review the suggestions found in *Standards for Technological Literacy*. Numerous elementary-level topics and activities are covered in the appropriate sections of the manual.

Indiana standards for the study of technology at the secondary level (found in this booklet) are based on the national guidelines. Actually, a checklist to both

NATIONAL STANDARDS – KNOWING THE NATURE OF TECHNOLOGY

1) The Characteristics & Scope Of Technology
2) The Core Concepts Of Technology
3) Relationships Among Technologies & The Connections Between Technology & Other Fields

NATIONAL STANDARDS – KNOWING ABOUT TECHNOLOGY & SOCIETY

4) The Cultural, Social, Economic, & Political Effects Of Technology
5) The Effects Of Technology & The Environment
6) The Role Of Society In The Development & Use Of Technology
7) The Influence Of Technology On History

NATIONAL STANDARDS – KNOWING ABOUT DESIGN / ENGINEERING

8) The Attributes Of Design
9) Engineering Design
10) The Role Of Troubleshooting, Research & Development, Invention and Innovation, & Experimentation In Problem Solving

NATIONAL STANDARDS – ABILITIES FOR A TECHNOLOGICAL WORLD

11) Apply Design Processes
12) Use & Maintain Technological Products & Systems
13) Assess The Impact Of Products & Systems

NATIONAL STANDARDS – ABILITIES FOR THE DESIGNED WORLD

14) Medical Technologies
15) Agricultural & Related Biotechnologies
16) Energy & Power Technologies
17) Information & Communication Technologies
18) Transportation Technologies
19) Manufacturing Technologies
20) Construction Technologies

Adapted from the *Standards for Technological Literacy*, ITEA 2000
www.iteawww.org

the state and national content standards are included in each course guide. The standards for Indiana's technology education program served as guidelines when course titles were developed, and later as class outlines, lessons, and laboratory activities were identified.

Listed below are the 17 standards that have shaped the Indiana T.E. curriculum. Throughout the remainder of this booklet, the Indiana content standards are noted (one per page) and sample lessons or activities are listed for each level of instruction.

GENERAL TECHNOLOGICAL CONCEPTS

- Standard #1
  Describe technology as a system with inputs, processes, outputs, impacts, and feedback.
- Standard #2
  Understand technology as a global system to improve, manage, and control the natural and human-made environments.
- Standard #3
  Describe technology as it is applied in the context of communication, construction, manufacturing, transportation, and related technologies.
- Standard #4
  Work cooperatively and productively in groups to design and use technology to solve technological problems.
- Standard #5
  Identify societal and personal needs and opportunities that can be addressed through technology.
- Standard #6
  Develop and refine alternate solutions that address technological needs and opportunities.
- Standard #7
  Evaluate and select appropriate solutions that address technological needs and opportunities.

DESIGNING / PRODUCING TECHNOLOGY

- Standard #8
  Specify solutions to stated needs and opportunities using appropriate technical means.
- Standard #9
  Select the appropriate resources needed to produce and operate communication, construction, manufacturing, transportation, and other technological systems and artifacts.
- Standard #10
  Select the appropriate processes needed to produce or operate products, structures, and systems.

USING / ASSESSING TECHNOLOGY

- Standard #11
  Efficiently use appropriate processes to produce communication, construction, manufacturing, transportation, and related devices and systems.
- Standard #12
  Select the appropriate devices and systems to meet personal and societal needs.

CONTINUED

- Standard #13
  Appropriately operate technological devices and systems.
- Standard #14
  Recognize the need for servicing and repairing technological devices and systems.
- Standard #15
  Properly dispose or recondition worn out and obsolete technological devices
- Standard #16
  Determine the impact of technological actions on people, society, and the environment.
- Standard #17
  Describe the relationships among entrepreneurship, business enterprises, and technology.

The rest of this booklet will focus on each of the 17 Technology Education standards in more depth. The format for each page is similar . . .

- ✓ One of the seventeen Indiana standards is listed at the top of the page.
- ✓ A brief rationale concerning each standard follows the entry.
- ✓ Exploratory-level benchmarks for the middle school / junior high school experience appear in the left-hand column and high school-level benchmarks are found in the right-hand column.
- ✓ The benchmarks are lettered for reference purposes (i.e., for T.E. lesson plans or related documentation).
- ✓ Samples of T.E. content plus classroom and laboratory experiences are include below the benchmarks.
- ✓ Each "sample" is labeled as to which benchmark(s) are supported through that activity or lesson.

