A STATUS REPORT OF WISCONSIN PUBLIC SECONDARY TECHNOLOGY EDUCATION PROGRAMS AND THEIR HISTORICAL, COMPARATIVE NATURE WITH NATIONAL AND STATE STUDIES

By

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ABSTRACT

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The purpose of this descriptive study was to provide benchmark data regarding the status of Technology Education Programs in public secondary schools in the state of Wisconsin. This study solicited information from a representative sample of Wisconsin TE program chairpersons regarding program demographics, current practice, and program purpose/barriers. Specifically, a 65-question survey was mailed to 175 department chairpersons requesting feedback on program name, mission, facilities, gender and minority enrollment, course offerings, class sizes, faculty and student demographics, instructional methodology, curriculum preparation, course titles, program purpose, and barriers to building, maintaining, and improving upon an exemplary TE program. Survey data was compiled and subsequently analyzed utilizing SPSS software. The resulting information was then presented in two formats: a) as a conglomerate group and b) by school size (small, medium, and large cohorts).

Current findings identified the characteristics of Wisconsin Technology Education programs, faculty, and students. The research examined technology education curricula, content, and instructional methods followed in the state of Wisconsin at the high school level. Furthermore, the study determined the course titles currently being taught and discussed what those titles might suggest about the status of the profession. The findings also revealed the opinions of Technology Education regarding purpose and impediments to exemplary curriculum. Finally the research compared the current status of Wisconsin Technology Education programs with those of the industrial arts/technology education programs of the 1960s, and 1990s at state and national levels.

The current research was significant in that it provided fact-based evidence concerning the current condition, respective trends, and comparative nature to previous findings regarding Wisconsin Technology Education programs to a wide range of professionals. The Department of Public Instruction and higher education institutions may utilize the data to warrant development of state-wide initiatives, supervisory support for teachers, increased program funding, alterations in teacher preparation, and mandates for specific in-service training. Legislators may find the information useful when writing policy and forming budget proposals regarding the state education system. At the local level, school districts and technology education teachers can exercise this new knowledge when evaluating programs and timing the implementation of new curricula.

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Chapter 1

Introduction

Technology continues to play an increasingly significant role in society by affecting everyday existence via the way people travel, communicate, conduct business, and consume goods and services. As technology advances, the ability to understand, utilize, and manage it effectively on both personal and professional levels procures even more importance. Therefore, it is quite evident that technology is a fundamental aspect of human activity. Subsequently, it might be expected that an important step in this technological progress is the realization that the United States' technological superiority, affluence, security, and democracy itself will not continue unless the populace is educated to take advantage of the opportunities that exist – likened to a required and significantly supported educational initiative (ITEA, 1996). However, this assumption is far from the truth.

Even with a history traceable to the dawn of civilization, technology remains, in the view of its critics, at the margin of the public school curriculum and consciousness of the public (Lewis, 1995). Historical research shows that the technology education discipline has undergone significant changes from the early progenitors of imitation/apprenticeship and subsequent curricular inception as "manual training" in the late 19th century. From manual training and manual arts to industrial arts and technology education, the profession has tried to transform itself into a more core-centered arena of general academia. Although these name shifts supported curriculum/content change, defining their progressions as paradigm shifts has not followed without contention (Sanders, 2001).

Whereas the central role of an educational institution is to offer a curriculum that provides students a basic understanding of concepts, theory, practice, and the society in which they live, the educational system does not always agree upon what is most important. The debate over continuities between intrinsic and extrinsic content and liberal or vocational prescriptions of processes within a subject area further muddy the waters for the discipline related to technology (Streichler, 2000, and Lewis, 1999). Furthermore, it is important to note that there can be a wide discrepancy between the prescriptions and the practices when discussing the discipline (Lewis, 1999). Though its importance in prescriptive theory is unquestionable, technology as an academic subject in practice continues to struggle for legitimization, justification, and a position within the academic core arena (Lewis, 1995).

