

# Technology Content in K-12 Education Standards in the United States

NAE/USDE

State Educators' Symposium  
on  
Technological Literacy

April 28, 2004

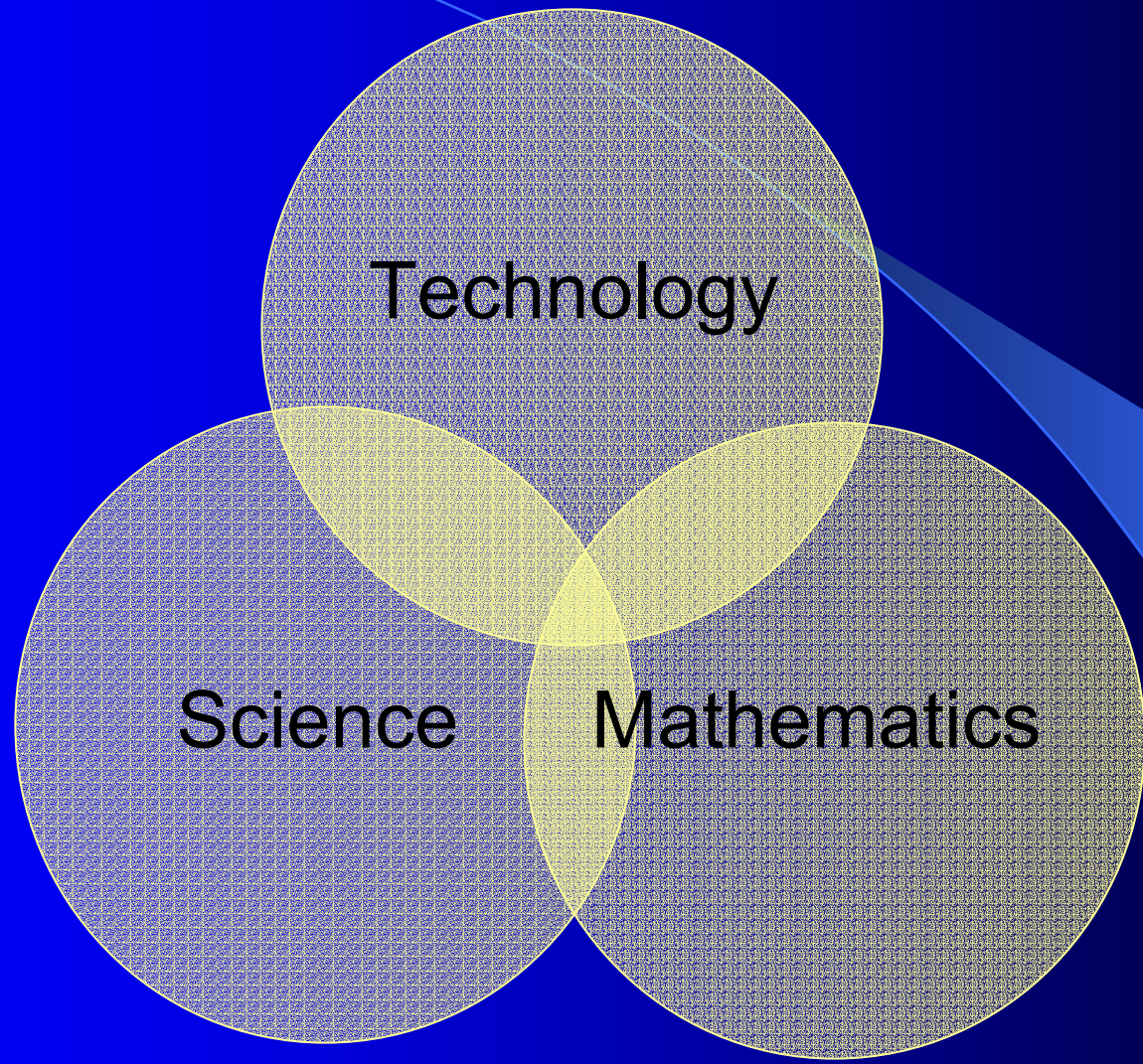


# What This Presentation Includes

- Technology and Technological Literacy
- *Standards for Technological Literacy*
- How Other Nationally Developed Standards Address Technological Literacy
- Implementing Technological Literacy in Your State

# Confusion about Technology in U.S.

- Many Americans view technology narrowly as being computers (67%).
- The public sees engineering and science as the same as technology.  
(ITEA Gallup Poll, March, 2001)



