Technology Education: AKA Industrial Arts

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Pullias (1989) identified three viewpoints individuals may take regarding the implementation of technology education. One, which will be referred to as the "revolutionary" position here, proposes "to discard the old and begin fresh." (p. 3-4). Another, perhaps "evolutionary," view prefers "to keep part of the old, install part of the new, and 'ease' into full implementation" (p. 3). The third position "is to disguise what we have been doing for years and try to make it look like a new curriculum" (p. 3).

These viewpoints can be correlated directly to positions one may take relative to the historical relationship between industrial arts and technology education. For example, those who hold a revolutionary historical view find few similarities between industrial arts and technology education. Pullias, for example, argued that "blinders are going to have to be removed and educators are going to have to accept the fact that technology education is something totally new. Technology education is not a remake of industrial arts..." (1992, p. 4).

Those holding the evolutionary point of view also see technology education as something new. But they point to industrial arts as the progenitor of technology education. Dugger (1985) suggested a major event as the cause of technology education when he noted that "industrial arts education has undergone a tremendous curriculum thrust that has become identified as technology education" (p. 2). Echoing Dugger, Waetjen wrote:

> The last decade has witnessed a startling change in what was once Industrial Arts Education and has now evolved into Technology Education. The evolution has been more than cosmetic, and far more than a simple change of names (1989, p. 1).

Intrinsically, the terms "startling change" and "tremendous transition" may suggest revolution, but it bears mention that the evolutionary point of view regards industrial arts as the foundation for the change, while the revolutionary stance considers the change as the foundation of technology education.

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Finally, the last position denies that any major revelations have occured in the field recently. Its adherents contend that the theoretical philosophy and methodology of technology education are not significantly different from those of industrial arts. The notion that technology education is simply another name for industrial arts may be termed an "alias" theory. That theory will be explicated here.

The Alias Theory vs. the Revoltionary and Evolutionary Positions

Both evolutionists and revolutionists ascribe the characteristic of *newness* to technology education. Finely distinguished from another of the qualities enjoyed by technology education, that of being contemporary, the characteristic of newness implies invention, as opposed to simple, linear progress.

Arguably, the profession known only a few years ago as "industrial arts" stands to benefit greatly from a public perception of newness. And, rightfully so, it has appeared to undergo a change in name, change in content organization (and to a certain degree, in content as well) and a change in philosophy.

As Waetjen suggested, more than a change in name will be necessary for the profession to realize its true mission. As for organizational changes with respect to content, or modifications in content itself, these are superficially an indication of a substantial transformation. But in light of the evolving nature of the industrial arts they are by no means earthshaking – they may simply represent a contemporization of the field. What seems to be required to validate and complete this change is a revision of the profession's philosophy. This, the evolutionists and revolutionists seems to be indicating, has in fact happened.

The objective of this paper is to show that, for practical purposes, technology education is simply the appropriate renaming of industrial arts. What the profession defines as "technology education" – in an attempt to distance it philosophically from "industrial arts" – is essentially the definition suggested many times in the past for industrial arts. Furthermore, many of the major teaching methodologies associated with technology education are not new either – they have been suggested in literature as directives for industrial arts for years.

The Philosophy of Technology Education is Not New

Although the most popular and accepted definitions for "industrial arts" and "technology education" may differ in wording, there has been very little difference in meaning between definitions for the two over the last seventy years.

Bonser and Mossman

> 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 (Bonser and Mossman, 1923).

This interpretation of the meaning of “industrial arts” was written seventy years ago by Frederick Gordon Bonser and Lois Coffey Mossman of Teacher’s College at Columbia University. Lux (1981), characterizing this definition as “famous” and “widely accepted,” credited Bonser with leading “a major thrust to redirect industrial arts away from activities and studies based on discrete materials or selected trade skills and toward broader conceptualizations such as how humankind provides itself with clothing, food, and shelter” (p. 211). The definition has three major elements: education, technology, and society (see Figure 1). Industry is not mentioned.

