Chapter 1

Introduction and the Problem

Introduction

Throughout the history of the manual labor movement, manual training, manual arts, industrial arts, and technology education, educators have contemplated the philosophical underpinnings of the discipline and attempted to devise appropriate curriculum . Assuming that the descriptors listed above constitute a chronological progression of a single discipline, and further, assuming that the name changes were necessitated by fundamental shifts in the discipline's emphasis, then two very simple but subtle conclusions must follow: some themes or aspects of the discipline changed while others remained constant.

To some degree this study was concerned with change, particularly changes in the curriculum that occurred or perhaps should have occurred as a result of shifting from the industrial arts to technology education. However, equally important was the lack of change to the foundational disciplinary themes - general education and technological literacy . Even though the phrase *technological literacy* only recently (within the last 10 to 15 years) gained widespread acceptance, a review of literature revealed that the essence of these guiding principles has been integral to the philosophy of the field for approximately 100 years, during which time the name, the curriculum, and the content have varied.

Assuming one subscribes to the notion that the discipline has evolved, and assuming that the proponents of the discipline have promoted general education and technological literacy consistently throughout the last century, then one might ask if the disciplinary name changes and related curriculum revisions actually increased the potential for successfully addressing these fundamental goals? Additionally, it might be profitable to consider whether curriculum organizers such as construction, have been reevaluated in accordance with the change from an industrial focus to a technological focus.

While the prevailing leaders in the discipline obviously considered technology to be a more promising field of study than industry, clearly some confusion arose by it being introduced into industrial arts. Disciplinary politics notwithstanding, the review of literature performed for this research suggested that various attempts to engage technology as a means for studying the industrial world, as opposed to the study of industry falling within the realm of technology, contributed to the turmoil. In William E. Warner's *A Curriculum To Reflect Technology* we find perhaps the first examples of this. Although the apparent intention was to focus on technology, certain portions of the document presented industry as the primary source for curriculum development. The opening paragraph of the section titled “The Manufacturing Division” pointed out that, “this is an enrichment of the old ‘general shop’ but presented in the context of technology" (Warner, 1947/ 1965, p. 33). Even though this statement suggested a change in emphasis, it failed to clarify any real difference between the study of technology and the study of industry. In fact, it went on to offer curriculum based on "the manufacturing industry . . . grouped into nine main headings" (p. 33). In subsequent pages, those headings were all presented as industries which were defined according to certain categories of materials. In "The Management Division," the author wrote, "if we are to reflect technology, we must use personnel management organizations" (p. 7). Since personnel management is not usually a concern outside the business environment, this statement seemed most likely to apply to industry. This impression was validated when the author expanded on "the need for organization" (p. 7) and wrote that, "industry in its explosive development after the turn of the century found the effective organization of its personnel to be as necessary as the raw material and machinery" (p. 7).

In his conclusion, Warner indicated that the Industrial Arts was a general education subject "in a free society concerned with providing experiences that will help persons of all ages and both sexes to profit by the technology" (p. 47). However, he also considered it capable of, "providing specialized elements of the technical program and a sound basis for a possible industrial-vocational education" (p. 47).

In 1966, DeVore argued for, "an industrial arts curriculum based upon the study of Man and technology. " He stated that it "provides a better base from which to implement the purposes and objectives of general education" (p. 2). Further he wrote that, "a knowledge of man's technology is vital to the understanding of any culture; and identifies a knowledge area meeting the criterion of a discipline in the truest sense of the term" (p. 2). While DeVore carefully laid out the principles for developing a taxonomy and advocated "an exhaustive classification" (p. 7), he ultimately restricted the technology curriculum based on industrial arts considerations. This appears to have been in direct violation of the criteria he established. He determined that, the purpose of a taxonomy is not to limit a field of knowledge arbitrarily but to ascertain its totality" (p. 10). Yet later in the same document he delimited the "function of industrial arts in a formal educational program" (p. 10) and wrote,

> The industrial arts are closely related to man's endeavors in meeting his biological-physiological needs. The main responsibility for meeting these needs rests with the agricultural and medical technologies and is not a part of the present consideration. (pp. 11-12)

While Warner and DeVore clearly were concerned with general education and technological literacy, both of them compromised technology to conform to industrial arts limitations. They were by no means alone. The authors of the Jackson's Mill Industrial Arts Curriculum Theory recognized this problem and wrote that, "this document provides a foundation for reconciliation of the divergence which exists within industrial arts - industry and technology" (Hale, J. & Snyder, J., 1981, p. 2). However, in defining "Industrial Arts", Hale & Snyder seemed to place technology and industry on equal levels. They wrote that it was “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 impact” (pp. 1-2).

