GUEST EDITARTICLES On the proposition that technology education leaders have neglected important qualities of industrial arts education

Like their historical predecessors, contemporary leaders have drawn criticism for ideas related to changing the curriculum. But constructive criticism often sharpens the quality of ideas, focuses the attention, and often results in superior concepts. Some statements in recent journals have been critical of the work of some of the leaders who have been conceptualizing and implementing technology education curriculum. This prompted the program topic selection for the Epsilon Pi Tau International Breakfast at the International Technology Education Association Conference on Tuesday April 2, 1996. Breakfast attendees were well-rewarded by two distinguished speakers whose views are published on these pages. The program was designed around a modified debate format and each speaker took a side on the proposition that . . .

leaders who have influenced technology education curriculum development and implementation have neglected some important and enduring qualities inherent in industrial arts education; for example, as the qualities that resided in the conceptualizations and rationalizations of industrial arts that related it and its students to the entire educational and social context. **JS**

Dennis Herschbach

Supporting the Proposition

It has been only a little more than a decade since a professional consensus emerged concerning the need to formulate an alternative to industrial arts. Few question the importance of technology education, or the need for a new name to characterize the program area. Technology education, however, is at a critical juncture. What can be questioned is the ability of the profession to clearly articulate the educational role of technology education. Just what is technology education, who does it serve, and for what reasons? And how is technology incorporated into its program structure? There is not yet a professional consensus concerning these fundamental questions. The subject field is still struggling to clearly define its educational purpose, and the educational public is not sure why technology education is important in the school.

In part, the uncertainty surrounding the curricular dimensions of technology education is due to the newness of the field. It is also due to the complexity of technology itself, and the difficulty in reducing the concept to curricular elements. Yet, if technology education has difficulty defining itself, how can the subject field be explained in terms that the educational public can understand and value? And today, in a period of limited financial resources, changing educational priorities, and greater accountability, the subject field is vulnerable to budget cuts and replacement. Other educational alternatives will continue to challenge technology education's place in the school unless we do a better job in defining who we are.

I would like to suggest that a major reason for the ambiguity surrounding technology education is the inability of the profession to constructively build from its historical roots, industrial arts. The profession has attempted to formulate a framework and a rationale, and has created programs while largely disregarding the historical foundations of the field. It has ignored basic curriculum concepts that historically have undergirded program design and that are understood by the educational public.

The Failure to Build From Industrial Arts

In the haste to stake out a separate curriculum claim for technology education, there was a conscious effort on the part of many within the profession to distance themselves from industrial arts. "Traditional" industrial arts was highly criticized as being outdated, unresponsive to technological change, and focused too heavily on manipulative activities. The attitude seemed to prevail, at least in some circles, that it was first necessary to destroy industrial arts in order to clear a path for technology education. As a result of this attitude, there has been a professional reluctance to examine the rich curriculum heritage embedded in industrial arts, or to even acknowledge that the subject had educational value.

Technology education may be a "new" concept, but this does not mean that everything that was programmatically constructive about industrial arts should be rejected. Industrial arts made a significant educational contribution, and technology education itself can be strengthened by building on what was good about industrial arts.

I am not suggesting that the clock be turned back, and that we attempt to reconstitute industrial arts programs. What I am suggesting, however, is that we use our understanding of our pedagogical roots to build viable technology education programs. There is not a single curriculum concept in technology education that was not also expressed through industrial arts. We may use different wording, but the basic concepts are similar. Through the

Dr. Herschbach is a Professor in the Department of Policy, Planning, and Administration in the College of Education at the University of Maryland. He is a member-at-large of Epsilon Pi Tau.

examination of industrial arts we arrive at a more complete set of curriculum assumptions, and a deeper understanding of the curriculum issues that the field faces today. The past does inform the present.

CRITICAL CURRICULUM ISSUES

By way of illustration, I would like to briefly discuss four fundamental curriculum issues faced by technology education today. Our understanding of the past can help us to confront these issues. How we define these issues largely defines technology education.

What is the Subject Matter of Technology Education?