Technology

Science

Mathematics

# What is Technological Literacy?

- ITEA's *Standards for Technological Literacy: Content for the Study of Technology* defines technological literacy as the ability to use, manage, assess, and understand technology.
- Technological literacy, like other forms of literacy, is what every person needs in order to be an informed and contributing citizen for the world of today and tomorrow.
- Technological literacy is more a capacity to understand the broader technological world rather than an ability to work with specific processes of it. (NAE/NRC, 2002)

# Technology Education and Educational Technology

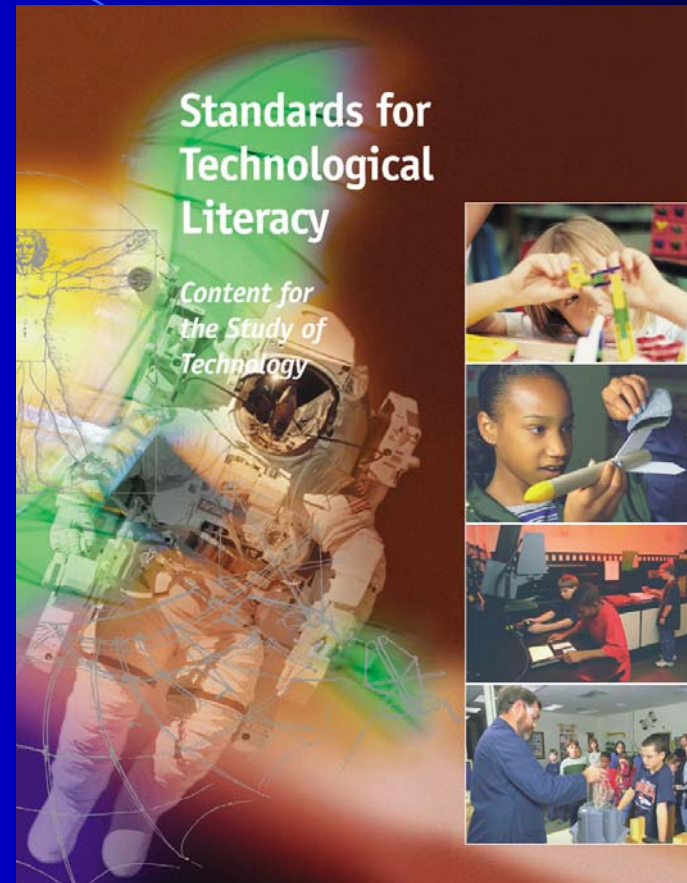
## **Technology Education** (The Study of Technology)

- Teaches about technology as a content area
- Concerned with the broad spectrum of technology (How humans have designed & innovated the natural world)
- Primary goal: Technological literacy for everyone

## **Educational Technology** (Information Technology)

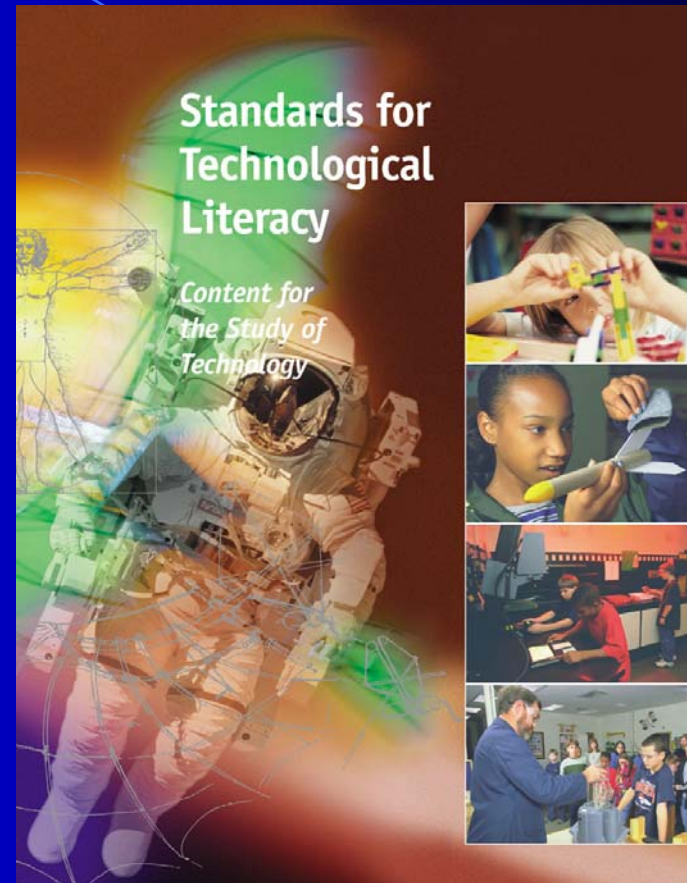
- Teaches with technology (uses technology as a tool)
- Primarily concerned with the focused spectrum of information and communication technologies
- Primary goal: To enhance the teaching and learning process

*Standards for Technological Literacy: Content for the Study of Technology (STL)* presents the content for what every student should know and be able to do in order to be technologically literate.