This definition was hardly obscure in Bonser and Mossman’s time or ignored since. Smith (1981) wrote of the definition, “even to this day it has created much excitement and given much direction to curriculum development in industrial arts” (p. 188). However, Smith goes on to note, as the definition originally appeared in *Industrial Arts for Elementary Schools*, “many practitioners have found it difficult to make the transition and apply... Bonser’s philosophies to industrial arts programs that have traditionally been established in the secondary schools” (p. 188-189). In fact, acceptance of Bonser’s ideas may have been hampered by his reputation as a “leader in the area of *elementary* education” (Luetkemeyer and McPherson, 1975, p. 260-261; emphasis added).

Wilber and Maley

In 1948, shortly after quoting Bonser and Mossman’s definition in his *Industrial Arts in General Education*, Wilber defined the industrial arts as “those phases of general education which deal with industry — its organization, materials, occupations, processes, and products — and with the problems of life resulting from the industrial and technological nature of society” (p. 2.) Wilber’s definition is constructed similarly to Bonser and Mossman’s, but substitutes the concept of industry for technology.

Like Bonser and Mossman’s definition, Wilber’s was prominent. Martin and Luetkemeyer (1979) credited Wilber with considerable influence in the

	"Industrial Arts"			"Technology Education"	
Definition component	Bonser and Mossman, 1923	Maley, 1973 (cf. Wilber, 1948)	Jackson's Mill, 1981	AIAA, 1985	Wright, Israel, and Lauda, 1993
Education	"Industrial Arts is a study	"those phases of general education	"a comprehensive educational program	"A comprehensive, action-based educational program	"Technology Education is an educational program
Technology	of the changes made by man in the forms of materials to increase their values,	which deal with technology, its evolution, utilization, and significance;	concerned with technology, its evolution, utilization, and significance;	concerned with technical means, their evolution, utilization, and significance;	that helps people develop an understanding and competence in designing, producing, and using technology products and systems
Industry	{none}	with industry, its organization, materials, occupations, processes, and products;	with industry, its organization, personnel, systems, techniques, resources, and products;	with industry, its organization, personnel systems, techniques, resources, and products;	{none}
Society	and of the problems of life related to these changes."	and with the problems and benefits resulting from the technological nature of society "	and their social/ cultural impact."	and their socio- cultural impacts."	and in assesing the appropriateness of technological actions."

Figure 1. Prominent definitions of industrial arts and technology education

post-World War II era of industrial arts. Calling it the "basic text for professional courses in industrial arts teacher education" and "famous," they wrote that *Industrial Arts in General Education* was "used by colleges throughout the country" (p. 35.)

Maley's *Maryland Plan* definition was quite similar to Wilber's; the main disparity between the two is Maley's inclusion of a passage concerning technology. This definition is closely related to Bonser and Mossman's as well, and is comprised of four elements: education, technology, industry, and society. Industrial arts, he said, was:

> ...those phases of general education which deal with technology, its evolution, utilization, and significance; with industry, its organization, materials, occupations, processes, and products; and with the problems and benefits resulting from the technological nature of society (1973, p.2).

Jackson's Mill

The definition of the term "industrial arts" evolved further with the publication of *Jackson's Mill Industrial Arts Curriculum Theory* in 1981. As opposed to considering industrial arts "phases of general education," as Wilber had in 1948, and Maley had in 1973, the Jackson's Mill document began the practice of characterizing the study of industrial arts as a "comprehensive" study. Otherwise it is very similar to Wilber's and Maley's: "Industrial Arts is 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 impact" (Snyder and Hales, n.d., p. 1). The Jackson's Mill definition retains the four-element formula of education, technology, industry, and society.

Definitions of "Technology Education"

Almost ten years after DeVore and Lauda suggested "that the Industrial Arts profession change its name to technology education to reflect cultural reality" (1976, p. 145), the American Industrial Arts Association issued this definition of *technology education*:

> ...a comprehensive, action-based educational program concerned with technical means, their evolution, utilization, and significance; with industry, its organization, personnel systems, techniques, resources, and products; and their socio-cultural impacts (1985, p. 25).