Technology is a complex concept. It embraces abstract knowledge, but it also encompasses considerable prescriptive knowledge in the form of "know how," as well as tacit "tricks of the trade" best learned through individual practice and experience. Considerable use is made of knowledge from the formal "disciplines," particularly math and science. But this knowledge does not constitute a discipline because it is primarily a manifestation of the selective use of disciplines. There are also important social, political, and ethical aspects associated with technology.

A major issue faced by the field today is how the diverse subject matter of technology can best be represented in instruction. This is no simple issue.

There is a strong belief among some technology educators that technology constitutes a "discipline," and that its study should be organized like the study of any other discipline in the school, such as algebra or chemistry. Not only does this belief misinterpret the epistemological character of technology, but much of the rich instructional potential of technology education is lost. It is puzzling why some technology education supporters cling to an erroneous concept of technology that robs programs of much of their vitality. The last thing that we want to do is to make technology more like sterile academic instruction.

My own reading of history suggests that technology education can be best conceived as interdisciplinary in scope. This lends itself to rich programming. Technological content is drawn from across different fields of inquiry. Learning is integrated with other fields, as well as with purposeful activity; and knowledge is applied widely. In fact, few other fields of study have as much potential to fully integrate interrelated fields of study. Dewey (1938) recognized this fact, and so did Bonser and Mossman (1923). Early leaders, such as A. B. Mays (1934), Heber Sotzin (1958), and William Warner (1936), among others, grappled with ways to reflect the multidimensional character of instruction. Even in more technocratic programs of industrial arts, such as the work of Selvidge and Fryklund (1930), the interdisciplinary character of technology was acknowledged.

This does not mean, however, that there was complete agreement over what constituted the subject matter of industrial arts. Some stressed the more technical aspects of industrial activity (technology), for example, while others advanced more integrative programming or tried to puzzle out the social implications of the study of technology. But what it does mean is that we need to have an understanding of the issues surrounding the selection of subject matter, and of the different curricular positions taken among curriculum theorists in industrial arts. We need to know, as well, why some curriculum proposals were successful, and why some failed. We need to know who programs were designed to serve, and how they fit into the larger school program. This understanding provides the conceptual leverage to address current curriculum concerns more completely.

The Use of Activities

Activities were the bread and butter of industrial arts. One of the most potentially powerful rationales for technology education is its use as an interdisciplinary, activity-based subject through which effective learning can take place. A number of learning theorists, for example, have advanced the argument that the acquisition of knowledge cannot be separate from the context in which it is constructed, used, and reconstructed. Resnick (1989), for example, contended that it is only when knowledge is put to use through activities can the learner build a concept of what organized knowledge means and how it is applied. Activities result in a deeper and more comprehensive understanding of organized knowledge; a reconstruction of learning in the Deweyan (1933) sense.

Technology education can move beyond simplistic concepts of technology that emphasize just content to more active forms of instruction and learning that use technology itself as a means to help students to create meaning for themselves (Zuga, 1992). Technology education can be conceived of as more than a body of subject matter to be transferred to students in the same way as, for example, math, physics, or economics.

Little professional attention, however, has been given to learning theory and to how it relates to technological activity and instruction. Technological educators appear to be largely oblivious to the highly influential work of researchers outside of the field, such as Brophy and Alleman (1991), Glaser (1984), and Resnick (1987, 1989), among others, who build a persuasive case for positioning activity-based learning at the center of educational reform. With few exceptions, the profession has not demonstrated that it is even aware of the potential for creating a curriculum framework grounded in contemporary learning theory and based on activity.

However, there is a long history of experience in the use of activity-based curricula within the field of curriculum development in general, as well as within industrial arts. This rich body of experience has been virtually ignored.

Teach Students, Not Subject Matter

The purpose of industrial arts was to serve students, and we had all kinds: bright ones and not so bright ones; interested and highly motivated students and kids just "marking time"; kids with great moral character, and delinquents; kids bound for college and kids going straight into work. Sometimes we were very successful, and sometimes we failed miserably.

But I am afraid that we have lost something in technology education. We may have become so caught up in technology itself and defining the subject field that we may have forgotten our primary purpose—to serve students. Technology education, above all, is only the vehicle through which learning occurs. How we convey technology as an abstract concept is less important than how we use technology education to teach kids. Educational programs stand or fall because of their perceived importance to students.