With Dewey (1916) purporting that rationalized knowledge represents the perfected outcome of learning, implying that the intellectual certainty of subject matter is dependent upon science (or in other words, that the content and methodology of a discipline should be based in research), one would expect that a discipline as crucial as technology education would be backed with exhaustive research. On the contrary, there has been little research upon which to draw scientifically based conclusions and ". . . the evidence that does exist is suggestive of relatively little time spent investigating the practice of technology at the local, school-based level (Petrina, 1998). Both Rudiger (1961) and Schmitt & Pelley (1966) argued in line with Dewey's philosophy of improving education by stating that sound educational planning should be based on knowledge of the present status of the discipline without which it is very difficult to move forward (Rudiger, 1961). Later, Dugger et al. (1980) and Sanders (2001) expounded upon these ideals as justification for updated research. With these lines of thought came to fruition three exhaustive national studies of technology education/industrial arts programs as well as the first and only State of Wisconsin study of the same.

Prior to 1960, very little research had been conducted at any level regarding industrial arts (technology education's most recent precursor). Manual training, manual arts, and industrial arts enjoyed many years of growth without scientifically supported inquiry. Post World War II, and more precisely post-Sputnik, education reform initiatives without a doubt committed American society to scrutinize all areas of education – industrial arts being weighed upon heavily. As a result of very little national information being available, Marshall Schmitt and Albert Pelley, on behalf of the U.S. Department of Health, Education and Welfare, conducted a national study of public secondary school industrial arts programs in 1962-63: Industrial Arts Education—A Survey of Programs, Teachers, Students, and Curriculum published in 1966. The purpose of their study was to establish benchmark data by revealing the breadth of instruction and the concentration of instructional content within the various courses in industrial arts (Schmitt & Pelley, 1966). The research focused on program/faculty/student demographics, program purpose, instructional methods, current practices, and major problems confronting teachers.

Sixteen years after the first national study, William E. Dugger and his colleagues conducted the second comprehensive study of the Profession. The Standards for Industrial Arts Program (SfIAP Project) was designed similarly to the previous research and consisted of nearly all the same objectives. The most meaningful conclusion drawn from the research was that relatively little change had occurred since the early 1960s (Dugger et al., 1980).

In 1999, Marc Sanders, Technology Education Professor at Virginia Tech, conducted the most recent national study regarding technology education programs: New Paradigm or Old Wine? The Status of Technology Education Practice in the United States, published in 2001. It too was based on the framework of the previous national studies thus incorporating their objectives. Sanders provides evidence that substantive changes have occurred in practice with respect to program names, discipline purpose, students served, and instructional methods employed. However, he is quick to point out that ". . . the magnitude of change pales in comparison with the shift from Ptolemy's view of the universe (earth at the center) to the Copernican view (sun at the center)." In other words the data suggests a decided, evolutionary shift rather than a total transformation (Sanders, 2001).

Akin to the national research, Robert Rudiger, Professor of Education at Stout State College (University of Wisconsin-Stout), headed a committee from the Wisconsin Industrial Arts Association which conducted a survey of public secondary school industrial arts programs in the state: Status of Industrial Arts in the Public Secondary Schools of Wisconsin, published in 1961. This 1960-61 study included similarly worded objectives as the Schmitt & Pelley study but also considered additional variables. The Wisconsin research consisted of additional items such as the role of professional organizations and the extent to which local and state agencies' supervisory practices affect programs. It is important to note that the Wisconsin study was conducted before the first comprehensive national study. Perhaps this would imply that the state was quite progressive in its efforts to bolster the significance and promote positive change in the industrial arts/technology education programs. However the necessary updated research to support such claims never transpired thus leaving a void in regard to the status of Wisconsin industrial arts programs through present time.

All of this begs the question, to what extent does current practice in Wisconsin technology education programs differ from that of previous paradigms? While many have speculated regarding a "new paradigm" at the national level, there has been a void of research upon which to make such claims (Sanders 2001). If professionals in the discipline are vying for more research at the national level to make such claims, such cries at the state level should be even louder as no updated study has been conducted since 1961 from which to draw conclusions.

Statement of the Problem

Although discipline name changes and subsequent curriculum changes have occurred, prescription within the technology education profession is not necessarily synonymous with practice. Furthermore, a relatively insignificant amount of outdated data currently exists regarding the status of technology education practice at the local, school-based level. This precarious position prohibits program evaluation, proper comparative analysis, and subsequent future program progress.