[www.iteawww.org](http://www.iteawww.org)

*STL* went through separate formal reviews by the National Research Council and the National Academy of Engineering.

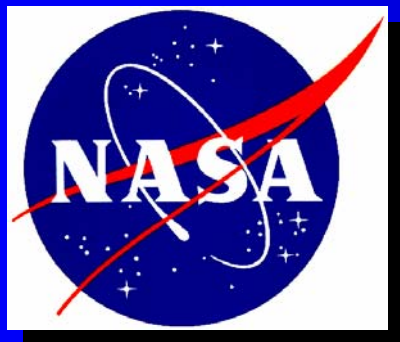


[www.iteawww.org](http://www.iteawww.org)

International Technology Education Association's  
**Technology for All Americans Project**  
Funded by:



National Science Foundation (NSF)



National Aeronautics and Space  
Administration (NASA)

# Nature of Technology

- Students will develop an understanding of the **characteristics and scope of technology**.
- Students will develop an understanding of the **core concepts of technology**.
- Students will develop an understanding of the **relationships among technologies and the connection between technology and other fields of study**.

# Technology and Society

- Students will develop an understanding of the **cultural, social, economic, and political effects of technology**.
- Students will develop an understanding of the **effects of technology on the environment**.
- Students will develop an understanding of the **role of society in the development and use of technology**.
- Students will develop an understanding of the **influence of technology on history**.

# Design

- Students will develop an understanding of the **attributes of design**.
- Students will develop an understanding of **engineering design**.
- Students will develop an understanding of the **role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving**.

**Design and Innovation  
are as basic to Technology  
as  
Inquiry  
is to Science  
and  
Numeracy  
is to Mathematics.**

# Abilities for a Technological World

- Students will develop the abilities to apply the design process.
- Students will develop the abilities to use and maintain technological products and systems.
- Students will develop the abilities to assess the impact of products and systems.

# The Designed World

- Students will develop an understanding of and be able to select and use **medical technologies**.
- Students will develop an understanding of and be able to select and use **agricultural and related biotechnologies**.
- Students will develop an understanding of and be able to select and use **energy and power technologies**.

# The Designed World (Cont.)

- Students will develop an understanding of and be able to select and use **information and communication technologies**.
- Students will develop an understanding of and be able to select and use **transportation technologies**.
- Students will develop an understanding of and be able to select and use **manufacturing technologies**.
- Students will develop an understanding of and be able to select and use **construction technologies**.

# Benchmarks

These are statements which enable students to meet a given standard (by grade level K-2, 3-5, 6-8, and 9-12).

GRADES  
3-5

Students in Grades 3-5 should learn that people's needs and wants have a direct influence on the development of technology. If people have no desire for a certain product or system, companies will not generally develop it. Furthermore, once people lose interest in a product or system, even one that was previously seen as a necessity, it will probably be removed from the marketplace and quickly forgotten.

In contrast, companies often encourage the demand for a product through such tactics as marketing or deliberately creating a shortage. Furthermore, because people's wants and needs are constantly changing, technology too is constantly changing. Toy sales can exemplify this principle. Many toys are made and brought to market because parents and children demand them. If the demand for certain toys drops, prices will also drop, and companies will reduce production of those items. Students should learn that when people are deciding which product to purchase, they are also influencing the rise and fall of technological development.