Programming Reflects Multiple Applications in the School

If the history of industrial arts is a guide, technology education can be best conceived as having multiple purposes and applications in the school and serving different student populations. Industrial arts did this through different program designs.

Technology education requires multiple applications in the school because technology itself is a multi-dimensional concept that defies a single curricular application (Frey, 1989). In addition, the potential of the subject field to serve different student groups can only be realized through programs that have different purposes, organization, content, and learning experiences. This should not seem a strange idea. Most fields of study reflect different values, assumptions, and applications through programming that embodies different curriculum designs.

An important consideration, however, is that technology education must also clearly articulate the diverse educational roles that it plays in terms of defining curriculum concepts that provide coherent form to program design. This is largely lacking within the field. As a result, curriculum plans in technology education often are fragmented, lack a clear theoretical perspective, and do not relate well to prevailing curriculum concepts. If the educational public does not fully understand technology education, it is in part because the field has failed to speak the language of curriculum development.

One outcome of a better understanding of our history, then, can be a better awareness of the crucial curriculum issues faced by the field, and how they have been addressed in the past. There is no single answer to these issues; there are several answers, some of which are better than others. Nevertheless, we gain considerable conceptual leverage through our understanding of the past.

Another important outcome must be a better understanding of the basic curriculum concepts that historically have undergirded program design. In formulating their own program designs, industrial arts educators worked within prevailing concepts of curriculum development. The assumptions underlying their program designs with respect to purpose, organization, substance, and method reflected the larger educational community within which industrial arts educators worked. To the extent that they were able to link their own program designs to current educational ideas and problems, and to recognized curriculum theory and practice, they were successful in communicating with the educational public, just as technology education today must relate to the immediate curriculum concerns confronting education if it is going to be widely accepted.

I do not mean to imply that industrial arts educators always had a clear concept of what they were doing, or that there was complete agreement within the field regarding the direction that curriculum development should take. What I do mean is that if we examine the curricular relationship between industrial arts and technology education we can see how technology education was shaped by industrial arts through fundamental curriculum design patterns that continue to be applied in schools (Herschbach, 1989; *Journal of Technology Education*, 1992; Zuga, 1989). We must have a better understanding of what these curriculum design patterns mean for today's programming .

DIVERSITY IN CONCEPTS AND PRACTICE

A superficial understanding of our history leads us to an erroneous concept of the development of technology education, and masks important curricular distinctions. It is widely accepted within the profession, for example, that industrial arts evolved out of the work of Dewey, Richards, Bonser, and Mossman. This is true in so far as the field came into its own as part of the progressive educational movement during the 1920s and 1930s. Industrial arts was linked with those educators who wanted to break from traditional instruction: students would be offered a range of practical and general subjects; academic instruction would be integrated with practical activities; and the activities themselves would form the core of instruction. Social objectives would also be stressed. Much of the educational rationale surrounding industrial arts came from the progressive educational movement.

However, as Svendsen (1963) and, more recently, Zuga (1992) and Petrina and Volk (1995) have observed, for a number of reasons industrial arts educators were never completely successful in incorporating progressive concepts into programming. To be sure, the pedagogical rationale of the early progressives continued to serve as a general rationale for industrial arts (and continues to a considerable extent to be reflected in technology education), but at the level of implementation few programs reflected progressive ideas. The field was characterized by multiple curriculum orientations. More technocratic approaches, in particular, tended to dominate instruction. There is simply not a clean, single genealogical line from the work of Dewey and Bonser to technology education. There are different lines of development, each with its supporting curriculum rationale and program design.

It is true that progressive thought can be traced through the ideas of individuals such as Hornbake (1963), Maley (1973), Sotzin (1958), and Warner (1965), and their work has influenced technology education. But the ideas of DeVore (1968), Face and Flug (1965), Hales and Snyder (1982), Lux and Ray (Towers, Lux & Ray, 1966), and Ziel (1971), to name a few, come out of different curriculum orientations, and also have been highly influential. More contemporary work, represented by Dugger (1988), Hansen (1995), Lewis and Gagel (1992), and Wright (1992), among others, similarly reflects varying curriculum perspectives. The crucial point is that we must have a better understanding of these different curriculum perspectives in order to structure pedagogically sound programs in terms that relate to the larger educational public. It is only by fully understanding the diversity of curriculum perspectives which have characterized the development of our field that can we come to terms with the programming challenges facing us in all of their varieties.