Helpful resources in regard to standards-based instruction . . . .

International Technology Education Association. (2000). *Standards for technological literacy: Content for the study of technology*. Reston, VA: Author (Technology For All Americans Project). ISBN 1-887101-02-0

International Technology Education Association. (2003). *Advancing excellent in technological literacy: Student assessment, professional development, and program standards*. Reston, VA: Author. ISBN 1-887101-04-7

International Technology Education Association. (2004). *Measuring progress: A guide to assessing students for technological literacy: Student assessment, professional development, and program standards*. Reston, VA: Author. ISBN 1-887101-03-9

Pearson, G. & Young, A.T. (eds.). (2002). *Technically speaking: Why all Americans need to know more about technology*. Washington, DC: National Academy Press. ISBN 0-309-08262-5

Wiggins, G. & McTighe, J. (1998). *Understanding by design*. Alexandria, VA: Association for Supervision and Curriculum Development. ISBN 0-87120-313-8

Standard #1: Describe technology as a system with inputs, processes, outputs, impacts, and feedback.

The first standard in the Indiana program specifies that technology should be studied as an organized series of intentional actions. Typically, technological resources (inputs) are converted (processed) using various techniques into useful products, services, or systems (outputs). Often technological systems feature a feedback loop and means of storage. Finally, technologies impact people, societies, and the environment.

GRADES 6-8 BENCHMARKS

A) Define technology
B) Describe and apply a systems model
C) Identify resources
D) Describe processes
E) Explore impacts / consequences

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #1

Analyze a technological endeavor for its inputs, processes, outputs, impacts, and feedback.
[1-B, 1-C, 1-D, 1-E]

Use technologies from various historical periods to complete similar tasks, then compare the technologies.
[1-A, 1-D]

Describe technology as it is applied in communication, construction, manufacturing, transportation, and other systems.
[1-A, 1-B, 1-D]

GRADES 9-12 BENCHMARKS

F) Define technology
G) Describe and apply a systems model
H) Identify resources
I) Describe various processing techniques
J) Analyze and explain impacts / consequences

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #1

Explain the inputs, processes, and outputs for a typical communication, construction, manufacturing, transportation, or related system.
[1-F, 1-G, 1-H, 1-I]

Explain the positive and negative impacts of industrial growth in a community.
[1-G, 1-J]

Describe the solution of an R&D project in terms of its inputs, processes, and outputs and identify the impacts on people, society, and the environment.
[1-F, 1-G, 1-H, 1-I, 1-J]

Standard #2: Understand technology as a global system to improve, manage, and control the natural and human-made environments.

The second standard in the Indiana program addresses how technology is used around the world to enhance the quality of life. Modern systems such as construction and transportation help us adapt the natural and human-built environment to help people. An example would be the building of a hydro-electric facility for power and the recreational opportunities created by the reservoir behind the dam. The increased depth of water up-stream might also allow for increased travel on the waterway.

GRADES 6-8 BENCHMARKS

A) Explain the purpose of technology
B) Note how technology influences life

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #2

Explain connections between modern technological systems and global environmental issues.
[2-A, 2-B]

Collect samples of products produced around the globe and plot the location of manufacture on a world map.
[2-A, 2-B]

List local companies and show their world-wide business connections.
[2-A, 2-B]

GRADES 9-12 BENCHMARKS

C) Explain the purpose of technology
D) Describe the commercialization of technology
E) Identify types and rates of technological progress
F) Describe how devices and systems are controlled

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #2

Identify and compare methods of global communication in 1800, 1900, 2000, and today.
[2-C, 2-D, 2-E]

Compare and contrast an automobile-based versus a bicycle-based nation economically, socially, and environmentally.
[2-C, 2-D, 2-E, 2-F]

Analyze a major world construction project (Suez Canal, Three Gorges Dam, etc.) and identify challenges that the builders faced with materials, site, labor, impacts on the economy or environment, and so on.
[2-C, 2-D, 2-F]

Standard #3: Describe technology as it is applied in the context of communication, construction, manufacturing, transportation, and related technologies.

