SPECIAL SECTION

An Organizational Change Process–Part 2: The Mississippi Valley Industrial Teacher Education Conference's (MVITEC) Structured Approach

Editor's Note

That change is underway is evidenced by the fact that of the organization changed its name during the proceedings reported here. The word "industrial" was replaced by "technology" in the conference name. To benefit from as complete a record of the change process as possible, readers should review the Special Section on this topic that appeared in the previous issue, Volume XXII, Number 2, Summer/Fall 1996 of The Journal of Technology Studies. *Then...read on. In the midst of the change process, the conference elected a new chair to replace retiring David Bjorkquist. Editorially, it seemed a perfect opportunity to invite the new chair, Thomas L. Erekson, to introduce the special section by way of supplying the conference chair's unique perspectives and to ensure that there would be no gaps and voids in describing the change process. Note also that Erekson expediently uses the terms the "Conference" or "Mississippi Valley Conference" rather than the organization's full official name.* **JS**

Thomas L. Erekson

Overview of the Change Process

Some may question the benefits of documenting the organizational change process of the Mississippi Valley Conference in this ensus on the mission and direction of the Conference. The notion that the challenge was urgent was influenced by concerns that without a clear sense of mission and direction, it would be very difficult to sustain the Conference in the future. Thus, the focus of the 83rd Conference's first day was on presentations and discussions on the future of the professions served by the Conference and how that future would affect the direction and mission of the Conference.

The Mississippi Valley Conference is often viewed as an organization whose members resist change. Evidence of the resistance to change is seen in the attempts by David Bjorkquist when he was chair to develop statements of mission and direction for the Conference. At the 1993 Conference, he appointed a committee to develop a vision statement, a mission statement, and goals for the Conference. The committee was chaired by C. Dale Lemons, Pittsburg State University, and the report was presented at the 1994 Conference in Nashville, Tennessee (Lemons, Coffman, Rider, Simich, Smith, & Zuga, 1994). After extensive discussion, the committee's recommendations were not approved. This is why Bjorkquist focused the 1995 Conference solely on establishing a mission and direction for the Conference.

The material for this case is garnered from the process that Bjorkquist, who had served as Conference chair from 1991 to 1995, began during the 82nd Conference. The first day of that meeting included presentations on prerequesite material for the members to consider upon entering into change considerations and to clarify and/or develop a vision and mission statement for the Conference. Serving as strategic planning facilitators for the second day's meeting, Betty Rider, Anthony Schwaller, and Michael Wright introduced and guided a process that resulted in draft vision and mission statements, thus leaving a challenge for the new chair to develop a program for the 83rd Conference that would lead to a consensus on the mission and direction of the Conference. The notion that the challenge was urgent was influenced by concerns that without a clear sense of mission and direction, it would be very difficult to sustain the Conference in the future. Thus, the focus of the 83rd Conference's first day was on presentations and discussions on the future of the professions served by the Conference and how that future would affect the direction and mission of the Conference.

Development of a Mission Statement

In preparing to establish a mission statement and direction for an organization, it is important to review, or scan, the environment in which the organization operates. In the case of the Mississippi Valley Conference, the environmental scan included a review of related professional organizations. Thus, at the 82nd Conference, presentations were made regarding purposes of the Council on Technology Teacher Education (CTTE), International Technology Education Association (ITEA), National Association of Industrial and Technical Teacher Educators (NAITTE), National Association of Industrial Technology (NAIT), and Technol-

Dr. Erekson was elected chair at the November 1995 meeting of the Mississippi Valley Industrial Teacher Education Conference (now the Mississippi Valley Technology Teacher Education Conference) and assumed his duties immediately. He is also Dean of the College of Technology at Bowling Green State University, Ohio and a Laureate member of Alpha Gamma Chapter.

ogy Education Division of The American Vocational Association (AVA). Additional presentations were made about the historical nature of the Conference and the job responsibilities of the members of the Conference.

The strategic planning facilitators, Rider, Schwaller, and Wright, involved members and guests in small-group brainstorming sessions to develop and refine a vision statement and a mission statement for the Conference. In this process the Conference's tradition of not allowing guests to participate in the discussions was ignored. This was viewed as a positive step in the strategic planning process. At the end of the day, a draft vision statement and a draft mission statement had been developed.

The results of the planning efforts in 1995 included the following draft vision statement:

> The Mississippi Valley Industrial Teacher Education Conference will be the premier leadership forum for technology teachers. (Bjorkquist, 1995)

The draft mission statement developed at the 1995 Conference was:

> The mission of the Mississippi Valley Industrial Teacher Education Conference is to facilitate debate on the critical issues and problems of teaching and research about technology, to develop solutions, and to communicate them to the field and public at large. (Bjorkquist, 1995)

Thus, a major focus of the 83rd Conference was to finalize these draft statements. As noted earlier, the focus of the first day of the 83rd Conference was on the future of the profession and the direction and mission of the Mississippi Valley Conference. The articles that follow include the perspectives presented at the 83rd Conference. The first three articles present perspectives of the future of the profession as viewed through the lens of a university president, a dean, and a faculty member. The "Three Minute Philosophers" provide perspectives of the draft mission and vision statements developed at the 82nd Conference by representative members. These perspectives are then followed by perspectives of change for the Conference and a reaction by the immediate past chair of the Conference.

These represent the presentations related to the change process at the 83rd Conference. The last article of this Special Section, "The Past Instructs the Future," was developed by me after the Conference. The reflections contained therein result directly from my reflections on the change process and articulate information and challenges that may contribute to the preparation of a vision statement by the Conference.

References

Lemons, D., Coffman, S., Rider, B., Simich, J., Smith, D., & Zuga, K. (1994). *Mission of the Mississippi Valley Conference*. Paper presented at the 81st Mississippi Valley Industrial Teacher Education Conference, Nashville, TN.

Bjorkquist, D. C. (1995). *Post conference report, 82nd Conference*. St. Paul, MN: Mississippi Valley Industrial Teacher Education Conference.

A University President's Perspective of the Future of the Profession

M. James Bensen

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Technology education programs have undergone enormous changes in the past two decades and will undergo continual change as we move toward the 21st century. While the dramatic changes have been unfolding across the country, primarily in programs focused on the early adolescent, too many technology teacher education programs have not kept pace. Rather than take the lead in the profession and "push the envelope of change," many have hung back, looked to the past, and lost their relevance. Many programs that took that approach are no longer with us. During a discussion held at this Conference about 15 years ago, Rupert Evans, who was the Conference's chair at the time, made a prediction that less than half of the institutions represented at the table would be around in 10 years. I do not know how accurate Chair Evans' prediction was, but a casual observation reveals that dozens of teacher education programs have been discontinued, downsized, or radically altered at our institutions.

Crisis Time

We are reaching a crisis in the profession. The crisis is one of understanding of what we are all about, a crisis of identity, which leads to a crisis of support. While many secondary programs are struggling and are in danger of

being closed, other programs that are "flying high" and expanding cannot find enough qualified teachers. All this is unraveling at a time when our subject matter, technology, is soaring throughout the world as one of the "hot topics" in our vocabulary, our work, and our lives. The opportunities for expansion of technology-based programs are unlimited in K-12 education, and the potential for our field to explode on the scene has never been better. Yet, too many teacher education programs in technology-based programs "trudge" towards tomorrow as a profession walking in quicksand looking at where our next step will be placed rather than focusing on the horizon and catching the excitement that other sectors in technology are enjoying.

