Guest Article

A United Vision: Technology for All Americans

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Over one hundred years ago, the departmentalization by institutions of higher education validated the movement to make language arts, mathematics, science, foreign language, and history essential components of our schooling. Throughout the twentieth century, these core subjects have endured to become situated at the center of our current educational paradigm.

A century later, in the current context of educational reform, parents, students, and educators are questioning what students should be expected to know and be able to do by the end of their formal instruction. In addition, the call for technological literacy continues to grow stronger each year. Employers, policy makers, and educational leaders are starting to agree that all citizens need to be technologically literate in order to succeed in today's world. What should be essential education for all pupils regardless of their socio-economic background, gender, or heritage? What should be taught? At what step between a technological novice and expert do we want students to exit formal instruction? How will this degree of technological knowledge be achieved at a national level? Are the core subjects of one hundred years ago still appropriate today? These questions and many more led to the development and implementation of the *Technology for All Americans* project.

Technology as a Core Subject

Those concerned with technological literacy have proposed that the best way to achieve technological knowledge and abilities at a national level is through our schools (National Commission on Excellence in Education, 1983; National Research Council, 1996). It is only through an articulated technology program of study that every child will be empowered with the needed technological knowledge and abilities to become confident problem-solvers, who are able to view issues from different perspectives and in relation to a number of different contexts. Proponents of technological education envision more than an area of study that trains students to use computers. They envision an articulated, hands-on, program that enables students to gain the needed knowledge and experience working with a wide spectrum of technological devices and processes. Such programs can help students "begin to think differently about all their school subjects as they put knowledge from several

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fields to work in an attempt to solve practical problems" (Raizen, et. al., 1995, p. 53).

Technology as a core subject in our public school curriculum is a relatively new concept. While references to technology as a subject matter for schools can be found in the theme of the first conference of the American Industrial Arts Association in 1947 entitled "A Curriculum to Reflect Technology," only in the past decade has technology education gained national consideration. Because of its newness as a field of study, technology is often misunderstood and technology education is often confused with other areas of study such as educational technology (i.e., the use of hardware and software to facilitate learning). In its simplest terms, technology can best be described by the following set of generally accepted characteristics identified by Johnson, Foster and Satchwell (1989, p. 12):

- Technology is applied human knowledge. It is more than applied science.
- Technology is application based. It is a combination of knowing, thinking, and doing.
- Technology extends human capability. It enables humans to adapt to and change the physical world around them.
- Technology exists in social domains as well as physical domains. There are both "hard" technologies (e.g., tools, equipment, etc.) and "soft" technologies (e.g., management systems, software, Internet, etc.).

Technology draws its domain along the dynamic continuum that starts with human wants and needs and ends in the satisfaction of those wants and needs. It includes such human capability as designing, inventing, innovating, practical-problem solving, producing, communicating, and transporting. Technology influences our society and culture by changing our lives and our environment. Since education is an important component of our culture, the study of technology must be an essential part of our educational core or basic subject requirements in grades K-12 and beyond. As a core subject, technology education strives to help students understand, use, and evaluate the effects of current and emerging technological devices and activities. Technology education can provide a continuum of educational benefits to all students, from awareness to competence.

The Importance of a United Vision for an Emerging Field of Study

The National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) are funding an effort to develop a national rationale and structure for technology education. The effort is spearheaded by the International Technology Education Association (ITEA) and is entitled "Technology for All Americans." The ultimate goal is to offer those who are interested in technology education as an essential core subject a clear vision for what it means to be technologically prepared, how this preparation can be achieved at a national level, and why it is important for our nation.

The Technology for All Americans Project set out to achieve this goal by establishing a National Commission to serve in an advisory capacity to the project staff. The 21-member Commission functions independently of both the project and ITEA. The Commission is composed of persons who are especially

aware of the need for a technologically literate society. Members represent the fields of engineering, science, mathematics, the humanities, education, government, professional associations, and industry. They serve as a vital resource of experts who are knowledgeable in technology and its interface with science, mathematics, engineering, and education.

A six member writing team was formed from the National Commission. The writing team represents a wealth of knowledge, extensive background, and a unique diversity that has played an important role in the development of the Project's final product entitled *Technology for All Americans: A Rationale and Structure for the Study of Technology* (TAA:RSST).