This third standard divides the study of technology into common activities that have transcended time. For instance, individuals and societies have always attempted to communicate with each other. At the same time they have always built shelters and structures, have produced goods to fulfill needs, and have moved about the planet for commerce and recreation. These common actions should continue well into the future, so are all important topics.

GRADES 6-8 BENCHMARKS

A) Define communication and information technology
B) Define production technology
C) Define transportation technology
D) Explain various technological systems

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #3

Develop a radio commercial and explain how technology was used in the process.
[3-A]

Produce a simple consumer product using custom and continuous manufacturing techniques and compare the two systems.
[3-B]

Identify technological devices or systems that enhance the quality of life and classify them as either communication, construction, manufacturing, transportation, or other related endeavors.
[3-A, 3-B, 3-C, 3-D]

GRADES 9-12 BENCHMARKS

E) Differentiate production from service actions
F) Categorize technological ventures
G) Explain how basic devices and systems work
H) Describe the interdisciplinary nature of various technologies

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #3

Develop a TV commercial from initial concept to final production and describe the inputs, objectives, and tasks involved.
[3-F, 3-G]

Develop an employment chart for a construction project and explain the job requirements involved in each position.
[3-E, 3-F, 3-H]

Analyze a given product in terms of materials used, manufacturing operations performed, costs of materials and labor, and uses.
[3-E, 3-F, 3-G, 3-H]

Build a model of a given vehicle or transportation system
[3-E, 3-F, 3-G, 3-H]

Standard #4: Work cooperatively and productively in groups to design and use technology to solve technological problems.

The fourth standard notes how technological accomplishments and progress are often the result of a group venture. Teams of qualified individuals fly large airliners, or design skyscrapers, or run production lines. The ability to work with others is an important life skill, especially when working with modern devices and systems.

GRADES 6-8 BENCHMARKS

A) Work in teams to address an opportunity or solve a problem
B) Use a standard design process to create a new product
C) Help manage a group activity in an efficient manner

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #4

Work cooperatively in a group to design and build a model or prototype.
[4-A, 4-B, 4-C]

Participate in a team to develop and record an audio or video production.
[4-A, 4-B, 4-C]

Work on a R & D team to develop a new vehicle.
[4-A, 4-B, 4-C]

GRADES 9-12 BENCHMARKS

D) Contribute during group problem solving assignments
E) Complete design tasks using a standard process
F) Participate in small group design and production activities
G) Evaluate the efficiency of a team project

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #4

Work in a group to design and produce a greeting card for a specific age group and occasion.
[4-A, 4-E, 4-F]

As a team, design and construct a model of a structure such as a local monument, bridge, or communication tower.
[4-A, 4-E, 4-F]

As a team, develop recommendations for controlling the environmental pollution produced by your school's classroom and lab activities.
[4-A, 4-E, 4-F, 4-G]

As a class, evaluate the solutions of teams addressing the problem of designing an energy efficient vehicle (such as a “supermileage vehicle”).
[4-A, 4-E, 4-F, 4-G]

Standard #5: Identify societal and personal needs and opportunities that can be addressed through technology.

The fifth standard in the Indiana program reviews how technology is used to address personal and societal needs and opportunities. Technological solutions are often sought when a new challenge arises. For instance, communication or transportation problems are often resolved with a new or refined device, system, or service.

GRADES 6-8 BENCHMARKS

A) List how demands, values, and opinions drive technology
B) Describe the acceptance and popularity of various devices and systems
C) Outline the innovation and invention process

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #5

Collect and review examples of trends of personal needs and wants from various modern publications.
[5-A, 5-B]

Identify environmental problems created by technological activities and suggest ways to correct the problem.
[5-A, 5-B, 5-C]

GRADES 9-12 BENCHMARKS

A) Explain factors which influence technological implementation
B) Differentiate consumer wants, needs, and interests
C) Describe cultural differences in the application of technological devices and systems
D) Categorize personal and societal needs and wants

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #5

Identify the personal wants and needs that are addressed by various communication media.
[5-A, 5-B, 5-D]

Describe the historical correlation between advancements in construction technology and the comfort in which people lived.
[5-A, 5-B, 5-C, 5-D]

Conduct a survey to determine a need / want for a product or service.
[5-B, 5-C, 5-D]

Describe ways that traffic congestion might be solved with a new system.
[5-A, 5-B, 5-C, 5-D]

Examine the liability issues associated with a new product.
[5-A, 5-C]

Standard #6: Develop and refine alternate solutions that address technological needs and opportunities.

