Technology for All Americans: a rationale and structure for the study of technology – executive summary

RESEARCH

Wiliam E. Dugger

Director, Technology for All Americans Project

Many national associations and agencies, including the International Technology Education Association (ITEA), have recently called for technology education. As envisioned by all of these groups, technology education is a dynamic problem-solving and design-based programme that enables students to gain experience with a wide variety of technological devices and processes.

What does every student need to know about and do with technology? How should the articulated programme in technology from kindergarten through 12th grade be organised? Is there a structure for teaching technology that can withstand the accelerating changes in our technological environment? These issues were the driving force behind the development of the Technology for All Americans Project, which has been working on developing a rationale and structure to assist states and local communities who have struggled with the content for the study of technology.

The ITEA's Technology for All Americans Project was funded by the National Science Foundation and the National Aeronautics and Space Administration to answer those critical issues for technology education. The Project developed a document targeted for technology educators, policy makers and all those concerned with our national level of technological literacy, entitled *Technology for All Americans: A Rationale and Structure for the Study of Technology.*

The Project utilised a National Commission for Technology Education, as well as a group of experts who were consulted to provide help and advice on the content of the document. After undergoing an extensive review process, the final product provides a new vision for the study of technology.

There are a number of definitions for the concept of technology. The concept is complex and used in a variety of different contexts, nonetheless, a working definition was necessary to convey the desired meaning of technology. After extensive discussion and review, the Project adopted the following definition that guided the development of the rationale and structure.

Technology is human innovation in action. This involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities.

This document discusses the power and promises of technology and the need for universal technological literacy. Seven universals for the study of technology are presented. The document also describes how technology should be integrated into the core of the curriculum from kindergarten through to high school and beyond. Finally, a challenge is made to all concerned to take action to establish technology education standards and make technological literacy a national priority.

The power and promise of technology

Technology is a fundamental aspect of human activity. The acceleration of technological change is a constant in everyone's life today. The power and the promise of technology is based on the need for technological literacy – the ability to use, manage and understand technology. Technological literacy is considered to be critical to the success of individuals, entire societies and to the Earth's ecological balance. The promise of the future lies not in technology alone, but in people's ability to use, manage and understand technology.

Technological literacy – the ability to use, manage and understand technology.

A structure for the study of technology

Agreement on the need for technological literacy is just the beginning. The more difficult problem is determining how to develop this literacy. What experiences, abilities and knowledge are needed? What exactly should a person know about and be able to do with technology? What should be the content of this literacy effort?

The specific answers change with a person's locations, as well as individual aspirations, careers and capabilities. In addition, the answers change rapidly with time.

The structure developed for the study of technology focuses on *universals* of

technology that are considered to be significant and timeless, even in an era dominated by uncertainties and accelerated change. As the definition indicates, there is a knowledge and process base for technology that is quantifiable and universal. The technological knowledge includes the nature and evolution of technology, contextual relationships and technological concepts and principles.

The process is those actions people undertake to create, invent, design, transform, produce, make, control, maintain and use systems. The process includes the human activities of designing and developing technological systems; utilising technological systems; and assessing the impacts and consequences of technological systems. Both the knowledge and process are critical to the existence and advancement of technology. One cannot exist without the other, for they are mutually dependent. With technological knowledge people engage in the process, yet it is through the process that technological knowledge is developed.

People develop technological knowledge and processes in order to develop and use systems that solve problems and extend their capabilities. Invariably this involves physical, biological or informational systems that manipulate the natural world. In other words, people develop technological processes and knowledge within the context of adaptive systems, which are the means that people use to modify nature.

Knowledge, processes and adaptive systems, then, have been identified in this document as the universals of technology and are considered the foundation of the structure for the study of technology. Each of the universals is discussed in detail within the document.

Teaching technology

School systems across the country must establish effective technological literacy efforts, beginning in kindergarten and continuing each year through high school. By using the structure outlined in the document, communities can incorporate the necessary concepts and experiences so all students have the opportunity to develop the

necessary knowledge and abilities. By incorporating the universals of technology through the curriculum and in technology courses, schools can provide experiences that instil insight and problem-solving capabilities. Technology should be a required subject for every student at every level. This vision necessitates curriculum development, teacher enhancement and, in some cases, restructuring building space. However, it is an effort that will reap rewards for every community in the country. The study of technology during the elementary school years, middle school years, high school years and beyond should become a national priority.

Taking action

To help achieve technological literacy at a national level, standards for technology education should be developed based on the universals and structure described in this document.

The ITEA and the Technology for All Americans project provide the support, knowledge-base and opportunity for groups, agencies and associations to become involved in the promotion of technology education as an essential core subject in our nation's schools.

For more information on *Technology for All Americans: A Rationale and Structure for the Study of Technology*, contact:
Technology for All Americans Project, 1997 S. Main Street, Suite 701, Blacksburg, VA 24061-0353.
Tel: (540) 953-0203.
Fax: (540) 953-0014.
E-mail: tfaap@swva.net