One of the troublesome elements of our profession is that we have ignored, dismissed, and even turned away from one of the major segments in our society, which includes practicing professionals in our field of study. That segment, which has tremendous power, support, and recognition, is the field of engineering. After all these years of co-existing, why is it that we have not established a stronger collaboration with the engineering profession?

It is interesting to note the tremendous pace of development in technology over the past 30 years and the corresponding change in the definition of the term itself. One need only examine definitions of *technology* in *Webster's Dictionary* at each end of that time span to see the obvious differences:

"Technology: The science or study of the practical or industrial arts" (1959).

"Technology: Engineering; also, a manner of accomplishing a task using technological methods of knowledge" (1995).

There was a time back in the 1940s and 1950s when society used the term *science* when describing technical feats. The expression of "scientific breakthrough" was common in our vocabulary during that time. Then, in the 1960s and 1970s the terms *science* and *technology* were often linked together in describing exciting new developments. Now, in the 1980s and 1990s technology is a "stand alone" term! We develop it, buy it, sell it, use it, and it has become a worldwide commodity of value and impact. The presence of technology, or "know-how," has become the sign of well-being in any society that is a leader in the world.

A MAGNIFICENT RATIONALE

Early Proposals

The study of technology, whether under the term of manual training, manual arts, industrial arts, or technology education, has benefited from a powerful rationale. From the early writings of Bonser, Mossman, Richards, and Warner and on to the leaders "pushing the envelope" of leading edge programs today, the study of technology has always been carefully thought out, consistent with the needs of society, and relevant. As Cox (1996) stated, we have done a good job in "redefining our corporate soul!" The problem has usually been one where the rationale exceeded the practice of what was going on in the classrooms and laboratories of the day. In fact, program changes from the 1920s to the 1960s were minimal, and many teacher education programs saw little in the content of their courses change with the exception of new techniques in the specific technologies.

The Time of Innovation

Change, however, burst onto the scene of technology education in the 1960s. Spurred by such major curriculum projects as the American Industry Project (Face & Flug, 1966) and the Industrial Arts Curriculum Project (Towers, Ray, & Lux, 1966), the fuel for program improvement was ignited, and innovations sprang up throughout the United States. The rationales for most of these innovative programs were exceptionally well developed and far exceeded that being accomplished in other curricular areas. The 1960s and 1970s were truly a time of innovation and excitement in the profession.

A FOCUS ON REFINEMENT

Jackson's Mill Curriculum Theory

The period of innovations was just that, with a wide spray of programs being developed, some based on technology, others on industry, and still others around the narrower spectrum of industrial technology. During this time there was a call among the leaders in the profession to seek some consensus and to determine if a more united front could be placed before the educational community. This was accomplished to a certain extent by the Jackson's Mill Project (Snyder & Hales,1981). The Jackson's Mill Project looked at the content area as being both the "study of technology" and the "adaptive system" of technology. This project served as the spur for later developments to drop the term *industrial arts* in favor of that of *technology education*.

Statewide Innovations

With the publication of the Jackson's Mill initiative, program development on the state level flourished across the country. Dozens of

state curriculum guides were published, and workshops were developed to assist teachers in the implementation of the concepts. These state curriculum efforts, put forth in such states as New York, Virginia, Illinois, Indiana, Wisconsin, Minnesota, Texas, and Kansas, brought with them local program improvements and, in many cases, were supported by technology teacher education institutions and professional state technology education associations.

Symposium Series

Technology teacher education institutions were very instrumental at this time in providing leadership to the profession. Led by Professors John Wright and Ronald Jones (1980), then at Eastern Illinois University, *Symposium 80: Technology Education* was hosted at their university. After the initial event, a series of symposiums followed each year with pronouncements and proposals for change and improvement. These symposiums attracted the leaders in the profession and were highly popular with technology teacher educators. During these symposiums, theories were presented, debated, and reviewed while the applications of actual program changes were demonstrated to serve as the "reality check" for the attendees.

Mississippi Valley Industrial Teacher Education Conference

Unique in its composition and structure, the Conference has served the profession well in providing a forum for proposals, discussion, analysis, and debate. Using a format that reminds many of their defense of their doctoral dissertation, the commentary many times becomes highly energized, spirited, and sometimes blunt. The Conference has, however, served as a place to propose ideas, to put them to the test, and to validate them.

NATIONAL AND INTERNATIONAL ASSOCIATIONS

Through the leadership of the International Technology Education Association and the Technology Education Division of the American Vocational Education Association, we have enjoyed the resources that come only through a professional association. We have been fortunate that these organizations have led by example and have been open to embracing excellence.

These organizations have provided us with programs, resource material, leadership, and publications. Key yearbook series, structures and frameworks for curriculum development, software, and research are just a few of the benefits that we enjoy as a result of their existence. Along with the support and enhancement that they bring to the profession, both at the K-12 level and in higher education, we also reap rewards through recognition programs, marketing efforts, and interaction with and direction for those who develop and market the supplies and equipment for our laboratories. The Council of Technology Teacher Education has been particularly instrumental in providing leadership both for the profession and more specifically in teacher education. The publications, programs, and accreditation initiatives in collaboration with NCATE are examples of an outstanding record of excellence.

Likewise, the leadership provided by professional association programs in developing standards for the field, exemplified by the *Technology for All Americans* (1996) project, suggests that great promise will come with the full development of such efforts.

WHAT IS THE PROBLEM?

Tradition, Tradition, Tradition

The problem, as I see it, is that our rationale for most K-12 programs far exceeds our national practice. If our rationale is so well done then why is our practice lagging behind? Why do we have this gap? This gap is not different from what exists in all walks of life. But in the dynamic field of technology, it is obvious when the content and process of our area of study, which is bursting with new developments daily, become out of date. What worked yesterday might have been appropriate for yesterday, but we need to look to tomorrow. Harry Qaudracci, CEO of Quadgraphics, once stated that "change is our bread and butter. We see it as our job security." While change is the security element of Mr. Quadracci, too many people in all walks of life see change as threatening and needing to be avoided at all costs. We need to turn our thinking on this around and loosen our grip on tradition.

The College Prep Curriculum

Another problem that we have encountered is the dash for shoring up the high school education of our youth following the series of reports that began with *A Nation at Risk*. These reports served as a rallying cry to add more courses of the traditional college preparation curriculum to "add rigor" and to ensure quality. This rush to pack the list of course requirements to gain entry to colleges and universities took away most of the electives that students had available to them during the school day and, hence, technology-based programs shrank across the country.

The Two Cultures: Education for Work and Education for Life

At the base of much of the decision making in our schools today is the split in the school curriculum. Students find themselves having to choose whether they are going to prepare to enter higher education or if they are going to seek an education to prepare themselves for work. Counselors, parents, and peers put undue pressure on students to make these choices early in their schooling, and while there should not be an "exclusiveness" or an "either/or" dichotomy, practice usually plays itself out with learners categorized into the two camps.