Technology is developed to address problems and opportunities. This standard outlines how a structured process is used to complete this development task, starting with a clear definition of the central issue and leading to various alternative (yet practical) ideas.

GRADES 6-8 BENCHMARKS

A) Describe and use a basic problem solving process
B) List the requirements for a design project
C) Participate in brainstorming and develop activities
D) Apply technical illustration and modeling skills

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #6

Lists the steps in a technological problem solving model.
[6-A}

Use brainstorming techniques to generate technological product, structure, and system ideas.
{6-A, 6-C, 6-D]

Use sketching techniques to develop and refine various design solutions.
[6-A, 6-B, 6-C, 6-D]

GRADES 9-12 BENCHMARKS

E) Applies different problem solving processes
F) Participates in brainstorming and develop activities
G) Models potential designs in an efficient manner
H) Creates unique solutions to stated issues

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #6

Contribute to a brainstorming session to refine solutions for a product development, community planning, or R&D project.
[6-E, 6-F]

Develop alternate plans for a video presentation using storyboarding and scripting techniques.
[6-E, 6-F, 6-G, 6-H]

Develop plans for a small structure or a model of a civil structure using technical documentation procedures.
[6-E, 6-F, 6-G, 6-H]

Build mock-ups (appearance models) and prototypes for a new product or system.
[6-E, 6-F, 6-G, 6-H]

Use computer software to simulate a process or prepare a graphic.
[6-E, 6-F, 6-G, 6-H]

Standard #7: Evaluate and select appropriate solutions that address technological needs and opportunities.

The seventh standard in the Indiana T.E. program focuses on the development and selection of technological solutions. As new designs or proposed plans are generated, it is important that suggestions be reviewed. That helps in identifying the best possible solution each time.

GRADES 6-8 BENCHMARKS

A) Evaluate technologies based on research and data
B) Make informed technological decisions

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #7

Select evaluation criteria for a product or technological service.
{7-A, 7-B]

Select the best design solution using established criteria.
{7-A, 7-B]

GRADES 6-8 BENCHMARKS

C) Apply a problem solving or formal design process for a technological project
D) Consider human and environmental factors when making decisions
E) Evaluate technologies based on formal research and experimentation
F) Make informed technological decisions

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #7

Develop evaluation criteria and rating scales to assess product and technological service ideas.
[7-C, 7-D, 7-F]

Test operational characteristics using prototypes.
[7-C, 7-D, 7-E, 7-F]

Conduct a consumer or client acceptance study using graphic and or physical models.
[7-C, 7-D, 7-E]

Review a product, structure, or systems design with national or local codes / regulations.
[7-C, 7-D, 7-F]

Standard #8: Specify solutions to stated needs and opportunities using appropriate technical means.

As technologies solutions are approved, they must be communicated (often to a non-technical audience) using the optimal means. This might involve written documentation, illustrations, models, computer graphics, or as raw data. This standard addresses the techniques related to specifying an approved plan, scheme, or design.

GRADES 6-8 BENCHMARKS

A) Explain how devices, products, structures, or systems function
B) Communicate new designs with appropriate media
C) Report design or production information in an efficient manner

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #8

Prepare a dimensioned sketch for a product or technological service.
[8-A, 8-B, 8-C]

Word process the instructions for using a device or system.
[8-A, 8-B, 8-C]

Prepare a bill of materials for a manufactured product.
[8-B, 8-C]

Prepare the complete script for a television or radio commercial.
[8-B, 8-C]

GRADES 9-12 BENCHMARKS

D) Communicate design and production information with appropriate media
E) Use standard forms and documents to describe a new design or plan
F) Model a solution in various ways
G) Re-evaluate a previously approved solution

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #8

Prepare a dimensioned drawing for a new product or structure.
[8-D, 8-E]

Prepare and present a final engineering report or client presentation for a given design solution.
[8-D, 8-E, 8-F]

Prepare an environmental impact report on a product, structure, service, or system.
[8-D, 8-G]

Use various techniques to communicate decisions, solutions to problems, and inventions developed in industrial, health, business, and fine arts contexts.
[8-D, 8-E, 8-F, 8-G]

Standard #9: Select the appropriate resources needed to produce and operate communication, construction, manufacturing, transportation, and other technological systems and artifacts.