We are at an important juncture in technology education. Do we move ahead as a field of study and realize the considerable programming potential that we have? Or do we continue to flounder in programming uncertainty, not able to clearly communicate to ourselves or to the general public who we are, who we serve, and why? The significance of the technology education movement is that a new basis for the study of technology will emerge, one that addresses the needs of students, and is coherently organized; one that reflects technology in all of its dimensions; and one that brings together diverse strands of curriculum practice as reflected through our educational heritage. For this to happen, however, we must fully grasp the enduring, specific, and contextual ideas associated with industrial arts.

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Ernest Savage

Opposing the Proposition

Dr. Savage is Associate Dean and Director of Graduate Studies in the College of Technology at Bowling Green State University, Ohio. He holds a Distinguished Service Citation from Epsilon Pi Tau and is a member of the Alpha Gamma Chapter of Epsilon Pi Tau.

Some contemporary philosophers and historians in our field have implied that curriculum theorists and innovators of technology education have lost touch with their past; there appears to be no direct link in curriculum with the theorists and developers of the past. I will demonstrate that a definite link between present curriculum theories and those of the early part of the century does exist.

One concerns is that leaders of the technology education movement have built a framework, developed a rationale, and carried out implementation plans in disregard to some of the enduring specific and contextual ideals associated with industrial arts. To respond to this concern, one needs to determine the framework and rationale upon which these programs were built and to determine respective contextual ideals. This concern will be addressed from a curriculum practice perspective which shows that technology education has a strong foundation in the arts of industry.

A framework is the basic structure of a program of study. According to Andrews and

Erickson (1976), the framework for industrial arts can be traced back to Bonser who in 1913

> established the framework for establishing the program of industrial arts as a separate subject by changing its previous concentration on use as a method of instruction. Working mainly with elementary school students, he promoted the idea that students should become producers before participating in society as adult consumers. Thus, as members of an adult society they would have a greater awareness and deeper understanding of the methods of industrial production used to fill human needs. (pp. 32-33)

No doubt, Bonser was one of the most significant leaders in positioning industrial arts as a vital part of education for all learners. His link to Dewey (1934), particularly in Dewey's perspective that education was experience, was strong and consistent and was supported by Bennett (1934). Bonser and Mossman's (1923) outcomes reveal their perspective and philosophy for industrial arts. They observed that one who studied the industries should:

> 1. Be aware of general health needs, be able to select and use foods and clothing so that they will help to keep him well, and be intelligent about all phases of cleanliness and sanitation in and around the home. This is the health outcome.
> 2. Be able to buy and use industrial products of good quality in material construction and well adapted to their purposes, at costs that are reasonable; to care for what is secured so that it will remain serviceable in its fullest possible measure; to repair, or supervise repairing, when it can be done to advantage; and intelligently to substitute inexpensive for expensive products when this is needed. This is the economic outcome.
> 3. Love that which is beautiful, and be able to select and use products which are beautiful in themselves, which are well adapted to the particular purpose for which they are chosen, and which fit harmoniously the surroundings in which they are placed. This is the art of aesthetic outcome.
> 4. Be sensitive to the well being of industrial workers, understand the conditions of the industries, and respond intelligently in all ways possible to help in regulating industry so that no one will suffer injustice or injury for the sake of unfair profits for employers, unfair wages for employees, or unfair prices for consumers. This is the social outcome.
> 5. Have permanent interests in the materials, processes, products, and achievements of industry which express themselves in observation and reading of the changes, discoveries, and inventions of industry as these are found in operation or described in current magazines or books; or as expressed in avocational construction of products of special appeal; or as satisfied by observing and enjoying products of use and beauty which one may not be able to possess but which are found in the homes of friends, in public buildings, in shops and stores, and in museums. This is the recreational outcome.
> 6. Be reasonably dextrous in handling materials, tools, machines, and products found in the general environment; be capable of doing or directing the simple kinds of repair work related to clothing and the household where the specialist is not needed; and have such qualities as accuracy, neatness, and persistence reasonably well developed with reference to their application to the use or upkeep of industrial products. These are the outcomes incidentally developed through the appropriate realization of the primary outcomes. (pp. 14-16)