Whereas in wording, the AIAA definition is nearly identical to the one advocated in the Jackson's Mill document, and whereas it retains the educational–technological–industrial–societal formula, the striking difference between the definitions is that one defines *industrial arts* and the other defines *technology education*, while some contend that there are “substantial differences” (Hayden, 1991, p. 30) between the the two.

In addition to its close similarity to the Jackson’s Mill definition, the AIAA’s is a definition that does not vary greatly from Bonser and Mossman’s. In fact, not only do the two essentially emphasize the same points (the main disparity being the AIAA’s greater preoccupation with concepts related to industry), they do so in the same order.

Continuing the trend back toward the spirit and design of Bonser and Mossman’s 1923 definition is Wright, Israel and Lauda’s 1993 definition for technology education, published by the ITEA: “an educational program that helps people develop an understanding and competence in designing, producing, and using technology products and systems and in assessing the appropriateness of technological actions” (p. 4). Although its similarities to the AIAA definition may outweigh its differences, the phrasing of this definition is highly signifcant, as it revisits Bonser and Mossman’s three-element formula, finally eliminating the concept of industry (see Figure 1).

Similarity Of Definition Versus Similarity Of Philosophy

Although these similarities do not authenticate claims that the philosophies suggested by Bonser in 1923 (industrial arts), and by the AIAA in 1985 (technology education) were the same, it is safe to assume that by virtue of their definitions being quite similar, their philosophies may be related. Directly under the heading “The Philosophical Dimensions of Education,” Morris and Pai (1976) state that “one way of simplifying (education) is to separate its basic elements and to let those elements *define* the area of disclosure” (p. 8 emphasis added).

It seems clear that the “famous” and “widely accepted” definition of *industrial arts* and the profession’s official definition of *technology education* contain the same basic elements, thereby defining the same area of disclosure. By extension, then, the “philosophical dimensions” of technology education are not essentially new.

The Strategies of Technology Education Are Not New

If technology education and industrial arts are not significantly disparate philosophically, then perhaps the difference between them, assuming it to be more than nominal, is methodological. Kemp and Schwaller, in editing the 1988 CTTE yearbook, repeatedly (e.g. p. xiii, 36, 205) divided “approaches that are recommended as instructional strategies for technology education” into six categories (and devote one chapter to each): “the teaching of concepts, using an interdisciplinary approach, emphasizing social/cultural impacts of technology, developing problem solving skills, being able to integrate the systems of technology, and interpreting industry. It is suggested,” they went on to say, “that the technology teacher incorporate as many as possible into the classroom and/or laboratory."

Four of those six categories will be used individually to illustrate that, just as the philosophy of technology education is not new, neither are the teaching strategies associated therewith. The origins of other popular methodologies will be discussed as well.

Integration, or the "Interdisciplinary Approach"

> "Teaching technology education with an interdisciplinary approach has been explored by determining the nature of disciplines, discussing the uses of an interdisciplinary approach and planning ways in which to implement an interdisciplinary approach" (Zuga, 1988, p. 71).

An instructional strategy prevalent in technology education is that of integrating technology with other subject areas taught in the public schools. This "interdisciplinary approach"[1] is a recognition in education that subject areas are inherently related and should be taught in such a way so as to suggest this to students. This methodology was suggested long ago in industrial education:

> In the early nineties the idea began to develop that manual training should not be an isolated special subject. Instead, consideration should be given to the mutual influences of this subject and the other studies of the school. Bennett, in 1892, told how manual training, when properly taught, could integrate the other studies of the school (Stombaugh, 1936, p. 148).

Integrating other subjects in problem-solving also has a long history. "Educators know," Marot wrote 1918, "as we all do, that industrial problems carry those who participate in their solution into pure and applied science, the (economic) market..." (p. 110). In listing the general objectives of the industrial arts, Sotzin emphasized the aim "to correlate and vitalize other school subjects" (1929, p. 36). In his 1919 book *Principles and Methods of Industrial Education*, Dooley devotes a chapter each to teaching children science, math, and English "in the shop."