Many inputs (materials, information, labor, finances, etc.) are required to enjoy the advantages of technological systems. The ninth standard in the Indiana T.E. program focuses on the personal and corporate need to be able to identify resources associated with today's technologies.

GRADES 6-8 BENCHMARKS

A) Explain how technological devices and systems work
B) Safely use tools and equipment
C) Specify resources required to use or operate a technological system

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #9

Identify the major classes of resources used by technological activities.
[9-C]

Determine the required inks, paper, and related supplies needed to print a brochure or flyer.
[9-A, 9-C]

Safely operate a tool or machine.
[9-A, 9-B]

List the materials used to produce a simple product.
[9-A, 9-C]

GRADES 9-12 BENCHMARKS

D) Operate tools, equipment, and systems safely
E) Describe the technological processes / techniques required for a proposed solution
F) Troubleshoot and maintain systems

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #9

Determine quantity and cost of materials needed to construct a small structure.
[9-E]

Identify the heavy equipment required for a civil construction project.
[9-E]

Race a magnetic levitation vehicle down a guideway.
[9-D, 9-F]

Specify the tooling needed for a continuous production line, then build and use the jigs or fixtures.
[9-D, 9-E, 9-F]

Estimate the financial needs for a community development project.
[9-E, 9-F]

Standard #10: Select the appropriate processes needed to produce or operate products, structures, and systems.

This content standard addresses the importance of technological processes, activities such as designing, building, and operating. Technology is a dynamic, action-based endeavor and numerous processing techniques are employed daily. Individuals must be able to select the resources needed to use devices and systems for their intended purpose.

GRADES 6-8 BENCHMARKS

A) Explain the invention and experimentation processes
B) Troubleshoot a simple technological problem

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #10

Identify the processes used to produce a simple technological product.
[10-A, 10-B]

Use troubleshooting skills to examine an issue, problem, or challenge.
[10-B]

Identify the tools, materials, and procedures needed to build a model of a new structure or vehicle.
[10-A]

GRADES 9-12 BENCHMARKS

C) Research and develop fresh solutions to problems or issues
D) Troubleshoot a technological problem
E) Apply a multidisciplinary approach when solving problems

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #10

In a group activity, determine the best way to instruct other students on how to complete a technological activity.
[10-C, 10-D, 10-E]

Select an appropriate method to construct a civil structure such as a dam or road.
[10-C, 10-E]

Select a product that would make a vehicle safer and determine the effects it would have on the appearance, performance, and cost of the vehicle.
[10-C, 10-D, 10-E]

Analyze a commercially produced product to determine the processes used to produce it.
[10-D]

Standard #11: Efficiently use appropriate processes to produce communication, construction, manufacturing, transportation, and related devices and systems.

Standard #11 focuses on the means of converting technological inputs into desired outputs, specifically the processing techniques used in businesses and industrial facilities. The study of technology is a "doing" venture, as students complete tasks, projects, group activities, and design work . . . . all classroom and laboratory work designed to reflect the practices of modern technology-based firms.

GRADES 6-8 BENCHMARKS

A) Use a variety of tools and machinery appropriately
B) Produce a simple product or service using a modern technology

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #11

Use tools and machines to produce a consumer product or create a model of a large structure.
[11-A, 11-B]

Produce a communication product, such as a printed flyer, T-shirt, or poster.
[11-A, 11-B]

GRADES 9-12 BENCHMARKS

C) Create a prototype or model of a structure to evaluate a design
D) Prepare media using modern technological devices and systems
E) Build a model of a proposed design or solution
F) Use a computer to model a complex product or system

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #11

Write and produce a TV commercial.
[11-D]

Build a small greenhouse or similar structure from technical drawings.
[11-C, 11-E, 11-F]

Use computer software to develop and test land vehicle systems.
[11-E, 11-F]

Install and test a propulsion system for a simple vehicle.
[11-C, 11-E]

Selects appropriate processes for an industrial, health, business, or fine arts activity.
[11-C, 11-D, 11-E, 11-F]

Standard #12: Select the appropriate devices and systems to meet personal and societal needs.