It would appear, therefore, that a framework for industrial arts grew from Bonser's social reconstructionist philosophy (Petrina & Volk, 1995) and probably reaffirmed Russell's (1914) set of curricular boundaries for the subject area: "For pedagogical purposes, the materials of significance in the industries are (1) foods, (2) textiles, (3) woods, (4) metals, and (5) clays and other allied earth materials" (p. 11). Russell also recognized the need for the study of fuel and transportation, as well as the study of commerce; reflecting on the future need, at that time, to study elements of production, manufacturing, and distribution.

The philosophy of social reconstructionism, supported to some degree by Dewey (1934) and endorsed by scholars such as Kilpatrick (1925) and Bode (1926), as well as Bonser, offers us the "reason d'etre" for industrial arts. This educational philosophy

> places an extraordinary faith in the ability of education, reasonable people, armed with relevant knowledge, to actively cooperate and solve humanity's many problems. . . . It presupposes that . . . in a democracy all people ought to plan, prepare for and participate in achieving a more desirable society. Education can lead society toward democratic perfection and is capable of solving the problems of the future. This can be done through the use of experimental sociology, exploration of alternative scenarios and by isolating the deterrents to human progress. . . . It is education's responsibility to teach students their rights and duties; and to help them envision a better society. (Lerwick, 1979, pp. 51-52)

This movement flew in the faces of perennialists such as Morrison (1926) and Bagley (1938) who felt that school subjects should be discipline-centered and the teacher should be the distributor of all wisdom with the student being the passive recipient of this fountain of knowledge. In many ways, this thinking is still reflected today by conservative leaders. Social reconstructionists believed that students learn through a variety of modalities and that the subject matter offered and the instructional methods used should enhance the student's ability to learn and that this learning should be used to foster social change; hence, reconstruct society.

Unfortunately, it appears that this vision for industrial arts was never reflected in widespread practice. There were many new "shops" added to school districts, but they were unit shops that replicated industrial processes and practices to varying levels of capability but where connections to societal cause and effect was not evidenced. It could well be that the key to successful social reconstruction took on a pragmatic perspective during the depressed 1930s, resulting in the need to prepare students, who were swamping schools as a result of required school attendance, for employment in our industrial society—a society that was also gearing up industrially for World War II.

Another significant link to the framework for industrial arts came from W. E. Warner, who carried the definition of industrial arts created by Bonser and Mossman (1923) into the postwar era. Snedden and Warner (1927) noted that with regard to industrial arts for ages 12 to 16,

> there is especially needed an exact and detailed analysis of the meaning, scope, and character of each of the several specific purposes that can be defined for the subject at the ages given. For brevity these can be referred to as:
> a. The disciplinary or "manual training" purpose.
> b. The prevocational training purpose.
> c. The prevocational finding or guidance purpose.
> d. The "handyman" purpose.
> e. The utilizers' appreciational purpose.
> f. The economic knowledge (euthenic) purpose.
> g. The developmental purpose (similar to that of sports, in the furnishing of experience and growth of visibly needed sorts).
> h. The concrete centers of correlation purpose. . . .

However, Warner later promoted technologies of dominant industries over technologies of the home that Dewey, Bonser and Mossman had attempted to balance with economic imperatives. Warner could not sustain Bonser and Mossman's discourse on industrial arts in the larger educational arena, nor could he alone develop Dewey's progressive views on the structure of experience and unitary organizations of curriculum. He chose not to carry Bonser's reconstructionist mission for industrial arts or broad, critical interpretations of industry and technology in general. Ideological differences, manifested in his conciliatory views of industry, science, and technology, set Warner apart from Dewey and Bonser (Petrina & Volk, 1995).