A SOLUTION OR TWO

Leave the Adjectives Behind

To gain broad support and full responsibility for the teaching of technology in our schools, I would suggest that we drop the term *industrial* as an adjective. We don't do this in science or math, so why should we do this in technology? By using the term *industrial* we are limiting the slice of technology that we choose to focus on, and the rest of the field of technology will someday have to be taken up by other areas of the curriculum if we take this narrow view.

Just as the term *industrial* narrows the spectrum of technology that we teach in our programs that are labeled as such, we have another problem looming ahead with the term *education* attached to it. As we look at the curriculum in our secondary schools, we see that some have the term *education* behind them and others do not. Generally, those with education attached to them are elective in nature and are not as fully accepted as those that do not do so. Only in technology teacher education programs should we use the term *education*, which is parallel to other preservice and advanced credentialing.

Identify with Engineering

The most influential sector of practicing professionals in technology is engineers. Engineers have university programs leading all the way to the doctorate, have accreditation, certification, and other standards of quality, and have instant recognition by all segments in society. Technology educators need to embrace the engineering profession and utilize the power that comes with it to promote the technolgy curriculum and programs and to gain resources to expand them in the schools.

Integration with Other Subjects

There are growing opportunities in education today that come through the integration of education. More and more connections are being sought in the academic enterprise that will more fully mirror the life that people live and work in. This life is an integrated life, a life of unity, a life of broad connections and seamless experiences. Hence, wherever technology programs can be integrated into the study of other subjects, we should be taking the lead in these endeavors.

Education for Employment/School to Work/Lifework Programs

The expanding program efforts to meet the needs of this rapidly changing world and the requirements for employability are bringing on many new partners in the design of education. Technology programs should be front and central to these movements and serve as the core upon which they are built. Shortages of qualified people and the ability to continue to keep good employees is a growing challenge for society. Building upon a broader approach to education and utilizing the study of technology to attract and hold the interest of young learners can be just the ticket for programs of this nature in the future.

Technology Teacher Education Prospects

The future for technology teacher education programs is exceptionally bright. The need for teachers is at an all time high. Programs that are moving ahead with contemporary designs and relevance are at the core of these developments. The challenge will be to recruit and admit enough good people. The charge, once they are admitted, is to give them an education that will provide the profession with leaders who will take us into the next century with the daring and the capabilities to re-invent our future.

References

Bensen, M. J. (1988). The transition from industrial arts to technology education. In R. S. Brandt (Ed.), *The content of the curriculum* (1988 Yearbook). Alexandria, VA: The Association for Supervision and Curriculum Development.

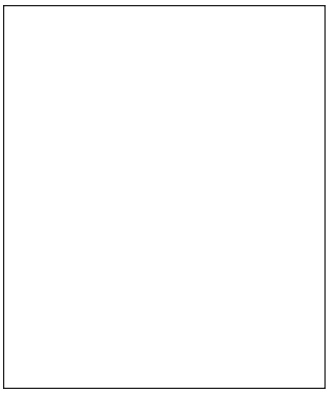
Cox, A. (1996). *Redefining corporate soul: Linking purpose and people.* Chicago: Irwin.

Face, W., & Flug, E. (1966). *The American industry project.* Menomonie, WI: The University of Wisconsin-Stout.

Snyder, J., & Hales, J. A. (1981). *Jackson's Mill industrial arts curriculum theory.* Charleston:

West Virginia Board of Education.
Technology for all Americans: A rationale and structure for the study of technology. (1996). Reston, VA: The International Technology Education Association.
Towers, E. R., Ray, W. E., & Lux, D. P. (1966). *A rationale and structure for industrial arts subject matter.* Columbus: The Ohio State University.
Webster's new American dictionary. (1995). New York: Smithmark.
Webster's new world dictionary of the American language. (1959). New York: The World Publishing Company.
Wright, J., & Jones, R. (1980). *Symposium 80: Technology education.* Charleston: Eastern Illinois University.

A Dean's Perspectives of the Future of the Profession



Donald F. Smith

As we look to the future and attempt to project where higher education may be going in the next century, we may wish to do a brief analysis of what has occurred during the present century. Davis (1995) reported that radical changes occurred near the end of the 19th century that have shaped our higher education and the way it has been delivered in the 20th century. From a liberal arts form of education, four major changes were identified as follows:

> 1. Disciplines and professional fields emerged with disciplinary specializations
> 2. Specialized departments at the institutional level and professional associations at the national level developed
> 3. Graduate education established to produce disciplinary specialists
> 4. Lecture teaching replaced recitation. (p. 16)

Davis (1995) pointed out that this specialized type of higher education has served us well during the 20th century. Much new knowledge was generated and an efficient system of delivery evolved. Academic departments and professional associations became powerful partners in the advancement of their disciplines. But, there are indications that specialization in the disciplines, which can be carried to the point where trivialization results, may not be the best form of higher education for the 21st century. While the knowledge of the disciplines will still be important, much more time and effort will need to be given to analyzing, synthesizing, and applying information. With the overwhelming amount of information available, higher education must focus on what to do with it: how to access, criticize, interpret, and use it.

Anne-Lee Verville, general manager of education and technical computing for IBM, offers several challenges to higher education in order for it to keep pace with the major transformations taking place in business and industry. Organizations have become leaner with managers giving less direction and more decision-making responsibility and accountability to their employees. Teamwork, group problem-solving skills, and the ability to use the power of technology and information to the company's benefit are critically important skills. Even the teams are getting more diverse. Due to the complexity of business today, the team must be composed of technical persons, lawyers, accountants, marketing persons, and other professionals. The teams may include persons from other cultures and countries. Verville (1995) asks if we in higher education are developing these kinds of complex teaming skills in our students.

Students must also enter business and industry with the desire and intellectual tools to continue to build their expertise throughout their entire career. Since the estimated shelf life of a technical degree is only five years, an employee's value to the company diminishes rapidly if he or she does not aggressively pursue constant updating. Verville (1995) suggests that higher education should consider the following competencies for their graduates, which were identified by the Secretary of Labor's Commission on Achieving Necessary Skills:

> RESOURCES—ability to allocate time, money, materials, space, and staff to complete tasks
> INTERPERSONAL SKILLS—ability to work on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds
> INFORMATION—ability to acquire and evaluate data, organize and maintain files, interpret, communicate, and use computers to process information
> SYSTEMS—ability to understand social, organizational, and technological systems, monitor and correct performance, and design or improve systems
> TECHNOLOGY—ability to select equipment and tools, applying technology to specific tasks, and maintain and troubleshoot technologies. (p. 48)

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This background information about higher education in general, where it has been during this century and where some feel it should go in the future, forms the basis for my thoughts on the changes needed in higher education programs in technology, namely, engineering technology, industrial technology, and technology teacher education.