[1]The reader may wonder as to the interchangability of the terms "integration" and "interdisciplinary;" Zuga, in discussing her yearbook chapter, wrote: Recognizing and integrating the knowledge of other disciplines into a technology education course is teaching with an interdisciplinary approach (p. 58). It would seem safe to generalize that these terms may be used interchangeably, and that references in literature using either term may be assumed to refer to the same general concept.

Nowhere has the interdisciplinary approach to industrial arts been more comprehensive than in the elementary school. "In elementary schools, including the first six grades, little or no formal work is now carried on in separate industrial-arts classes. Here the manipulative work is done in close coordination and integration with the total study program of the school" (Ericson, 1946, p. 276). In fact, in 1955, the Nevada Department of Vocational Education stressed that, in elementary schools in that state, there were no separate industrial arts programs. "Industrial arts activities are integrated..." (p. 58). In secondary education, historical examples of integration include the "Industrial Prep" project, a three-year interdisciplinary program operated by the Hackensack, NJ school system for vocational students. In a student's sophomore year for example, she or he would enroll in a curriculum integrating biology, English, architechture, and industrial education (Hackensack Public Schools, n.d.). The "Richmond Plan" of the late 1950s integrated English, science, mathematics, drafting, and shop subjects (Smith, 1966; Cogswell Polytechnical College, n.d.).

Emphasizing Social/Cultural Impacts of Technology

> "One major difference between traditional industrial arts and contemporary technology education is the inclusion of the social and cultural aspects of technology. This includes how technology influences the social systems of a society. Understanding these relationships will contribute to making students technologically literate" (Kemp and Schwaller, 1988, p. 21).

It is probably true that the inclusion of the social and the cultural did not often take place in *actual* industrial arts but would take place in *ideal* technology education. But certainly it can be demonstrated that the investigation of the socio-cultural aspects of technology, as well as the impact of technology on the natural and social environments, was a major component of the theory and philosophy of the inclusion of industrial arts in general education.

In discussing the place of industries in elementary education ninety years ago, Dopp wrote:

> Whatever activity we consider (for industrial education) of whatever age, if it be a significant one we find that it is because of its relation to the natural and social environment ... It was not an accident that the mariner's compass, gunpowder, and the printing press appeared when they did. Neither was it an accident that the pyramids were erected in regions abounding with limestone and syenite ...the permanent element in all these is directly related to the natural and social environment of the age and not to that of some other place and time.

Let us apply this truth to the education of the child (Dopp, 1902, p. 100).

"The social and liberal elements in the study of the industrial arts," Bonser said a decade before the publication of his and Mossman's eminent definition, "are more significant than are the elements involved in the mere manipulation of materials" (Bonser, 1914, p. 28). And just as culture was seen as being an important part of industrial arts, industrial arts was viewed as an important part of culture. In 1920, Griffith wrote that "an individual whose education and experience has consisted solely in academic training along some narrow line if intellectual activity can hardly be considered as broadly appreciative (of culture as the) people who make their living thru [*sic*] working with their hands" (p. 57).

Not only *industrial arts* educators felt that there was a strong association between industrial education and the cultural education of children. An analysis during the 1920s by another scholar of the industrial arts revealed that "among the most frequent claims and recommendations listed for the industrial arts by authors of text-books *in the field of secondary education* are the following: a. it is a cultural subject; b. it enriches the curriculum; c. it adds to social intelligence; d. it gives an insight into social end economic values; e. it trains in problem solving ..." (Sotzin, 1929, p. 21; emphasis added).

As Ericson said nearly fifty years ago, "industrial-arts teaching can render a service at this point by assisting in a reinterpretation and enlightenment of the concept of culture to American youth" (Ericson, 1946, p. 260).