The context of this curricular organization when placed into historical perspective reveals a significant "tug of war" between the visions of Warner and those of Selvidge, who was the most vocal and influential spokesperson for the inclusion of industrial arts as a component of vocational education. His work with the Standards of Attainment in Industrial Arts Teaching was an attempt to reinforce the traditional trades and crafts approach use in vocational subjects (Martin & Luetkeymer, 1979). Horton (1985) said that Warner, during his affiliation with the Western Arts Association, developed literature for vocational and practical arts education that clearly reflected the Dewey-Bonser philosophy. Warner used Dewey's framework and Bonser's rationale to support the creation of a separate organization and an autonomous profession for industrial arts (Horton, 1985). However, The Curriculum to Reflect Technology (Warner et al., 1952) appears to have shifted industrial arts away from social reconstructionism while keeping the broader content elements listed by Russell (1914) and Bonser and Mossman (1923), who identified industrial arts as

> those occupations by which changes are made in the forms of materials to increase their values for human usage. As a subject for educative purposes, industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes. (p. 5)

Warner's (1952) ideal curriculum included the following:

1. Management Organization
2. Communication Division
3. Construction Division
4. Power Division
5. Transportation Division
6. Manufacturing Division

The content under these divisions appear to meet or exceed Russell's (1914) "materials of significance" and his "recognized needs." They appear, however, to exclude those elements of Bonser's general education purpose for industrial arts dealing "from the point of view of the problems, opportunities, and obligations of the consumer and the citizen" (p. 7), and of Bonser and Mossman's (1923) five stated purposes of this program; three (health, social, and recreational) were ignored by Warner. One might say that after the war those divisions prescribed by Warner were of greater importance or that those three purposes were beginning to be addressed by other curricular areas. This may be so, but The Curriculum to Reflect Technology (Warner et al., 1952) appears to have cast a beacon that still shines brightly today, and it appears that this curriculum reflected a departure from Warner's liberal thinking of a decade earlier (Snedden &

Warner, 1927) when he observed that

> every energetic industrial arts teacher will wish to develop in detail certain constructive proposals for a practical arts course for a described case-group. The first treatment of any one of the topics listed below may be in summary or digest form but should be followed by full descriptive treatment. . . .
> 1. Diagnose the total social situation involving the pupil problems which you desire to study—to include the prevalent economic, racial, and social factors presented by them. (p. 111)

Olson (1963), a disciple of Warner, developed an approach to subject matter selection quite unlike any used before to classify content in manual training, manual arts, and Bonser's industrial arts. Those classifications identified the industries of ceramics, chemicals, foods, graphic arts-printing, leather, metals, paper, plastics, rubber, textiles, tools and machines, woods, construction, power, transportation, and electronics, along with supporting components such as industrial research, industrial management, and services. What is interesting about Olson's content classification is that it appears to have included all of the past content structures and to have been the foundational document for future curriculum projects. More interestingly, Olson created a pattern for deriving typical applications of curricular components by functions, including cultural functions (history and development, great people and great achievements, and contemporary status, influence) and social functions (relationship to the standard of living, legislative aspects, and significance to society, to the individual).

The decade of the 1960s resulted in major funded curriculum efforts such as the Industrial Arts Curriculum Project (Towers, Lux, & Ray, 1966), and the American Industry Project (Gebhart, 1968) supported an almost complete focus on industry, even narrowing Warner's perspective. For example, Towers, Lux, and Ray (1966) suggested that the instructional program address the content from (a) industrial management technology, (b) industrial production technology, (c) industrial personnel technology, (d) industrial material goods, (e) construction technology, and (f) manufacturing. To their credit, they did include an objective in their teacher's guide stating that industrial technology "provides knowledge and skills that will be useful in life situations of occupational, recreational, consumer, and social-cultural significance" (Lux, Ray, & Hauenstein, 1970, p. 3).

The general objectives of the American industry courses were seen as:

> A. To develop an understanding of those concepts which directly apply to industry.
> B. To develop the ability to solve problems related to industry. (Face & Flug, 1967).

Within the environment of American industry could be found government, private property, resources, competition, public interest, and the concepts of communication, transportation, finance, property, research, procurement, relationship, marketing, management, production, materials, processes, and energy (Face & Flug, 1967). It appears that the American Industry Project represents a logical extension of the content specificity of Russell and Warner.