Engineering Technology and Industrial Technology

Many of the right things are being done in industrial and engineering technology. Many of them just need to be done better. Several research projects confirm this position. Zirbel's (1992) recent study surveyed large company managers to determine the competencies needed by entry-level manufacturing engineering technologists. Among the conclusions were:

> . . . must exhibit a strong work ethic in all duties performed, including motivation, natural curiosity, and a sense of responsiveness without close supervision.
> . . . must understand the importance of quality in all duties.
> Oral and written communication skills are extremely important.
> . . . must have the ability to compromise and work in a "team" environment with individuals from other disciplines.
> A basic working knowledge of personal computers will be essential.
> A sound background in the basics of manufacturing will be essential.
> A thorough knowledge of materials will be essential, especially in the areas of metals, plastics and composites.
> . . . will need a greater understanding of the technical language and cultural problems associated with worldwide manufacturing. (p. 7)

Miller's (1996) study of exemplary manufacturing engineering technology programs identified eight characteristics. These characteristics included programs with more technical courses, emphasis on manufacturing processes and methods, faculty with close relationships to industry and professional organizations, good teachers and facilities, adequate financial support from the university, and responsiveness to industry needs. The findings in both of these studies parallel the position taken by Verville (1995) on higher education in general.

Shaw (1996) studied the status of experiential education in industrial technology programs. He found that 88% of the programs responding offer this option and 37% require it. He recommended that the National Association of Industrial Technology (NAIT) accreditation standards be changed to recognize more forms of experiential education. He also recommended that NAIT consider requiring all accredited programs to make it an option. This type of experience is being demanded for higher education in general. For instance, Davis (1995) wrote that "much more of professional education will be field-based, building up skills, concepts, and theories from the actual demands of ever-changing practice" (p. 17). Again, I say we are doing the right thing, but we need to emphasize it more. These experiences need to be provided to more students. We know that coop and internship experiences add a great deal to students' knowledge, experience, and confidence. It also strengthens their resume immeasurably. These positives are too important to not receive our full attention.

For the most part, appropriate amounts of mathematics and science are required in our industrial and engineering technology programs. The NAIT and ABET accreditation requirements have helped assure that this is the case. Many studies, including those cited here, mention the complexities of international business and the need for graduates to be prepared to work in this environment. Foreign language is an area not required by many of our programs. I am not so sure it should be required, but it certainly should be encouraged. It would undoubtedly involve considerable extra effort on the part of those students who elect it, but it would certainly pay dividends in the job market. Japanese, Spanish, and German would seem to be good choices. With more and more companies buying from, selling to, or owned by foreign corporations, the ability to communicate in a foreign language would certainly be an asset.

Technology Teacher Education

First of all, I am an optimist. I believe that technology education will be with us in the future and, thus, technology teacher education will also be with us. I believe, however, that it will be quite different. At least, it should be quite different from many of our traditional teacher education programs of today. Change is all around us, and it is continuing to accelerate. The Technology for All Americans project and the standards that will result from it should give the profession a foundation upon which to build curriculum, teaching methodologies, and public understanding of technology education and its relevance to the education of our youth.

Quotes from the recent Technology for All Americans (1996) publication give clues as to the kind of learning environments our new teachers will be entering in the public schools:

Middle School-

Programs at this level can be implemented through interdisciplinary teams that include a certificated technology education teacher.

Also, students begin to develop the ability to assess the impacts and consequences of these systems on individuals, society, and the environment.

Middle school students continue to be given opportunities to see how technology has contextual relationships with other fields of study, such as science, mathematics, social studies, language arts, the humanities, and society and the environment.

They learn how to apply principles of engineering, architecture, industrial design, and computer science to gain a better understanding of technology. (p. 38)

High School-

Technology education at the high school level . . . develops a richer sense of the relationships between technology and other school subjects. This is especially appropriate with courses in which there is a direct application with technology, such as science and mathematics.

. . . technology education can assist the high school student to learn in an interdisciplinary nature by providing relevance to many school subjects.

The technology program at the high-school level should be taught by certificated technology education teachers, individually or in a team-teaching environment. (p. 40)

This is not necessarily the future, since many of these types of interdisciplinary programs are operating throughout the country today. A review of the International Technology Education Association's 59th annual conference program reveals that at least 11 presentations suggest interdisciplinary programs. This includes three involving science, two with mathematics and science, one with English, one with literature, and one with engineering. The others did not identify the curriculum areas included.

How should our teacher education programs change to prepare new teachers to work best in the environment they may face in the innovative public schools? Some course requirements must change to give these new professionals the tools to function as an equal partner in interdisciplinary settings. This would mean, in many cases, more mathematics and science. A technology teacher with a solid background in mathematics, physics, and chemistry would seem to be a much better team member than one without this background. An appropriate computer science course could also be useful. With the changing makeup of our public schools, a language, particularly Spanish, would be very helpful to many of our new teachers.

How could these course requirements be added? One way would be to take a serious look at what is currently taught in technical courses. Are as many courses needed today as formerly? The answer may be no. For the most part, the high level of manual skill development that we once required is no longer needed. A restructuring of the curriculum might allow some different or additional content and experiences to be included in the curriculum.

Technology students need more experiences with team planning. They can do this with classmates, but maybe they should be doing it across disciplines with teacher education majors from mathematics, science, and social studies. That is what they may face in their first job. Are we talking to the other disciplines at our universities about these issues or are we just talking to ourselves? The other disciplines are probably talking to themselves, too. All of teacher education should benefit from this kind of initiative. Team planning and team teaching are difficult in the best of circumstances, but we need to give our students the best possible experiences in their preservice education if we expect them to be successful in the public schools.

If graduates are going to be involved with interdisciplinary teams, they must also have a thorough understanding of what technology education is and what it can contribute to the learning activity. Wright (1996) discussed the importance of this when he wrote, "With the growing emphasis on integrating learning experiences in mathematics, science, and technology, it is critical that technology enters this three-way marriage as an equal partner and not as an academically deprived entity" (p. 2). This statement offers a challenge to the profession. Our graduates must leave our programs with a knowledge base and a philosophical understanding of technology that they believe in, one that they will be able to utilize in their interdisciplinary teaching without being relegated to a less-than-respectable role. Teachers who have the strong academic background in science, mathematics, and technology are more likely to be strong team members who will be capable of appropriately integrating technology activities into the units being studied.

With the many changes occurring in technology education, it is without question an exciting and challenging time for teacher education. Are we up to this challenge? I think so.

OTHER INFLUENCES AND CHALLENGES

Educational Technology

Electronic media is certainly a fact of life today in higher education. Not only is it a major factor in our professional lives, but it is advancing like a runaway freight train. The

technology is wonderful, but the costs are a terrible worry to administrators. In two recent issues of the *Chronicle of Higher Education* (Haworth, 1996; Wilson, 1996), Internet II is being proposed at a cost of $500 million, which will be 100 to 1000 times faster than the present system. Costs to keep pace with this technology on university campuses will be enormous. However, our faculty must be providing extensive experiences with these technologies in the classroom or we are not giving our students the communications skills they will need in their professions. This challenge applies to all programs in teacher education and technology. Some suggest it will force us into technology leasing arrangements, rather than buying. With obsolescence being shortened to months rather than years in some instances, leasing may be the only way to keep pace.