This standard in the Indiana T.E. program applies to the many consumer choices we enjoy today. We have the opportunity to buy various brands of computers, equipment, forms of transportation, etc. Each student should be able to identify the optimal goods and services based on technical factors including performance, function, value, quality, and environmental-friendliness.

GRADES 6-8 BENCHMARKS

A) Identify technologies that improve daily life
B) Develop solutions to environmental or economic problems

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #12

Identify products or services based on performance, value, environmental, and cost factors.
[12-A, 12-B]

Determine the most appropriate machine or system for a specific task.
[12-A]

GRADES 9-12 BENCHMARKS

C) Select the optimum tools or systems to complete a task
D) Apply common technologies when addressing a want or need
E) Identify how various tools or equipment solve personal or societal needs

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #12

Select and use a computer software that will both entertain and educate a participant.
[12-D, 12-E]

Select an appropriate wall treatment for a room when redecorating a new structure
[12-C, 12-D, 12-E]

Identify the most direct route (pathway) between two cities or from home to a remote vacation spot.
[12-C, 12-D]

Analyze and select an appropriate digital camera for home use to take family photographs or make videos.
[12-C, 12-D, 12-E]

Select a transportation vehicle or system based on enhanced fuel economy or one that minimizes air pollution.
[12-C, 12-D, 12-E]

Standard #13: Appropriately operate technological devices and systems.

This standard suggests that technological literate individual can use and safely operate the tools, devices, equipment, and systems that drive the modern world. Many types of machines and systems are used daily at both home and work. Students should be exposed to numerous classroom and laboratory resources during their T.E. activities.

GRADES 6-8 BENCHMARKS

A) Follow instructions when using tools, equipment, and systems
B) Operate equipment in a safe manner

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #13

Read an owner's manual to determine the appropriate operating procedures for a device or system.
[13-A, 13-B]

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Use equipment properly when processing materials.
[13-A, 13-B]

GRADES 9-12 BENCHMARKS

C) Use tools, equipment, and systems properly
D) Follow safe practices around technological devices and systems
E) Evaluate the appropriate means of completing technological tasks

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #13

Use proper tools and materials to make something by mixing and pouring concrete.
[13-C, 13-D]

Appropriately operate manufacturing tools to make a simple product.
[13-C, 13-D, 13-E]

Use a transportation system to move a specified cargo over a specified distance.
[13-C, 13-D, 13-E]

Use appropriate test apparatus to conduct a research and development project.
[13-C, 13-D, 13-E]

Use computer software to develop maps and related documentation for a community plan.
[13-C, 13-D, 13-E]

Standard #14: Recognize the need for servicing and repairing technological devices and systems.

Standard #14 focuses on the continuing attempt to maintain technological devices and systems over a lifetime of use. Each product, mechanism, device, and system has a planned life expectancy. Repairs, adjustments, and up-dates are a normal part of the routine operation of most technologies.

GRADES 6-8 BENCHMARKS

A) Properly use and maintain technological resources

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #14

Describe the importance of routine maintenance for common products, systems, and structures.
[14-A]

Perform simple service on a product and record actions performed.
[14-A]

GRADES 9-12 BENCHMARKS

B) Follow the owner's or operator's instructions when using tools and equipment
C) Complete routine maintenance of devices and systems
D) Identify when devices, products, structures, or systems can not be repaired

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #14

Read an owner's or service manual to determine the servicing needs of a product or vehicle.
[14-B, 14-D]

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Use the proper tools to make routine adjustments and repairs on products and structures.
[14-B, 14-C]

Identify when a product, structure, or system cannot be feasibly repaired.
[14-B, 14-D]

Identify a city area that could use renovation or the addition of an industrial / commercial enterprise.
[14-D]

Standard #15: Properly dispose or recondition worn out and obsolete technological devices.

This content standard denotes the importance of "responsibility" in the use and disposal of products, materials, and similar items. From an environmental and personal perspective, technological resources need to be handled and discarded with care. Once materials or equipment have exceeded their usefulness, the responsibility of the user continues until the items are either recycled, refurbished, or secured in a safe place.