That industry should have been the focal point of the industrial arts curriculum obviously made sense. But, when the study of technology was promoted as the domain of knowledge from which the discipline would draw its content, the study of industry was no longer sufficient. Industry uses, alters, and invents some technologies but it does not encompass technology in its entirety. As a result of the confusion caused by merging or overlapping these two subject areas it became important to question whether historically accepted curriculum organizers adequately reflected the philosophy and content of technology or were they simply carried over without a review of their appropriateness or effectiveness? In an article titled *“Technology or Industry: Which Shall It Be?”,* McCrory (1985) stated that

> the two camps differ dramatically . . . [and] have important program implications for how content is derived, what learning activities are selected, what teaching strategies are used, what instructional materials are chosen, and how facilities are organized. (p. 2)

McCrory observed that technology education promoted a “macro view of technical systems and their impacts on individuals and society” (p. 2) while “the industrial technology camp prefers to focus on the technologies of industry” (p. 2). In addition he felt that their mission was qualitatively different in that technology education aimed at general education where industrial technology “focuses on preparing young people for careers in contemporary industries” (p. 2).

To discover, then, the existence of changes which were substantive as the discipline evolved into technology education, one must look beyond the descriptors to the principles on which they were founded. The complexity of this type of examination can be demonstrated through a careful review of two well-known definitions. In 1923, Frederick Bonser and Lois Mossman wrote what many have considered to be the original and conclusive definition of the industrial arts. They wrote, “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 their changes” (p. 5). In Savage & Sterry’s (1990) *A Conceptual Framework For Technology Education* we find, “technology is a body of knowledge and the systematic application of resources to produce outcomes in response to human needs and wants” (p. 7). On the surface these statements appear quite different. However, the differences that do exist are rather subtle.

Table 1. A Comparison of Bonser & Mossman's Definition of Industrial Arts and the Definition of Technology Forwarded by Savage & Sterry

Bonser & Mossman's Definition of Industrial Arts		Savage & Sterry's Definition of Technology
A study	↔	A body of knowledge
of changes made by man in the form of materials	↔	and the systematic application of resources
to increase their value	↔	to produce outcomes
and of the problems of life related to their changes.	↔	in response to human needs and wants.

Aside from the use of the word "man" which is now perceived as inappropriate, "changes made by man in the forms of materials" seems quite similar to "application of resources to produce outcomes". Logically, doesn't "study" imply the existence of "a body of knowledge?" Don't we change the form of materials "in response to human needs and wants"? Certainly altered forms of materials are more valuable if they satisfy our wants and needs. Finally, aren't unfulfilled wants and needs often perceived as "the problems of life"? Even though almost seventy years and numerous curriculum revisions separated these statements it seems quite possible that confusion could arise as to what if any philosophical changes occurred.

Presumably the previous definitions were written with the intention of providing a sense of clarity and direction for the discipline. One would assume that curriculum developers have considered these definitions and attempted to devise appropriate curriculum and content. Yet, given the similarities and the ambiguities, and therefore, the potential for misinterpretation, it seemed important to reconsider the discipline's fundamental concepts and synthesize the essential qualities. This lack of clarity also provided support for investigating how curriculum organizers are perceived by faculty in technology teacher education programs. It was believed that the faculty, to a degree, pass on their understanding of the discipline and its precepts to students who go on to teach technology to our children. Further, because construction technology impacts our lives from the moment we wake, throughout the day, and even while we sleep, it was a worthy topic for research. Specifically, this research questioned how construction was viewed by experts in the discipline who perceive general education to be fundamental to technology education.

Because construction was originally promoted as a curriculum organizer during the industrial arts phase of this discipline, it was important to ascertain if it would function appropriately within the technology education context. While construction seems to have stood the test of time, its ability to address the goals of general education and technological literacy was seen as paramount. This dissertation, therefore, focused on synthesizing functional definitions for general education, technological literacy, and construction; and then determining whether a level of compatibility existed.

Significance of the Study

The organizational name change from the American Industrial Arts Association to the International Technology Association in 1985, along with the introduction of curriculum proposals such as *Jackson's Mill Industrial Arts Curriculum Theory* and *A Conceptual Framework for Technology Education* represented major shifts in the discipline. They were cause for reevaluation of the industrial arts/technology education philosophy, curriculum, and content. In 1993, Wicklein published the results of a Delphi study which identified the critical issues and problems facing technology education and determined that "curriculum development should be given priority in further study and developmental efforts" (p. 63).

Construction was identified as one of six major study areas or organizers by Warner in 1947. The importance of construction's contribution to the industrial arts was elevated as it was one of only two organizers in the 1966 Industrial Arts Curriculum Project. In 1981, the 21 contributors to the Jackson's Mill envisioned construction as one of the four human technical endeavors within the technological realm of the human adaptive systems. The 1990 *A Conceptual Framework for Technology Education* identified four content reservoirs for technology education and construction was not included. Instead, it was subsumed under the production technology reservoir. In 1996, the *Technology for All Americans: A Rationale and Structure for the Study of Technology* indicated that the three technological systems should be "informational systems, physical systems, and biological systems" (p. 17). Four brief sentences described some of the aspects of physical systems (p.