Another direction that appears to be based more on the social reconstructionist philosophy of Bonser is reflected in Wilber's (1948) definition of industrial arts: "those phases of general education which deal with industry—its organization, materials, occupations, processes, and products—and with the problems resulting from the industrial and technological nature of society" (p. 2). In his foreword to the book in which this definition surfaced, Warner wrote:

> Industrial Arts, therefore, has a new and profound mission of orienting everyone, especially in regard to the pertinent aspects of production, consumption, and recreation. Its procedures of learning remain the most natural ones because of the laboratory activities involved, but Industrial Arts is no longer a simple subject. Now all people—from young to old—and all phases of the school—from the social to the technical—are stimulated, as never before, to master the implications that industry has brought to this country. (p. vii)

Thus, Warner complicitly endorsed Wilber's definition, as Maley (1973) did in his The Maryland Plan:

> . . . those phases of general education which deal with technology—its evolution, utilization, and significance—and with industry—its organization, materials, occupations, processes, and products—and with the problems and benefits resulting from the technological and industrial nature of society. (p. 12)

The purpose of Maley's (1973) curriculum was to enable students to:

> 1. interpret, to discuss, or to describe the organization, problems, products, processes, and contributions of industry and technology;
> 2. explore and to realize his potential as an individual;
> 3. use his mind, in order to develop intellectual growth;
> 4. develop skills and habits in the areas of problem solving and social functioning, as well as in manual and mental manipulation;
> 5. describe and interpret the changing nature of

> industry and technology, and their impact on his goals. (p.12)

This exploration of human potential and development of intellectual growth as well as problem solving and social functioning appears to have resurrected the outcomes of Bonser's industrial arts with a 1970s flair—a flair that made its presence felt in the 1980s with the Jackson's Mill Industrial Arts Curriculum Theory (Snyder & Hales, 1981), which defined industrial arts as

> . . . a comprehensive educational program concerned with technology, its evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impacts. (pp. 1–2)

As a consensus document, the one produced out of Jackson's Mill had considerable influence, having borrowed its definition in part from Maley, its concept of industry from IACP, among others, and a definition of technology based upon the work of DeVore (1980). It also provided a strong commitment to the ideological human adaptive system which was concerned with the values and beliefs of society. The other human adaptive systems were the sociological—patterns of social endeavor characterized by social organization and regulation; and the technological system—technical means of manipulating the physical world as well as providing other goods, services, and means for extending human potential (Snyder & Hales, 1981). Again, the link to social reconstructionism appears to have emerged as a strong component of industrial arts, even while the content reflected physical technology—manufacturing, construction, transportation, and communication technology.

It appears that by the mid 1980s the study of industrial arts was well on its way to a paradigm shift from the arts of industry to the elements of technology. This did not mean that social reconstructionism experienced that same shift. It appears to have found its way securely into the next watershed event in our curricular evolution: A Conceptual Framework for Technology Education (Savage & Sterry, 1990). This framework endorsed the human adaptive systems and domains of knowledge of the Jackson's Mill effort while also centering on the human as a problem solver who, through the application of the technological method model, could identify, address, and solve problems and opportunities using resources and technological processes. Emphasis on the effects of this type of activity was also placed in the model through an analysis of outcomes and consequences. The shift from industrial arts to technology was reflected in the technological processes used in this model. Rather than just addressing the physical and communication technologies, as was essentially the content basis for industrial arts for generations, the conceptual framework document also suggested content for technology in the living world—an organizer that had previously achieved acceptance at the Museum of Science and Industry in Chicago and had been endorsed by Swyt (1987). Swyt classified the content organizers of technology to be (a) physical technology—motion, power, and work; (b) material technology—matter in non-life forms; (c) information technology—data, information, and knowledge; and (d) bio-technology—biologically active agents. The technological processes from the conceptual framework are bio-related technology, communication technology, and the physical technologies of production technology and transportation technology (Savage & Sterry, 1990).

It would appear that from a curriculum perspective, including the predominant philosophical viewpoint of our early leaders, the technology education movement has built a framework, and rationale, and has carried out implementation plans in harmony with some of the enduring specific and contextual ideals associated with industrial arts (Figure 1). However, many educators in this field are much more concerned with the constant shifting in the sands of content of our field of study, and this is as it should be. Most people in all fields of endeavor feel daunted by change, and in a field that now proports to address issues and content relating to the study of technology—an area that grows and changes exponentially—the fear is real. However, we should not fault our foundational structure and early contextual ideas. Rather, we should rally around a framework that most of our leadership can support and proceed with it into the next century.