GRADES 6-8 BENCHMARKS

A) Be aware of the environmental consequences of various resources
B) Dispose of technological devices and materials appropriately
C) Identify the normal use cycle of products and structures

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #15

Describe the importance of properly disposing of worn out and obsolete products, devices, and structures.
[15-A, 15-C]

Conduct a school survey to identify recyclable materials that are being sent to local landfills.
[15-A, 15-C]

Convert a waste material into a useful product.
[15-A, 15-B]

GRADES 9-12 BENCHMARKS

D) Identify the environmental consequences of various resources
E) Dispose of technological devices and materials in an appropriate manner
F) Repair or refurbish a worn-out product or structure
G) Plan for and implement ways to improve the local and global environment

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #15

Salvage useful parts and materials from worn-out products or an older structure.
[15-D, 15-E, 15-F, 15-G]

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Develop a waste recycling plan and collection center for the school or community.
[15-D, 15-G]

Design a product that can be completely recycled at the conclusion of its initial life cycle.
[15-D, 15-G]

Visit a historic structure to determine ways it can be restored, then initiate the activity.
[15-D, 15-F, 15-G]

Standard #16: Determine the impact of technological actions on individuals, society, and the environment.

The sixteenth standard encourages individuals, communities, and businesses to pay attention to technology's impact on people and the environment. All technological actions can have consequences, both positive and negative. It takes knowledge, attention to detail, and careful analysis to understand the short- and long-term the consequences of technology.

GRADES 6-8 BENCHMARKS

A) Explain the consequences of technology on people or society
B) Evaluate the environmental impacts of devices, products, or systems

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #16

Consider the environmental impact of a new product or packaging system.
[16-A, 16-B]

Identify several of the potential planned and unplanned personal, social, environmental, and economic impacts of technological systems and devices.
[16-A, 16-B]

GRADES 9-12 BENCHMARKS

C) Identify how technology impacts individuals, society, and the environment
D) Evaluate the potential impact of new products and systems
E) Analyze the economic influences of technology-based businesses
F) Assess the advantages and disadvantages of emerging technologies

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #16

Analyze advertisements for clues of gender, ethnic, age, economic, and political bias and develop a cultural alternative.
[16-C, 16-D, 16-E]

Trace the changes in career skills needed for machine operators and machine watchers in computer controlled (CIM) production.
[16-C, 16-D, 16-E, 16-F]

Compare the cost of a manufactured good produced 25 years ago with its current cost (adjusted for inflation).
[16-C, 16-D, 16-E]

Analyze the environmental impact of residential land use on agriculture and recreation.
[16-C, 16-E]

Standard #17: Describe the relationships among entrepreneurship, business enterprises, and technology.

This final standard in the Indiana T.E. program suggests that technology can be studied as an organized series of intentional actions. Specifically, technological resources (inputs) are converted (processed) using various techniques into useful products, services, or systems (outputs). Often technological systems feature a feedback loop and means of storage. Finally, all technologies impact people, societies, and the environment.

GRADES 6-8 BENCHMARKS

A) Learn the profit-making potential from modern technology
B) Participate in a technological enterprise

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 6-8 THAT SUPPORT STANDARD #17

Operate a teacher-established technological enterprise.
[17-A, 17-B]

Identify the role of owners, top and middle-management, and workers in a production line activity.
[17-A]

GRADES 9-12 BENCHMARKS

C) Describe how technological enterprises are developed and operated
D) Develop products and services with a profit-motive in mind
E) Participate in a mock corporate venture involving modern technology

EXAMPLES OF ACTIVITIES OR EXPERIENCES IN GRADES 9-12 THAT SUPPORT STANDARD #17

Develop a managerial structure for a simple technological enterprise.
[17-C]

Maintain production and financial records for a simple enterprise.
[17-C, 17-D, 17-E]

Develop a marketing plan for a product or technological service.
[17-C, 17-D, 17-E]

Develop and maintain personnel materials for an enterprise.
[17-C, 17-D, 17-E]

Explain the legal aspects, such as patents and liability, in managing a technological enterprise.
[17-C, 17-E]

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