One positive aspect of information technology is the capability it gives us for distance education. There are many ways it can be used to deliver parts or entire courses off our campuses. A major challenge to faculty and administrators is to maintain quality while delivering distance education courses. Other challenges involve how to deal with laboratory activities. Creative solutions need to be found to these problems. The new arena offered by information technology erases geographical territories. The competition among institutions to provide services is likely to be fierce. The answer may be for institutions and/or departments to carefully select niches in which to enter this market. Few institutions can afford to do it all.

Cost Containment

Most programs in technology are expensive. Space, equipment, supplies, and competitive faculty salaries all contribute to make us comparatively expensive on most university campuses. We must look for creative ways to help support our programs. Grants, equipment leasing, equipment donations and loans, and adjunct faculty are just a few of the methods we may have to rely on more in the future to control costs. Niches may also be a key here. Many of our programs may need to look for unique specialities and/or markets not being served.

Recruitment

Recruitment of women and minorities continues to be a concern for most of our programs. Recruitment in general is a concern. As our programs change, we should be constantly looking at new markets for recruiting. For instance, if technology teacher education began requiring more mathematics and science, and maybe computer science, could we draw majors from these areas. Would students find it more exciting to teach technology rather than math or science? I think there are those who would find it attractive.

THE PERSPECTIVES IN FOCUS

This presentation was prepared under the rubric of perspectives of the future as received through a dean's lens. There are certainly many other changes occurring as we prepare to enter the next century. I have discussed most of those that I have been able to bring into focus through my lens as a university dean. You must keep in mind that I am only an acting dean; thus, I am not as experienced at focusing this lens as I could be!

References

Davis, J. R. (1995). Reengineering teaching for 21st century learning. *Educational Record, 76*(4), 16–22.

Haworth, K. (1996, October 18). Clinton proposes $500 million plan for the internet. *Chronicle for Higher Education*, pp. A–25.

Miller, M. R. (1996). Characteristics of exemplary manufacturing engineering technology programs. *Journal of Engineering Technology*, *13*(1), 8–13.

Rogers, R. L., & Sternkoski, M. J. (1995). Reality-based learning and interdisciplinary teams: An interactive approach. *Journal of Engineering Technology*, *12*(2), 44–48.

Shaw, R. (1995). The status of experiential education/learning in industrial technology. *Journal of Industrial Technology*, *11*(2), 3–6.

Technology for all Americans: A rationale and structure for the study of technology. (1996). Reston, VA: International Technology Education Association.

Verville, A. (1995). What business needs from higher education. *Educational Record, 76*(4), 46–50.

Wilson, D. L. (1996, October 25). Clinton's new internet proposal could involve half a dozen agencies. *Chronicle of Higher Education*, pp. A–29.

Wright, T. (1996). Technology: An intellectual discipline. *The Technology Teacher, 56*(2), 2–3.

Zirbel, J. (1992). Manufacturing engineering technology: What employers want. *Journal of Engineering Technology*, *9*(1), 5–8.

The Future of Technology Teacher Education: A Faculty Vision

Michael K. Daugherty

In a truly rational society, the best of us would be teachers, and the rest would have to settle for something less. (Lee Iacocca)

The field of technology education has gone through considerable introspection and revision in the past 20 years. During this time, technology educators have instituted changes in curricula, program requirements, and facilities (Volk, 1993). Also, during this period the philosophy, curricula, and methodologies that guide the field may have changed more dramatically than in the preceding 100 years (Daugherty & Boser, 1993).

Our profession has undergone a dramatic transformation from a field dedicated exclusively to the preparation of teachers 20 years ago to a field whose graduates are increasingly prepared to enter nonteaching professions. Scott and Buffer (1995) noted that:

> Historically, the principle reason for undergraduate programs in technology education has been to prepare or contribute towards the preparation of teachers. Yet, a cursory examination of the professional and technical categories listed in the 1993-1994 Industrial Teacher Education Directory (Dennis, 1993) suggests that faculty are now engaged in a variety of professional activities focusing on the preparation of educational service providers and industrial technologists. (p. 448)

One has only to peruse the current *Industrial Teacher Education Directory* (Dennis, 1996) to determine that teacher education is no longer the driving force or major programmatic focus of most traditional technology teacher education institutions.

As early as 1988, LaPorte noted that there were fewer than 10 "pure" technology teacher preparation programs remaining. What caused this change in focus among traditional technology teacher education institutions? As early as 1970, many traditional technology teacher education programs began to offer dual programs that devoted resources and faculty to the preparation of industrial technologists whose primary purpose for attending the university was to prepare to enter an industry position (Scott & Buffer, 1995). These industrial technology graduates did not ordinarily take professional courses in education, but focused in more technical areas like construction, manufacturing, communications, and industrial management (Scott & Buffer, 1995). When not administered carefully, many of these dual programs have actually become deterrents to teacher education offerings.

Volk (1993) suggested that there has been an overall decline in the number of graduates from technology teacher education programs; however, the decline in technology teacher education graduates from those universities offering nonteaching options has been significantly greater than those that do not offer such options. It should be noted that these diverse programs alone do not begin to define the problem. Rather, the problems facing technology teacher education are based in national, societal, and economic changes and permeate all of teacher education.

This article briefly examines literature on the current economic, social, and technological changes impacting our nation, education, and, in particular, teacher education, and then draws inferences for technology teacher education. From this follows observations on the current position of technology teacher education and steps needed to ensure a secure future for the field.

SOCIAL CHANGE AND EDUCATIONAL CRISIS

Darling-Hammond (1996) has suggested that the pace of economic, technological, and social change has created especially critical times for teacher education. This approaches a deep crisis in teacher education in the United States that requires investigation and understanding if the profession is to be responsive. This crisis is not limited to technology teacher education—rather, it permeates almost every teacher education program. Economically, the United States has witnessed an unprecedented shakeup of the workforce and workplace (Reich, 1993). Low-skill jobs that pay high wages continue to become more scarce. Some low-skill industries have drifted to nations whose workers are eager to work for a small fraction of what American workers earn. Other jobs have fallen prey to technology: programmable robots displace factory workers; automated teller machines displace bank tellers. The diminishing number of defense-related jobs and intensifying global competition also contributes to America's changing labor market (Reich, 1993). Additionally, many Americans lack the basic academic and occupational skills necessary for the changing workforce or for further education. Drucker (1994) called the rise and fall of the blue-collar class between 1950 and the year 2000 the most rapid of any class in the history of the world. From half of all jobs at mid-century,

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blue-collar employment will comprise only 10% of the total by the year 2000. People trained for routine forms of work are often unable to move into the more intellectually and interpersonally demanding jobs necessary in the new American economy. With knowledge-work jobs now comprising nearly half of the total, workers with low levels of education can rarely find long-term employment. High school dropouts, for example, now have less than one chance in three of finding work, and if they do find work, they earn less than half as much as high school dropouts did 15 years ago (William T. Grant Foundation, 1988).