Problem-solving

In technology education, "problem solving is a process of seeking feasible solutions to a problem" (Hatch, 1988, p. 91). Although problem-solving may historically have become prominent in industrial arts literature later than other emphases of industrial arts education, Dopp (1902), Bonser (1914), Marot (1918), and Griffith (1920) all considered the topic to be a methodology integral to industrial arts in the first two decades of this century. At the end of the next decade, Sotzin listed "problem-solving" as being among the "claims and recommendations" most often made by educators for industrial arts (Sotzin, 1929, p. 21).

But claims and recommendations in theory do not always correlate to results in practice. Browning and Greenwald recently described problem-solving as "a goal never lived up to in many Industrial Arts programs" (1990, p. 9).

By the end of World War II, the idea of teaching not only problem-solving, but other "minds-on" skills in industrial arts was becoming popular. Wilber, in his *Industrial Arts in General Education*, insisted that "the ability to think critically can be developed only through practice in solving problems" (1948, p. 9); two years earlier, one of his contemporaries suggested that:

> Many other industrial arts teachers now have caught the vision ... Clear thinking, reasoning, creative thinking, problem solving (call it what you may) is a far more important basis of educational objectives in the lives of thirteen, fourteen, and fifteen year-old boys than one centered on skills and information... (Friese, 1946, p. 88).

Calvin M. Street also saw the relation between problem-solving and the scientific method as having a place in the teaching of the industrial arts:

> A further element of general education which is appropriate, not only to the industrial arts teacher, but to all citizens, is that which may be described as the area of important methods and tools of problem solving. Since the scientific method of problem solving is deemed the most valid way that human beings have discovered for solving problems, it becomes obvious that each person should develop...skills in the use of this method" (1956, p. 177).

Interpreting Industry

> "Technology in communication, construction, manufacturing, and transportation will continue to change at a rapid pace... If this is the plan of American industry, technology education teachers must plan to make changes. They must plan to make the curriculum reflect society today" (Bjorklund, 1988, p. 121).

Of all of the approaches to teaching technology education, this may be the best demonstration for the argument that technology education is simply renaming of industrial arts. It seems unlikely that veteran industrial arts teachers will differ with this instructional strategy (defined as such by Kemp and Schwaller, 1988); many may have been trained during the popularity of the *American Industry* or *Industrial Arts Curriculum Project* (IACP) movements of the 1960s, the latter of which Donald Lux, one of its founders, fifteen years later called a "course in industrial technology." "The fundamental question to be answered," he said of the IACP, "was 'What is industry?'" (Lux, 1979, p. 150).

Decades before the inception of the IACP, the interpretation of industry was already considered by some as either the primary purpose, or one of the most important, of industrial arts. Ericson's third objective for industrial arts was to impart to students an "understanding of industry and methods of production, and of the influence of industrial products and services upon the pattern of modern social and economic life" (Ericson, 1946). Various other objectives involved industry as well.

Wilber's first objective for industrial arts was "to explore industry and American civilization;" the manifestation in the instruction of students was that "they will read about and *interpret* industry" (1948, p. 42; emphasis added). Wilber's definition of industrial arts emphasized the interpretation of industry, not only via its common "organization, materials, occupations," and the like, but also through "the problems resulting from the industrial and technological nature of society" (1948, p. 2).

Martin and Luetkemeyer (1979) enumerated various efforts, some more interpretive than others, to include in industrial arts the content of contemporary industry, as suggested by Bjorklund: "If this is the plan of American industry, technology education teachers must plan to make changes" (1988, p. 121). These included one in 1942 in which students across the country produced nearly a million model aircraft for the military in a "new curricular approach" sponsored by the United States Office of Education and the United States Navy.

Other Technology Education Methodologies

These four common strategies are by no means the only teaching methodologies common in technology education which were also used in industrial arts; many other strategies which today might be considered novel have been in use for decades by industrial arts teachers. For example, not long after Sputnik, Jones (1958) noted that group activity was becoming prevelant in industrial education. "It is important that pupils learn to work together. *Many* (industrial arts) instructors," he said, "devise projects that require such group action" (p. 156 emphasis added).