Purpose of the Research

The purpose of this research was to describe current programs and practices of public high school technology education in Wisconsin and compare the findings with those of previous national and state studies. This study was based upon previous investigations conducted by Rudiger (1961), Schmitt & Pelley (1966), and Sanders

(2001), which examined technology education/industrial arts programs at the state and national levels. The results of the current research and comparisons to that of previous state and national studies of the current research can therefore be utilized in evaluation of course content, instructional practices, and overall program effectiveness. The findings of this inquiry also will contribute significant base data from which development of new curriculum, mission statements, and vision may arise. Furthermore, this research analyzed current trends and determined whether the profession is at a crucial juncture thus encouraging teachers to institute change.

Research Objectives

The following research objectives which framed this investigation followed closely with the previous studies explained above:

1. Identify the demographic characteristics of the school, technology education program, faculty, and students
2. Examine the current technology education curricula, content, and instructional methods followed in the state of Wisconsin at the high school level.
3. Determine which course titles are currently being used in Wisconsin public secondary technology education programs and decipher what these titles suggest about the status of the profession.
4. Examine the opinions of the technology education programs regarding purpose and barriers to having exemplary curriculum.
5. Upon determining the characteristics of current technology education programs within the state of Wisconsin, establish a comparison with those of the industrial

arts/ technology education programs of the 1960s and 1990s nationally and 1960s statewide.

Justification of the Research

A study of Wisconsin public high school technology education programs was justified on many levels. First, a lack of investigation into the realm of current practices within technology education supported continued research in this arena (Petrina, 1998). In fact the examination of current practice within this state had not been conducted in over forty years; and resulting curriculum improvement initiatives had never received follow up investigation (Rudiger, 1961). It was important to address how far the field had advanced, or not advanced, with respect to the ideals promoted throughout the profession regarding transition from industrial arts, expanded mission statement, and call for technological literacy for all (Sanders, 2001). Therefore it was imperative to create a new origin from which timely and/or more exhaustive studies could be directed to help further the knowledge base and overall effectiveness within the profession.

Significance of the Study

The research herein was inherently important to a wide range of professionals because it provided them with fact-based evidence concerning the current condition, respective trends, and comparative nature to previous findings regarding technology education programs – without such knowledge of the present condition, sound educational planning could not occur.

1. The State Department of Public Instruction and higher education institutions may utilize the data to warrant development of state-wide initiatives, supervisory

support for teachers, increased program funding, alterations in teacher preparation, and mandates for specific in-service training.

2. Legislators may find the information useful when writing policy and forming budget proposals regarding the state education system.
3. At the local level, school districts and technology education teachers can exercise this new knowledge when evaluating programs and timing the implementation of new curricula.

Limitations of the Study

1. This study was restricted to the technology education programs of Wisconsin public secondary schools grades 9-12.
2. The survey used in requesting information for this study was a compilation of previously tested survey questions and researcher developed questions.
3. The information received from respondents was limited to the biases, opinions, and insights revealed by the teaching professionals.
4. The study was conducted only through a sampling technique of the Wisconsin public secondary school population while striving to ensure high validity and reliability.

Assumptions of the Study

1. This study assumed that the surveys reached and were completed by the technology education department chairperson.
2. This study assumed that if no such chairperson existed, the survey would be completed by a technology education faculty member with sufficient knowledge to answer said questions.

3. This study assumed that the respondents answered the survey questions truthfully and honestly.
4. This study assumed that the respondents paid careful attention to the questions and took adequate time in answering dutifully.

Definition of Terms

For the purposes of this research, the following definitions shall be utilized in collection, compilation, and analysis of the data:

1. Content – Subject matter (ITEA, 2000).
2. Curriculum – The courses of study that teachers and students cover describing and specifying the methods, structure, organization, balance and presentation of the content (ITEA, 2000).
3. Industrial Arts – The study of the changes made by man in the forms of material to increase their values, and of the problems of life related to these changes (Bonser and Mossman, 1923).
4. Manual Training – The teaching of both wood and metal working, with the accompanying argument that this teaching improved perception, observation practical judgment, visual accuracy, manual dexterity and taught students the power of doing things instead of merely thinking, talking, and writing about them (Woodward, 1969).
5. Technological Literacy – The ability to use, manage, understand, and assess technology (ITEA, 2000).
6. Technology – The human innovation, change, or modification of the natural environment in action that involves the generation of knowledge and processes to

develop systems that solve problems, extend human capabilities, and satisfy human wants and needs (ITEA, 2000).