Toward a United Vision

Draft document development. The individual strengths and diversity of the writing team came into play from the beginning of its first meeting. This meeting resulted in a number of working papers ranging from a public commentary explaining the importance of technology education and its role as an essential core subject to an intellectual discourse on the meaning and structure of technology as an academic discipline.

The single draft document entitled *A Rationale and Structure for Technology Education* emerged from the visionary thinking of the working papers. The review of this draft document was the focus for the National Commission at its second meeting in Dearborn, Michigan on June 23-25, 1995. Many revisions were offered and incorporated into the TAA:RSST document that represented the best current thinking on the content, methods, and benefits of studying technology.

The Consensus Process. Consensus has been defined in a number of different ways. Most definitions indicate that some form of majority agreement is necessary in order to declare consensus. The draft document went through a dynamic process as a result of a very structured consensus process. It underwent the scrutiny of over 500 reviewers inside and outside the profession of technology education. During the initial review process, which took place during the month of August, 1995, the draft document was mailed to 150 professionals. These professionals were selected via a nomination process. Each state supervisor for technology education and president of state associations for technology education were asked to nominate mathematics, science, and technology educators from elementary through high school levels to participate in a series of consensus building workshops. These workshops were hosted by the following NASA field centers: Ames Research Center, Goddard Space Flight Center, Jet Propulsion Laboratory, Johnson Space Center, Langley Research Center, Lewis Research Center, and Kennedy Space Center.

The draft document was disseminated to the participants prior to the consensus building workshop. They were asked to review the draft document and respond to several prepared questions, as well as provide comments directly on their copy of the draft. At the workshops, participants were divided into heterogeneous groups that represented the interest groups of those involved (i.e., elementary school, middle school, high school, mathematics, science,

technology). These small groups were then asked to respond to prepared questions as a group and come to consensus on the content of the draft document.

Generating input and reactions from the field was very valuable during the consensus process. Perspectives were shared that had not been discussed in prior writing team meetings. Ideas for improving the draft document were generated from the group synergism, and regional philosophies or viewpoints were acknowledged.

This input was analyzed to determine the needed changes for its content. Changes were made to reflect the data from the summer workshops. In addition, these changes were "tried out" with groups throughout the fall of 1995 at the state and regional conferences indicated in Table 1. The project staff found that by focusing on "hot buttons" identified from the summer review process, changes made in subsequent versions of the draft document were well received and the hot buttons cooled off.

Table 1.
Consensus Building Workshops Conducted by the Technology for All Americans Project

Workshop Name	Location
The Southeast Technology Education Conference	Atlanta, Georgia
The Learning Institute for Technology Education	Lansing, Michigan
New England Technology Educators Conference	Farmington, Connecticut
Pennsylvania Annual Technology Education Conference	Camp Hill, Pennsylvania
Rocky Mountain-Colorado Technology Education Conference	Denver, Colorado
Mississippi Valley Industrial Teacher Education Conference	Chicago, Illinois
TSC Professional In-Service Conference	Trenton, New Jersey
American Vocational Association	Denver, Colorado
Technology Education Association of Massachusetts	Worcester, Massachusetts

Changes and revisions go hand-in-hand with the consensus process. This process continued throughout the fall until a second version of the draft document was disseminated for review in early November, 1995. This draft of the document was disseminated to over 250 people who were identified as having an interest in technology education as a core subject in our schools. This group contained a large number of administrators. It was felt that an important part of the consensus process includes a "buy-in" component. In other words, if technology education is to become a core subject in our schools, then those who

hold the power to enable this vision to become real must be involved in the front end of this process.

Additional efforts were made to expand the audience that reviewed this document by making it available to anyone having access to the Internet. Throughout this project, a World Wide Web home page has been maintained in an effort to disseminate timely material generated by the project. Access to the draft document became part of our home page in December, 1995, and reviewers were invited to fill out a comment and review form on-line and submit it to the project for consideration prior to the final revision.