Ten years earlier, Newkirk and Johnson noted that instruction in the industrial arts imparted to students an adaptability not found in other subjects in the school. "Industrial Arts Education gives an over-all training in industrial adaptability that is most helpful to those who find it necessary to change their type of work from time to time because of the technological developments or changes in the needs of society" (1948, p.8). And a quarter-century before that, in investigating industrial education in Minnesota, Smith found that the second most common objective there for the industrial arts was "to afford information and experiences that assure a broader view of the industrial world and make for social adaptiveness" (1924, p. 119). Smith's study was published in the year following the publication of Bonser and Mossman's aforementioned definition for industrial arts.

Years before that publication, Bonser himself emphasized another educational viewpoint that today many leading technology educators are advocating: that this area of education has a specific content associated with it. "The industrial arts, rightly interpreted, contain a body of thought and experience sufficiently vital to human well being to give the subject a place in the elementary and secondary school curriculum on a basis of thorough respectability and validity" (1914, p. 28). Stone (1934) echoed the need to view the industrial arts as a "subject-matter" rather than a "service."

In *Industrial Arts for Elementary Schools*, Bonser and Mossman emphasized that the content of the industrial arts should be an important part of the education of *all* students — another point today recognized but not yet accomplished by technology educators, and often thought of as new. "Is there not also a body of experience and knowledge relative to the industrial arts which is of common value to all, regardless of sex or occupation?" (1923, p. 20).

Similarly, the concept of *experiential* learning has been well established in industrial arts for at least a century. In addition to Dewey's pronouncements on experience and on experimentalism (e.g. Dewey, 1938), other educators emphasized the responsibility of industrial or manual school subjects to provide a forum of experience and experimentation for students. Dopp, in discussing the place of industries in industrial education, sees exploration and first-hand experience as appropriate for industrial education. "In so far as the completion of the situation requires the child to exploit his own environment in the search for real or illustrative materials of industrial processes, ... experimentation (finds its) place" (Dopp, 1902). Marot takes a more negative view of the situation:

> Educators know there is adventure in industry, but they believe that the adventure is the rare property of a few. They believe this so firmly that they surrender this great field of experience with its priceless educational content without reserving the right of such experience even for youth ... They are not alone in their lack of courage to admit that limiting this experience perverts normal desires and creates false ones" (Marot, 1918).

More recently the importance of experience in industrial arts has been stressed in literature pertaining to teacher training as well (e.g. Jones, 1958).

Among the other distinguishing characteristics of technology education which are ascertainable in the literature of industrial arts are team teaching (Bernucci, et al., 1963) and the prohibition of failure (Friese, 1934), as well as the "discovery method" and the "inventive method" of learning (Griffith, 1920). Ericson (1946) confirmed that the "discovery, or problem-solving method" was in "common use" in industrial arts (p. 45).

Conclusion: The Need for Change

Just as the definition and philosophical base for technology education have existed for years as the ideals for industrial arts, so have its teaching strategies and methodologies. Unfortunately, there is little evidence that this philosophy or these strategies have ever been seriously implemented on any large scale or for any perceptible length of time.

Today the profession appears to be aware of the need for a change from industrial arts. That change, however, may not be in philosophy or in strategy; rather, perhaps that change should be away from ignoring the ideal and toward attaining it. Technology education, in this light, can be seen as the final realization of the promise of the industrial arts — not something foreign to it.

This is not a position held by all. "Technology education must be thought of something new," Pullias wrote recently. "It has no place in an old industrial arts, or shop paradigm. To say that technology education can exist in the old setting is totally inaccurate." (1992, p. 3)

The distinction that must be made here is between theory and practice, between the real and the ideal — what Colelli (1989), in the context of industrial education, has termed the "theory-practice gap." Perhaps ideal technology education has no place in the "paradigm" of the way industrial arts has historically been practiced. But the challenge in interpreting past practice is not to criticize it in an attempt to inflate the value of that perceived as new. It is to learn from it in an attempt to recognize the value in that established as eminent.

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