Accentuating the importance of these workforce and workplace shifts are significant changes in the global economic picture. Robert Reich (1993), U.S. Secretary of Labor, stated: "In the new global economy, the only resource that is really rooted in a nation—the ultimate source of all its wealth—is its people. To compete and win, our workforce must be well educated, well trained, and highly skilled" (p. 22). Reich suggested that postsecondary educational institutions have a national obligation to prepare well educated, well trained, and highly skilled graduates who can contribute to the economic security of the United States.

Meanwhile, teacher preparation, recruitment, and hiring in the United States continues to be distressingly ad hoc, and teacher salaries continue to lag significantly behind those of all other professions. These problems add to the chronic shortage of qualified teachers and the continual hiring of large numbers of people as "teachers" who are unprepared for their jobs (National Commission on Teaching and America's Future [NCTAF], 1996). A recently published report by the National Council for Accreditation of Teacher Education (NCATE, 1996) noted that:

> Our society has changed radically in the past 40 years, with the pace of change escalating even more rapidly since the 1980's. Our system of teacher preparation and licensing may have been adequate for the pre-1950's America, but no longer will the old methods suffice. (p. 5)

In contrast with other countries that invest most of their education dollars in well-prepared and well-supported teachers, half of the educational dollars in the United States are spent on staff and activities outside classrooms. The lack of national standards for students and teachers, coupled with schools organized for 19th-century learning, leave educators with an inadequate foundation for constructing good teaching. Under these conditions, excellence has been hard to achieve (NCTAF, 1996).

Globally, education is under enormous pressure to change. All around the world, demands for higher quality education for larger numbers of citizens are being imposed on educational institutions designed a century ago for different purposes. A more complex, knowledge-based, and multicultural society has created new expectations for teaching and learning. Darling-Hammond (1996) stated: "The enormous complexity of today's world and the even greater complications of tomorrow's signal a new mission for education, one that requires schools not merely to deliver instruction but to ensure that students learn" (p. 6). If schools are to meet this new challenge, they must have access to highly qualified teachers who have the knowledge and skills necessary to meet the needs of students who bring with them varying experiences, talents, and beliefs.

The Educational Imperative

Nationally, education is increasingly seen as the critical social change agent with various state and national agencies expressing common concerns and an expanded future role for education. "Growing prison populations, public assistance programs, and unemployment mean that a shrinking portion of American citizens must generate the economic base that supports the rest of the nation—the young, the old, the ill, and those who are not now productive" (NCTAF, 1996, p. 8). This is the first time in history that the success, perhaps even survival, of nations and people has been so tightly tied to their ability to learn. Because of this, our future depends now, as never before, on our ability to learn and our teachers' ability to teach (Darling-Hammond, 1996).

"Due to sweeping economic changes, today's world has little room for workers who cannot read, write, and compute proficiently; find and use resources; frame and solve problems with other people; and continually learn new technologies and occupations" (NCTAF, 1996, p. 7). The educational challenge facing the United States is not that its schools are not as good as they once were, it is that schools must help the vast majority of young people reach levels of skill and competence once thought within the reach of only a few (NCTAF, 1996).

The nation was alerted to the need for a new educational paradigm with the publication of *A Nation at Risk* (National Commission on Excellence in Education [NCEE], 1983). The main premise of this document was that the nation's schools were putting the country at

risk through "*a rising tide of mediocrity*" [emphasis added] (p. 5) that threatened America's military and business competitiveness in the world (Schnur & Golby, 1995). While *A Nation at Risk* focused on the elementary and secondary schools, it also contained recommendations with direct and implied implications for teacher education.

Educational Reform

A Nation at Risk gave rise to movements leading to calls for educational reform. Yet, more than a decade after *A Nation at Risk* and the ensuing educational school reform movement, America is still a very long way from achieving its educational goals (House, 1996). Instead of newly revitalized teacher education programs preparing teachers for classrooms of the 21st century, teachers are prepared to enter the profession much the same as they were a decade ago. House (1996) stated that "one of the most perplexing problems in education has been the parade of school reforms that do not seem to change school practice much" (p. 6). Although most would agree that the educational reform movements have not created overnight changes in practice, they did create an atmosphere where teacher education reform and restructuring could gain public acceptance and momentum. Most current literature describes the reform in terms of stricter academic and assessment requirements, site-based professional development schools, integration projects, and other issues primarily concerned with the general education of teachers (Frantz, 1993; Holmes Group, 1990; House, 1996; Schnur & Golby, 1995; Strawderman & Lindsey, 1995).

During this past decade of reform, many committees, commissions, and other entities have addressed problems in education and teacher education and many play a familiar and similar tune. The "reformers" emphasize skills in academic subjects and often disregard educational theory. Many reformers assume that teachers need little more than knowledge of their teaching subjects and practical experience to be fully accredited members of their profession. On the other hand, Schnur and Golby (1995) stated that this sort of professional preparation is as unthinkable and unacceptable for education as it is for medicine or law. In 1996, the National Commission on Teaching and America's Future issued a report that was also critical of the "reformers." The commission suggested that although no state will permit a person to write wills, practice medicine, fix plumbing, or style hair without completing training and passing an examination, more than 40 states allow districts to hire teachers who have not met basic requirements. The commission report further stated that "most states pay more attention to the qualifications of veterinarians treating America's cats and dogs than to those of the people educating the nation's children and youth" (p. 9).

Schnur and Golby (1995) suggested that teacher education is rarely in the virtually autonomous position of law schools or medical schools. They add that teacher education

> is often in a campus role of disdain, of being not quite a profession, of having no real intellectual substance, and of possessing marginal academic value. Paradoxically, it [teacher education] enhances the balance sheets of these host universities by providing substantial funds upon which its most vocal critics realize their own academic wishes and dreams. (p. 14)

The National Commission on Teaching and America's Future was designed to help develop policies and practices aimed at ensuring improved teaching and learning in all American communities. In its 1996 report, the commission suggested that it is now clear that most teachers are not prepared to produce the kind of learning the new educational reforms demand—not because they do not want to, but because they have not been adequately prepared.

> By the standards of other professions and other countries, U.S. teacher education has historically been thin, uneven, and poorly financed. But the schools' most closely held secret amounts to a national shame: Roughly 1/4 of newly hired American teachers lack the qualifications for their jobs. More than 12% of new hires enter the classroom without any formal training at all, and another 14% arrive without fully meeting state standards. (NCTAF, 1996, p. 9)

Will Rogers, the 1920s "cowboy philosopher," once remarked, "You can't teach what you don't know any more than you can come back from where you ain't been" (Collins, 1988, p. 43). It seems that many of the educational reform committees, national commissions, councils, and other groups (Carnegie Forum on Education and the Economy, 1986; Holmes Group, 1990; What Do We Mean, 1992; Strawderman & Lindsey, 1995) are asking beginning teachers to essentially come back from where they have not been. The notion that anyone who has a background in a disciplinary subject area can teach that subject is nonsense—it relies upon a common stereotype associated with the teaching profession.

