Why is teaching technological literacy important for our students?

A central role of an educational institution is to offer a curriculum that gives its students a basic understanding of the society in which they live. While our society is certainly both democratic and technological, not enough emphasis is placed on the technology and engineering components through school curriculums. People are losing touch with a fundamental aspect of society due to the fact that educational institutions impart so little understanding of our technological base.

We risk underestimating the importance of the assessment of technological change or assuming that it is an entirely a scientific process. With our current zeal to improve schools, now is the time to examine how technology should be taught.

What should students know and be able to do to be technologically literate?

An NSF/NASA-funded standards project was used to identify what students should know and be able to do to become technologically literate. The resulting publication, Standards for Technological Literacy: Content for the Study of Technology was created by ITEEA’s Technology for All Americans Project and passed a formal review by the National Academy of Engineering, the National Research Council, and the technology teaching community.

The standards identify content related to the nature of technology, technology and society, design, abilities for a technological world, and the designed world. Knowledge has been identified for grade levels K-2, 3-5, 6-8, and 9-12. Content is integrated into thematic units at the elementary levels, while course titles at the middle and high school levels may include Exploring Technology, Innovation and Engineering Design, Technological Systems, Engineering Design Fundamentals, and more. The standards also address medical, agricultural and related bio-technologies, energy and power, information and communication, transportation, manufacturing, and construction topics.

Are technology and engineering being taught in our schools?

Elementary teachers teach about technology and engineering through integrated activities that are a part of their daily curriculum. One example would be a design activity to plan and build a community. Such an activity would integrate the subjects of technology, social studies, math, science, and language arts with the opportunity to create a hands-on community-planning experience. The culminating experience is the building of a student-planned city with consideration for transportation, communication, environmental, and construction systems.

There are an estimated 30,000 U.S. public school secondary technology/engineering teachers, with each state having its own customized technology program. Technology and engineering are electives in most locations, with a few states such as New York and Maryland having requirements for high school graduation. Technology and engineering teaching do not enjoy the same educational funding, support, or time in the school schedule as the other core subjects. However, the current science, technology, engineering, math (STEM) funding holds much promise for supporting technology and engineering programs.

Technology and engineering are often a required courses at the middle school, with courses such as Exploring Technology, Introduction to Technology, and Invention and Innovation. More detailed courses are offered as electives at the high school level with titles such as Manufacturing or Communication. With the release of Standards for Technological Literacy: Content for the Study of Technolgy, courses such as Technological Systems, Innovation and Engineering Design, and Technology Assessment will be available as course offerings.
Technology and engineering teaching has evolved as technology has advanced. During the industrial era of the 20th century, it was taught in the schools as industrial arts, reflecting the industrial society. As advancements have catapulted us into a faster moving, more highly sophisticated technological society, technology and engineering education has made content adjustments that reflect these changes. Generally, the public is unaware of these changes in curriculum and content, and therefore, the field must contend with a lack of support despite major strides to advance the subject matter.

What are the origins of teaching technology and engineering?

In a word, it is about INNOVATION! It is about how people think! It is how to apply technology and engineering in the solutions of problems facing society. The aim is to solve problems and create opportunities within a realistic context. That context can start with the student’s everyday environment and progressively move into more global issues.

Examples of technology and engineering problems and learning situations could be the cleaning of a stream that has become polluted, the creation and fabrication of an invention to solve a household problem, or designing and building of a habitat for a unique situation. The thinking process is closely related to that of an engineering, hi-tech worker, designer, or an architect.

What do students learn in technology and engineering classes?

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Students use their ingenuity with tools, materials, processes, and resources to create solutions and opportunities for themselves and others. The nature of learning goes from the very early years of just “knowing” to more developed applications that relate to the medical, agricultural, energy and power, information and communication, transportation, manufacturing, and construction technologies. It is a new and dynamic subject in our schools that is as fast-moving and as up-to-date as the thinking of technology in our society! It is workforce thinking!

What does a technology and engineering facility look like?

Classroom-laboratories can be found in most secondary public schools. These facilities usually have a research and design area in the planning stages of invention, innovation, and construction. Facilities have a fabrication space, where students can construct, build, or complete manipulative activities that relate to their work. Selected facilities have testing and experimentation areas. It is not uncommon for technology laboratories to have “clean rooms” as well as fabrication areas. Such facilities are mistaken for technical education areas due to the equipment often used in activities. Finally, many facilities have specific learning stations that allow individual studies on technical topics such as rocketry, telecommunications, computer numerical control, and more. Facilities vary depending upon the content emphasis of each program.

How are technology and engineering teachers prepared and licensed?

Technology and engineering teachers receive the same university education and teacher licensure as teachers of other core subjects. They often have a specialized background in design, engineering, and technical areas as well.

What is the real challenge pertaining to technology and engineering teaching?

The challenge is not whether technology and engineering should be offered or how it should be taught. The real challenge is how it will be possible for a country to maintain a competitive technological advantage if it continues to ignore teaching about technology and innovation. To maintain its superiority as a technological leader, a country must teach and emphasize the study of technology beyond its use as a delivery system for other subjects.

As technology and engineering play an increasingly important role in our society and affects our everyday existence, our ability to understand, use, and manage it in our daily lives requires that it become a significantly supported educational initiative, rather than one ignored by legislation. Fortunately, the groundwork has been completed with help from our nation’s most prestigious science and technology agencies. The important step in progress is the realization that our technological superiority and influence as a nation will not continue unless our populace is educated to take advantage of the opportunities that now exist.

What effect does teaching technological literacy have on our workforce and society?

A major consequence of accelerating technological change is a difference in levels of technological ability and understanding. The workforce of the future must have the ability to use, manage, and understand technology. Indeed, technological literacy is vital to individual, community, and national economic prosperity. Beyond economic vitality is the realization that how people develop and apply technology has become critical to future generations, society, and even the Earth’s continued ability to sustain life.

What can policy/decision makers do to advance technology and engineering teaching?

Past funding for technology as a part of science, mathematics, and technology education has existed only when used as a delivery system for the other two STEM subjects. Technology and engineering as a knowledge base or as a way of teaching innovation where students are involved with tools, materials, processes, and resources to create solutions and opportunities has been omitted. The Department of Education has undervalued the thinking and content applications of technology unless it has been tied into the delivery system for other subjects as in educational or instructional technology.

The science and technology agencies have supplied funding to nurture this content area. At the same time, our society has become characterized as being very technologically oriented. However, legislation to support the thinking processes involved with and utilized in the creation of technology and innovation has been nonexistent.

We urge the inclusion of technology and engineering in STEM education legislation as a subject area with a knowledge base as used by engineers, hi-tech workers, designers, and architects rather than just a delivery system for other subjects. Further, that technology and engineering teachers be given the same opportunities as their peers in concept-based instruction and assistance with investigating the ideal scope, sequence, and curriculum content in our country.

This means requiring meaningful professional development for technology and engineering teachers through rigorous summer institutes that will further their teaching skills. Also, instituting tax credits for beginning technology and engineering teachers with strong content preparation and tax incentives to businesses that provide assistance to local schools to help with science, technology, engineering, and mathematics (STEM) teacher enhancement.