A review of our past forces us to hear the scream of our present reality. The following concern surfaced—as it has for many of us for many years—as a result of this reflective activity: Where have all our heroes gone? In a time when the survival of our profession is in question, who will rise up to carry the banner for our program in the manner of Bonser, Warner, and Maley? Will it be you?

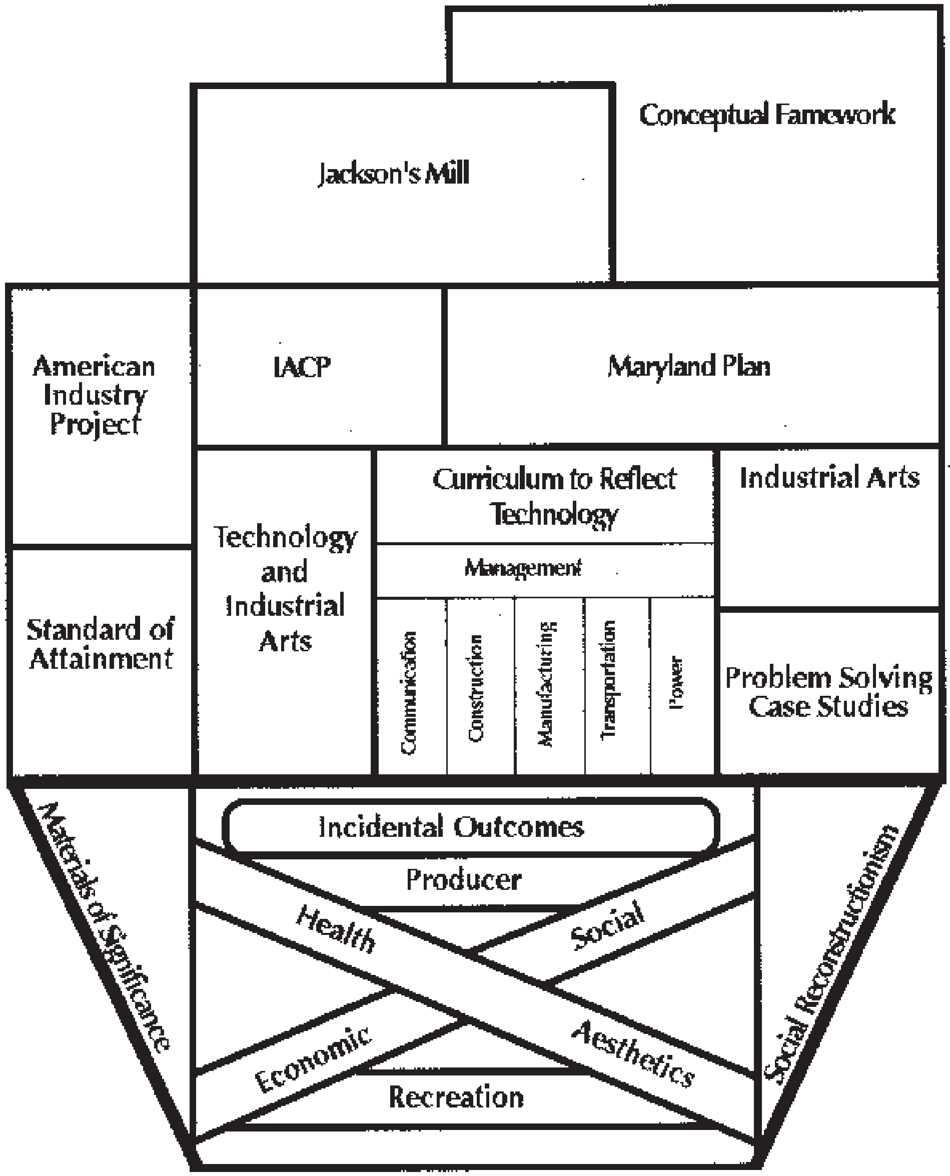

Figure 1. Framework for IA ⟶ TE

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