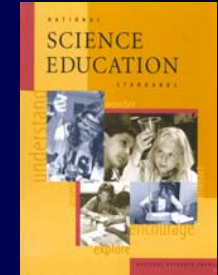
STANDARD 6 Impact of Society on Technology

In order to realize the impact of society on technology, students in Grades 3-5 should learn that

- B. Because people's needs and wants change, new technologies are developed, and old ones are improved to meet those changes.** Before the days of air conditioning, covered porches on homes were very popular because people could go outside to enjoy a cool breeze in a comfortable, shaded area. Now that air conditioning is widely available, new houses seldom feature open-air front porches; rather, uncovered backyard decks are favored to accommodate modern day preferences.
- C. Individual, family, community, and economic concerns may expand or limit the development of technologies.** The development of a product or system is related to the wants, interests, and acceptance of individuals. Just because a product or system could be developed does not mean it should be. Sometimes an industry is able to deliver a product or system, but because of misunderstanding or fear, a product or system is not developed. For example, the electric car, nuclear power, and genetic terminator seeds have stimulated both public mistrust and misunderstanding.

# How Other Nationally Developed Standards Address Technological Literacy

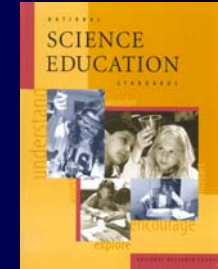
# National Science Education Standards (NRC, 1996)



Science Content Standards	K-4	5-8	9-12
	As a result of activities in grades K-4, all students should develop	As a result of activities in grades 5-8, all students should develop	As a result of activities in grades 9-12, all students should develop
<b>Standard E: Comprises the science and technology standard domain</b>	<ul style="list-style-type: none"> <li>•Abilities of technological design</li> <li>•Understanding about science and technology</li> <li>•Abilities to distinguish between natural objects and objects made by humans</li> </ul>	<ul style="list-style-type: none"> <li>•Abilities of technological design</li> <li>•Understanding about science and technology</li> </ul>	<ul style="list-style-type: none"> <li>•Abilities of technological design</li> <li>•Understandings about science and technology</li> </ul>

Adapted from Newberry, P. and Hallenbeck, L. (2002). Role of Standards in Different Areas. *Standards for Technological Literacy: The Role of Teacher Education, 51<sup>st</sup> Yearbook* (Chapter 2), Council on Technology Teacher Education.

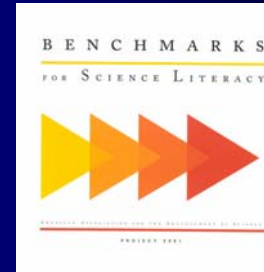
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<b>Standard F: Comprises the science in personal and social perspectives standard domain</b>	<ul style="list-style-type: none"> <li>•Personal health</li> <li>•Characteristics and changes in populations</li> <li>•Types of resources</li> <li>•Changes in environments</li> <li>•Science and technology in local challenges</li> </ul>	<ul style="list-style-type: none"> <li>•Personal health</li> <li>•Populations, resources, and environments</li> <li>•Natural hazards</li> <li>•Risks and benefits</li> <li>•Science and technology in society</li> </ul>	<ul style="list-style-type: none"> <li>•Personal and community health</li> <li>•Population growth</li> <li>•Natural resources</li> <li>•Environmental quality</li> <li>•Natural and human-induced hazards</li> <li>•Science and technology in local, national, and global challenges</li> </ul>

Adapted from Newberry, P. and Hallenbeck, L. (2002). Role of Standards in Different Areas. *Standards for Technological Literacy: The Role of Teacher Education, 51<sup>st</sup> Yearbook* (Chapter 2), Council on Technology Teacher Education.

# *Benchmarks for Science Literacy (AAAS, 1993)*

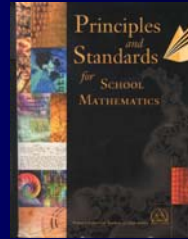


- Technological literacy is covered in:
  - Chapter 3 – The Nature of Technology
  - Chapter 8 – The Designed World
  - Chapter 10 – Historical Perspectives
  - Chapter 11 – Common Themes

“The task ahead is to build technology education into the curriculum...so that all students become well informed about the nature, powers, and limitations of technology.”

(AAAS, 1993, p. 42)