The final version of the document will represent the broad support and input that was provided throughout this consensus process. Mino (1995, p.4) clearly characterizes the consensus process when he states that, "Consensus building should be a time for discussion and debate among the concerned members of our [technology education] profession. But after all is said and done those who are impeding progress toward the real goal of technological literacy for all students need to lay aside their objections and endorse the most significant effort ever undertaken by our profession."

Reflections

The consensus building process is not unique to technology education. However, it provided the needed opportunities for the profession to reflect on its past, discuss its status, and guide its future. Each person concerned with technology education and its role as an essential core subject in our future educational paradigm had the opportunity to speak up and be heard. This process provided the needed time to reflect on technology education and many of the workshop participants agreed that it was a worthwhile process.

Many critical issues have surfaced during this process that go beyond the scope of this project. These issues are important and should provide guidance for research projects for many years to come. The following are just of a few of the questions and issues that will need to be addressed:

- How will *Technology for All Americans: A Rationale and Structure for the Study of Technology* be received in the field? The project has spent a great deal of time gaining consensus on the document's contents so that it is well received. What about the future?

- Does the document provide the needed guidance and direction? Will the document be useful for those making an effort to establish technology education as a core subject?

- Will there be the needed "buy-in" to establish a new core subject? It is too early to predict the impact that this document and the project's efforts will have. An important question for our future is how well this effort succeeded in positioning technology education as an essential part of every child's education—time will tell.

- What political processes are needed to ensure that technology education can be positioned as a core subject in the schools of tomorrow? Who will guide this effort? Will it come from the top down, or will this endeavor be guided by those in the field who are beginning to provide a united vision for technology education?

- What technological knowledge and abilities should students exist with? Many paradigms have been offered (Bensen, 1995; Dreyfuss & Dreyfuss, 1986; Dyrenfurth, 1991; Savage & Sterry, 1990; Snyder & Hales, 1981); however, this question has not been put to rest. It will be addressed in the second phase of this project, which seeks to establish standards for technology education.

The Technology Education Standards

Another important issue considered central to this project relates to educational standards. The second phase of this project, when funded, will attempt to establish standards for what every child should know and be able to do related to technology. This issue is considered paramount in the process of establishing technology education as a core subject in our schools.

These technology education standards will also provide criteria for assessing curriculum content in technology education, teaching, and evaluation, which can then provide opportunities for all students to learn technology in ways that are more consistent and coordinated across all levels of the education system.

The use of standards to improve the quality of technology education will have a positive impact on the student, school, community, and nation. The students should be the first to benefit through enhancement of technological content, instructional program, teaching methods, the physical environment of technology education laboratories, and the preparation and quality of teachers providing instruction for the field. Teachers will be able to assess their curriculum programs against a set of nationally developed and validated standards. After the assessment is made, curriculum and program strengths should be enhanced.

The school system should also benefit from having technology education standards. The technology education standards should mandate that effective, open communication be established with all elements in the school system, especially those in technology, science, and mathematics, and be used consistently by technology education faculty and staff. An additional benefit that the technology education standards will provide is that non-technology educators, students, and parents will be informed about the technology education programs, thereby generating opportunities for support, guidance, and interdisciplinary educational activities.

Summary

In the fall of 1995, during the first phase of the Technology for All Americans Project, a draft document entitled *Technology for All Americans: A Rationale and Structure for the Study of Technology* emerged from much debate and review by the writing team, project staff, and hundreds of people who are concerned about technology education and its role in our nation's schools. The project staff conducted several consensus building activities at national, regional, and state technology education meetings throughout the United States in an attempt to provide an avenue for individuals to review and comment on this important document.

The results of this consensus process have been positive; however, the results have also been challenging. This challenge has provided the much needed opportunity for reflection about our profession, as well as an opportunity to direct our destiny.

Today, there are very diverse offerings in the technology education profession ranging from basic programs reflective of the early manual arts to state-of-the-art technology education programs that reflect technology-based curriculum activities. It is hoped that this project will provide a means for improving the quantity and quality of technology education programs. Technology education has a bright future as an essential core subject in our schools.

As is true with the end of other millennia, the end of this millennium promises to close having sparked many changes in our society. One of those changes felt certain to evolve is that the core subjects in our schools will be amended. The core subjects of one hundred years ago are no longer enough to adequately produce technologically prepared citizens in our changing world of today.

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