Numerous research studies (Atwell, 1993; Buckingham, 1926; Goswami & Stillman,

1987) have confirmed that the best teachers understand their subjects, know how young people learn, and have mastered a range of teaching methods. Additional studies (NCATE, 1996; NCTAF, 1996) have found that teacher expertise is the single most important factor in determining student achievement and that fully trained teachers are far more effective with students than those who merely have a background in the subject area.

FROM THE CHALLENGES—A VISION

The Professional Response

Technology teacher educators must respond to the findings of the educational reformers and offer blueprints to create "real" improvement in teacher education. Aside from the distractions offered by most of the educational reformers, they must address a set of barriers. These barriers are noted in the following paragraphs, and each is followed by one or more imperatives.

First, because accreditation is not required of technology teacher education programs, the quality of technology teacher education programs varies widely.

Imperatives. The technology teacher education profession must decide whether to hold high expectations for all programs or only for some, and whether to hold high expectations for all teachers or only for some. Due, in part, to the critical shortage of qualified technology teachers in the United States, professionals within the field have not demanded excellence. Nor have they demanded that all technology teacher education programs achieve programmatic accreditation. Technology teacher educators must continue to adapt and improve the standards used to define quality technology teacher education programs. Further, they must develop mechanisms that ensure that all technology teacher education programs adequately prepare teachers to teach in the 21st century classroom.

Second, technology teacher education programs have traditionally provided limited professional induction opportunities for preservice and new teachers.

Imperatives. In this new global, technologically-driven environment, all preservice teachers should have the opportunity to work with experienced technology education teachers before graduation. Professional development schools should be established to allow preservice teachers to gradually be inducted into full-time teaching positions under the mentorship of exemplary teachers. These induction experiences should also be extended to the entry-year teacher. Currently, many beginning teachers are left to flounder on their own, without the kind of help provided by internships in other professions.

Third, many technology teacher education programs invest little in ongoing professional development for experienced teachers and spend much of their limited resources on unproductive "hit-and-run" workshops.

Imperatives. Technology teacher education programs should develop comprehensive, long-term professional development programs for practicing teachers that reflect the dynamic nature of technology, the economy, and society. Further, teacher educators should strive to identify funding sources to ensure that practicing technology teachers are cognizant of the most appropriate technologies, the current knowledge base, and the latest trends and issues facing the profession.

Fourth, the boundaries between disciplinary subject areas are becoming increasingly blurred. Dramatic changes in the American economic, social, and technological systems have necessitated a similar change in the way subject matter is presented in our secondary schools (NCATE, 1996). Although there have been a number of noteworthy projects whose purposes were to address the integration of technology education and other subject matter (Teaching Integrated Math and Science Project; Technology, Science, Mathematics Integration Project; the Technology Education Demonstration Projects; the Integrated Mathematics, Science and Technology Project), curriculum integration has not occurred in most technology teacher education programs.

Imperatives. Although technology teacher education programs continue to graduate teachers who have little exposure to integrated curriculum and the requisite teaching methodologies, this practice runs counter to conventional wisdom exposed by members of the technology teacher education community. In a recently published report by the Technology for All Americans Project (1996), the authors contend that technology education teachers must be capable of assisting the secondary school student to learn in an interdisciplinary environment by providing relevance to many other school subjects. Technology teacher education can and must provide preservice teachers with multidisciplinary experiences before they enter the profession.

Fifth, although the number of academically able young people entering the teaching profession has been increasing, there are critical shortages in technology education. Changes in curriculum, philosophy, or programmatic changes will have little value if there are no

applicants for entrance into the technology teacher education program.

Imperative. Technology teacher education leaders must develop and implement recruitment strategies and programs that encourage academically able young people to invest in the teaching profession.

Sixth, the lack of identifiable national standards for the technology education profession has led to a proliferation of technology teacher education programs that have no common goals or direction.

Imperative. The profession must act upon the observations in the Technology for All Americans Project (1996), such as, if we are to achieve technological literacy for the nation, standards should be developed that are based on the universals of technology. These technology education standards will provide a general framework from which state and local school systems, as well as universities, can develop curricula, programs, teacher enhancement, and teacher preparation programs best suited to the needs of students. "Standards can provide a guidance for teachers to improve their teaching and their technology education programs" (p. 42).

Change

Over the next decade, teacher education programs in America will have to change dramatically. They will have to prepare two million new teachers who can meet the demanding challenges created by a changing economy, escalating technological change, and a diverse social climate (Darling-Hammond, 1996). According to the NCTAF (1996) report, "More new teachers will be hired in the next decade than in any previous decade in our history" (p. 20). The report further implies that more than half of the teachers who will be teaching 10 years from now will be hired during the next decade. This new influx of teachers provides our profession with an entirely new set of challenges, but it also provides us with a great opportunity to positively impact future technology education programs.

If the profession can focus its energies on preparing the current generation of teachers with the kinds of knowledge and skills it will need to help students understand our technological society and on creating technology education programs that use their talents well, we will have made an enormous contribution to America's future. Members of the profession must get serious about establishing and implementing goals and standards for technology and technology teacher education. Technology teacher education and professional development must be reinvented, and teacher recruitment and the placement of qualified technology teachers in every classroom must become a priority. The profession must encourage and reward teaching knowledge and skill and prepare teachers that are capable of making significant contributions to the future successes of their students.

The changes necessary to reinvigorate technology teacher education are clear. No more graduating unqualified teachers on the sly. No more nods and winks at technology teacher education programs that fail to prepare teachers properly. No more tolerance for incompetence in the secondary or postsecondary classroom. No more closed classes due to small enrollments. No more wasting resources. Technology teacher educators should initiate changes in the manner in which teachers are recruited and prepared to ensure that they are providing schools with the most capable, brightest teachers possible and graduates with the most appropriate knowledge, abilities, and teaching capabilities. These changes would create a continuum of teacher preparation that ranges from recruitment and preservice education through licensing, hiring, and induction into the profession to advanced professional development.

To initiate the change process, technology teacher educators should embrace a common set of goals that will allow members of the profession to make serious, long-term improvements in teaching and learning. In order to initiate discussion, I submit the following goals for technology teacher education:

1. All elementary and secondary technology students will be taught by teachers who have the appropriate knowledge and skills and who have a commitment to teach technology.
2. All technology teacher education programs will develop long-term commitments to provide high-quality professional development programs for practicing teachers.
3. All technology teacher education programs will provide preservice teachers with multiple opportunities to interact with elementary and secondary teachers and students.
4. All technology teacher education programs will infuse interdisciplinary collaboration or teaming activities into existing programs.
5. All technology teacher education programs will restructure course work and course requirements to reflect the current knowledge base in technology education.
6. All technology teacher education programs will form school-university partnerships

in which practicing teachers, teacher interns, and university faculty will work together in teams.

7. All technology teacher education programs will become actively involved in the restructuring of existing university general education course work to include a wide knowledge base including the study of technology.
8. All technology teacher education programs will meet professional standards, or they will be closed.

Teacher Education in the Societal Context of the Future

In the future, technology teacher education will be influenced to a greater degree by social, economic, and technological change than in any other time in American history (Hughes, 1988). Important changes in the social makeup of American society will force technology teacher education to adapt. Some of these social trends include (a) an increase in minority populations, (b) an increase in nontraditional family structures, (c) an aging population, (d) changes in lifestyles, and (e) changes in the culture of the workplace. Additionally, it is clear that future program changes and adaptations will increasingly be in response to growing social awareness of the need for an educated citizenry.