33) and construction was not mentioned. However, reminiscent of Bonser and Mossman's 1923 definition of the industrial arts, the authors wrote that, "Changing the form of materials to increase their value and purpose provide the basis for production in physical systems. In addition under the heading "Using Technological Systems" (p. 21) we find that "People use technological systems to satisfy their needs and wants. This could be as fundamental as preserving life with food and shelter" (p. 21). Therefore, while only referenced indirectly, it appears that the technological system known as construction may still have some significance in our lives and in the discipline.

This dissertation was conducted in hopes of making a contribution toward a better understanding the guiding principles of the discipline and specifically the importance of construction as a curriculum organizer when viewed as a component of general education and technological literacy.

Statement of the Problem

The fundamental purpose of this study was to determine the relative importance of construction as a curriculum organizer when viewed from a general education perspective. To accomplish that goal it was necessary to determine the respondents' tendency to favor either a general education emphasis or a preparation for industry emphasis with respect to K-12 technology education programs. This study also investigated how the construction curriculum might be allocated such that the needs of the whole person could be addressed. Therefore, the spheres of human/technology interaction model was devised which provided the means for looking at the relative importance of technology education curriculum organizers as they related to personal-life, work-life, and civic-life. The relative importance of construction was determined and then compared to actual practice in technology teacher education programs. Finally, to determine how construction is incorporated into technology teacher education programs and also how construction is taught in such programs required the collection of specific data. This data was collected from technology teacher education programs in the United States.

The following statements were framed for the purpose of organizing the research.

1) The first problem was to determine the relative degree of importance of the curriculum content organizer, construction, as compared to other curriculum organizers, when rated by technology teacher education faculty members identified in the *Industrial Teacher Education Directory 1996-97 35th Edition*.

2) The second problem was to determine the respondents' tendency to value either general education or preparation for industry in K-12 technology education programs.

3) The third problem was to determine the effect of the respondents' tendency to value either general education or preparation for industry on their allocation of curricular emphasis among three spheres of human/technology interaction: personal-life, work-life, and civic-life.

4) The fourth problem was to determine the effect of the respondents' tendency to value either general education or preparation for industry on the relative importance they attributed to construction within each of the three spheres of interaction.

5) The fifth problem was to identify the level of agreement between the respondents' perceptions about the relative importance of construction and the percentage of technical course work devoted to construction (as opposed to other curriculum organizers) that is required in technology teacher education programs.

6) The sixth problem was to determine certain aspects related to the status of construction in technology teacher education programs in the United States. Data were collected to identify: a) whether course work in construction is offered, b) whether construction course work is required or an elective, c) what instructional methods were used to enhance learning about construction, d) what percentage of construction courses were devoted to residential or commercial/industrial or infrastructure, and e) whether construction courses tend to be taught with a content orientation or a process orientation.

Delimitation

The following delimitation was accepted when conducting this study:

- The study was delimited to teacher education programs in the United States of America that reported graduates in the areas of technology education, industrial technology education, industrial arts, industrial education, and other non vocationally oriented teacher education programs as identified in the Industrial Teacher Education Directory 1996-97.

Assumptions

The following assumptions were made when conducting this study:

- Faculty in technology teacher education programs to some degree pass on their opinions and or biases regarding the philosophy and principles of the discipline to students under their direction.

- When combined, Agriculture, Communication, Construction, Educational Technology, Energy, Health and Medicine, Manufacturing, Military, Recreation and Entertainment, and Transportation represent an acceptable and exhaustive set of curriculum organizers for technology education.

Operational Definitions

Construction. A site-specific human enterprise which involves the use of tools and devices, methods, and systems in processes that convert and/or consume resources for the purpose of creating, maintaining, and modifying environments in response to perceived wants and needs.

Content. Those separate elements which comprise the knowledge base of a field of study.

Curriculum Organizers. Primary level subdivisions of an educational discipline or a field of knowledge that are used to define an area of study; logically determined, mutually exclusive categories which incorporate an exhaustive group of related content elements - such categories support the philosophy of the discipline**.**

General Education. Education directed toward “the full development of the human personality” (Piaget, 1973, p. 41).

Literacy. The combination of domain specific knowledge and ability that constitutes functional competency; wherein such domain specific knowledge and ability can be subdivided into measurable dimensions of a multidimensional construct.

Technology. Knowledge applied and created in response to perceived wants and needs, which alters the human and non-human environments through the use of tools or devices, methods, and systems in processes that convert and/or consume resources.

Technological Literacy. A competent level of knowledge and ability related to altering the human and non-human environments through the use of tools or devices, methods, and systems in processes that convert and/or consume resources; in response to perceived wants and needs.