# Principles and Standards for School Mathematics (NCTM, 2000)



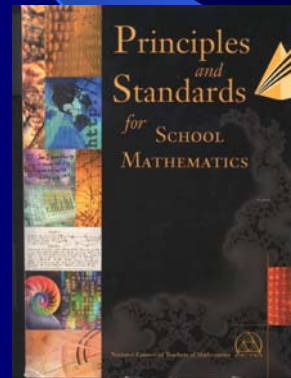
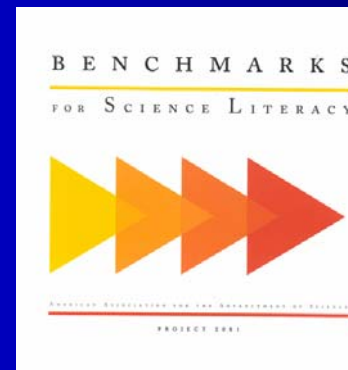
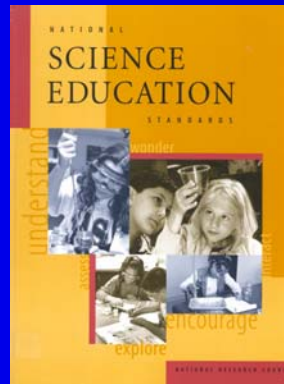
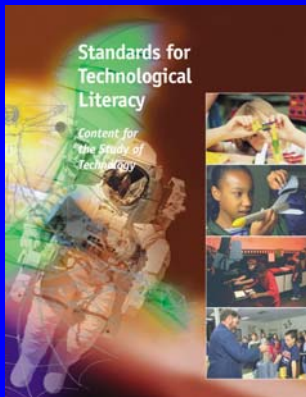
- Technological literacy is presented in:

Mathematical Content Standard	Instructional Program - PreK-12
Algebra	Understand patterns, relations, and functions
Geometry	Use visualization, spatial reasoning, and geometric modeling to solve problems.
Measurement	Understand measurable attributes of objects and the units, systems, and processes of measurement
Problem Solving	Solve problems that arise in mathematics and in other contexts

Adapted from Newberry, P. and Hallenbeck, L. (2002). Role of Standards in Different Areas. *Standards for Technological Literacy: The Role of Teacher Education, 51<sup>st</sup> Yearbook* (Chapter 2), Council on Technology Teacher Education.

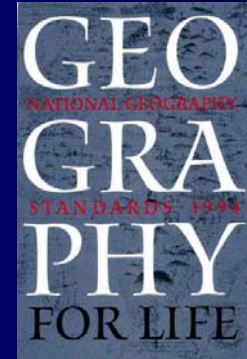
# A Common Theme

Exists across these standards:



## Systems Thinking

# *Geography for Life* (GESP, 1994)



- Technology is covered in:
  - Standard 10 – Human Systems (9-12)
  - Standard 16 – The Changes that Occur in the Meaning, Use, Distribution, and Importance of Resources

# *National Standards for History (1996)*



- Technological literacy is presented in:
  - Grade Cluster K-4
    - Topic 4 – The History of Peoples of Many Cultures Around the World
    - Standard 8 – Major Discoveries in Science and Technology, Their Social and Economic Effects, and the Scientists and Inventors Responsible for Them
  - Grade Cluster 5-12
    - Era 1 – The Beginnings of Human Society
    - Standard 1 – The Biological and Cultural Processes that Gave Rise to the Earliest Human Communities
    - Standard 2 – The Processes that Led to the Emergence of Agricultural Societies Around the World.

# *Standards for the English Language Arts (1996)*



- The concept of technology is covered in the areas of information and communication as multi-media relates to the delivery and presentation of ideas.

# National Educational Technology Standards (NETS)

- Produced by International Society for Technology in Education (ISTE)



# *Technically Speaking: Why All Americans Need to Know More About Technology*



# Further support for the study of technology can be found in the results of the ITEA Gallup Poll in the question:

Using a broad definition of technology as “modifying our natural world to meet human needs,” do you believe the study of technology should or should not be included in the school curriculum (in the United States)?

Choice	% Selecting
	2001
Yes, should be included.	97
No, should not be included.	3
Don't know/refused.	--

# How Can You Incorporate Technological Literacy in Your State?

- Become familiar with *Standards for Technological Literacy: Content for the Study of Technology* and *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards*
- Get to know the person in your state who is responsible for the study of technology
- Learn about other states that have included technological literacy in their mathematics and science curriculum
- Incorporate technological literacy in your state standards-based programs, curricula, and assessments.

“The health of the U.S. economy...will depend not only on [science, math, and engineering] professionals but also on a populace that can effectively assimilate a wide range of new tools and technologies.”

(U.S. Commission on National Security/21<sup>st</sup> Century, 2001, p. 39)

We are a nation increasingly dependent on technology. Yet, in spite of this dependence, U.S. society is largely ignorant of the history and fundamental nature of the technology that sustains it. The result is a public that is disengaged from the decisions that are helping shape its technological future. In a country founded on democratic principles, this is a dangerous situation.

William A. Wulf,  
President  
National Academy of Engineering



# Summary

## Thank You!

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