What will the future look like? Of all the available options for improving the education of technology teachers, the most reasonable alternative appears to be that of identifying trends and issues shaping the future and developing strategies for tomorrow's needs by combining the best practices of the present and past with new and creative solutions that address the concerns of the future. A systematic strategy must be developed to revitalize the preparation of well-qualified technology teachers to prepare youths to enter a very different and uncertain future. One way to prepare tomorrow's teachers to achieve a level of excellence is by having them move through high-quality formal teacher education programs that are consistent with national trends and that provide them with the knowledge and skills necessary to adapt as the national economy, technology, and social trends change (Frantz, 1993).

Schnur and Golby (1995) suggested that perhaps the real challenge for teacher education resides in the truth that nobody really knows a fail-safe method for producing an intelligent, effective teacher. However, that does not mean to suggest that teacher educators do not have some strong clues. It is clear that the challenges of improving technology teacher education are long-standing and complex—there are no easy or quick solutions. From curriculum reform to school restructuring, numerous educational reforms have been tried; thousands of pieces of legislation have been passed in an attempt to improve teaching and teacher education. In the end, the one thing that we can be sure of is that competent teachers are the key to our children's future. A recent Public Agenda poll asked parents, "What is the most important thing public schools need in order to help students learn?" The number one answer by a large margin was "good teachers" (NCTAF, 1996, p. 30).

A new day is dawning in technology teacher education. The preservice teachers in class today will most likely begin their teaching careers in the 21st century. Technology teacher education must enter the new millennium with new structures, new approaches, and a shared base of knowledge about teaching that the new professional technology teacher can apply in daily practice. Members of the profession must resolve themselves to developing new approaches to teacher training and the career development of teachers. The recruitment and selection of teachers is critically important worldwide, and the initial preparation of teachers and their continuing professional development are key factors in improving technology education at all levels.

It takes great skill, intellect, and foresight to prepare teachers who have the appropriate knowledge and abilities and who are capable of make learning an exciting adventure. I am certain that we are the right people, with the right abilities, and that we are up to the challenge.

References

American Association for the Advancement of Science. (1989). *Project 2061: Science for all Americans.* Washington, DC: Author.

Atwell, N. (1993). Foreword. In L. Patterson, C. M. Santa, K. G. Short, & K. Smith (Eds.), *Teachers are researchers: Reflection and action* (pp. vii–xii). Newark, DE: International Reading Association.

Buckingham, B. R. (1926). *Research for teachers.* New York: Silver, Burdett.

Budke, W. E. (1988). *Trends and issues in vocational education.* (ERIC Document Reproduction Service No. ED 303 682)

Carnegie Forum on Education and the Economy, Task Force on Teaching as a Profession. (1986). *A nation prepared: Teachers for the 21st century.* New York: Author.
Collins, R. N. (1988). *Will Rogers Says: Favorite quotations selected by the Will Rogers Memorial staff.* Claremore, OK: Will Rogers Heritage Press.
Darling-Hammond, L. (1996). The right to learn and the advancement of teaching: Research, policy, and practice for democratic education. *Educational Researcher, 25*(6), 5–17.
Daugherty, M. K., & Boser, R. (1993). The recruitment imperative: Replacement or displacement. *The Technology Teacher, 52*(7), 31–32.
Dennis, E. A. (Ed.). (1993). *Industrial teacher education directory* (32nd ed.). South Holland, IL: Goodheart-Willcox.
Dennis, E. A. (Ed.). (1996). *Industrial teacher education directory* (35th ed.). Peoria, IL: Glencoe.
Drucker, P. F. (1994, November). The age of social transformation. *Atlantic Monthly,* 53–80.
Frantz, N. R. (1993, December). *Education and work for the year 2000: The choices we face.* Paper presented at the annual meeting of the American Vocational Association, Nashville, TN.
Goswami, D., & Stillman, P. (Eds.). (1987). *Reclaiming the classroom: Teacher research as an agency for change.* Upper Montclair, NJ: Boynton/Cook.
Hill, R. B., Wicklein, R. C., & Daugherty, M. K. (1996). Technology education in transition: Perceptions of technology education teachers, administrators, and guidance counselors. *Journal of Industrial Teacher Education, 33*(3), 6–22.
Holmes Group. (1990). *Tomorrow's schools.* East Lansing, MI: Author.
House, E. R. (1996). A framework for appraising educational reforms. *Educational Researcher, 25*(7), 6–14.
Hughes, P. (1988). *Future directions for teacher education: Trends, needs and alternatives relating to inclusion of new content areas in teacher education.* (ERIC Document Reproduction Service No. ED 327 540)
LaPorte, J. E. (1993). Manufacturing technology in teacher education programs. In R. D. Seymour & R. L. Shackelford (Eds.), *Manufacturing in technology education* (42nd Yearbook of the Council on Technology Teacher Education, pp. 125–158). Peoria, IL: Glencoe.
LaPorte, J. E., & Sanders, M. (1993). Integrating technology, science, and mathematics in the middle school. *The Technology Teacher, 52*(6), 17–21.
Lewis, T. (1996). Studying the impact of technology on work and jobs. *Journal of Industrial Teacher Education, 33*(3), 44–65.
National Commission on Teaching and America's Future. (1996). *What matters most: Teaching for America's future (Summary report).* New York: Author.
National Council for Accreditation of Teacher Education. (1996). *Quality assurance for the teaching profession.* Washington, DC: Author.
Reich, R. B. (1993). Strategies for a changing workforce. *Educational Record, 17*(2), 21–23.
Reich, R. B. (1994). American renewal and higher education. *Liberal Education, 14*(1), 12–17.
Schnur, J. O., & Golby, M. J. (1995). Teacher education: A university mission. *Journal of Teacher Education, 46*(1), 11–18.
Scott, M. L., & Buffer, J. J. (1995). Undergraduate and graduate technology education. In G. E. Martin (Ed.), *Foundations of technology education* (44th Yearbook of the Council on Technology Teacher Education, pp. 443–477). Peoria, IL: Glencoe.
Strawderman, C., & Lindsey, P. (1995). Keeping up with the times: Reform in teacher education. *Journal of Teacher Education, 46*(2), 95–100.
Technology for All Americans Project. (1996). *Technology for all Americans: A rationale and structure for the study of technology.* Reston, VA: International Technology Education Association.
Volk, K. S. (1993). Enrollment trends in industrial arts/technology teacher education from 1970-1990. *Journal of Technology Education, 51*(2), 3–4.
Wicklein, R. C., Hammer, D. E., Balisteri, J., DeVore, P., Scherr, S., Boudreau, W., & Wright, J. (1991). Technology education demonstration projects: Multidisciplinary approaches to technology. *The Technology Teacher, 51*(3), 3–8.
William T. Grant Foundation, Commission on Work, Family, and Citizenship. (1988). *The forgotten half: Non-college youth in America.* Washington DC: Author.