7. Technology Education – A study of technology, which provides an opportunity for students to learn about the processes and knowledge related to technology that are needed to solve problems and extend human capabilities (ITEA, 2000).

Chapter 2

Review of Literature

The review of literature will consist of analysis of three industrial arts/technology education studies: The first national study entitled Industrial Arts Education: A Survey of Programs, Teachers, Students and Curriculum, (Schmitt & Pelley, 1966); the only Wisconsin survey entitled Status of Industrial Arts in the Public Secondary Schools of Wisconsin, (Rudiger, 1961): and the most recent national study New Paradigm or Old Wine? The Status of Technology Education Practice in the United States, (Sanders, 2001). Analysis of the three major studies will form benchmark data for the eventual comparison to the findings of the current research. This comparison matrix will enable trends, conclusions, and predictions to be drawn in the final chapter regarding the variables analyzed.

A review of literature prior to 1960 provided evidence that very little significant research had been conducted within the technology education profession. In fact, a pair of would-be prominent researchers argued in 1962 that although industrial arts had been taught for over half a century, very little national information was available on the program (Schmitt & Pelley, 1966). Their findings of insufficient research base for a profession looking to justify itself thus guided their purpose for developing an historical research study. Marshall Schmitt and Albert Pelley, on behalf of the U.S. Department of Health, Education and Welfare, conducted a national study of public secondary school industrial arts programs during the 1962-63 school year. Their purpose was to establish national benchmark data by revealing the breadth of instruction and the concentration of instructional content within industrial arts programs (Schmitt & Pelley, 1966). Table 1 illustrates their seven main objectives which focused on defining the attributes of industrial arts programs as purported through demographics, content, teaching methods, course offerings, program objectives, and instructor information.

Table 1

Research Objectives for Industrial Arts Education: A Survey of Programs, Teachers, Students and Curriculum

- Define the instructional program in industrial arts.
- Detect the extent to which schools offer industrial arts education.
- Determine what objectives are emphasized.
- Examine whether the school size affects industrial arts course offerings.
- Determine to what extent industrial arts is required of all students.
- Identify the major problems confronting industrial arts teachers.
- Characterize the demographics regarding the industrial arts teachers.

Note. Source Schmitt & Pelley, 1966.

Akin to the national research, a committee from the Wisconsin Industrial Arts Association conducted a survey of public secondary school industrial arts programs in the state. This 1960-61 study included similarly worded objectives as the Schmitt & Pelley study in that Rudiger collected data regarding content, curriculum delivery, course offerings, enrollment figures, program relationship with academic areas, and professional attributes of teachers. Table 2 identifies the objectives of the Wisconsin research.

Table 2

Research Objectives for Status of Industrial Arts in the Public Secondary Schools of Wisconsin

- Define the instructional program in industrial arts.
- Detect the extent to which schools offer industrial arts education.
- Identify the major problems confronting industrial arts teachers.
- Examine the role of professional organizations regarding industrial arts teachers.
- Determine the extent to which local and state agencies' supervisory practices affect industrial arts programs.
- Determine to what extent industrial arts is required of boys and girls.
- Ascertain the professional and personal qualities of industrial arts teachers.
- Clarify the relationship of industrial arts teachers to the total educational program.
- Ascertain the extent to which industrial arts offerings are being adapted to meet the needs of youth and society.

Note. Source Rudiger, 1961.

Although a national study conducted by Dugger and his colleagues (1980) was conducted 16 years later, neither new objectives nor, more importantly, changes in conclusions were evidenced. By the same token, the state of Wisconsin has not collected new data regarding its programs since Rudiger's study in 1961. Therefore, a jump to the recent most cumulative national study is warranted for comparison purposes. Nearly forty years after the initial studies at the state and national levels, Marc Sanders (2001), of Virginia Tech, thought it imperative to the profession that research must either prove or disprove the notion that a paradigm shift has occurred in name as well as practice.

Sanders, too, sought data collection in similar fashion and paralleled thought processes of the earlier studies. Table 3 defines the research questions that framed this study.

Table 3

Research Questions for New Paradigm or Old Wine? The Status of Technology Education Practice in the United States

- What characteristics of current technology education programs and how do they compare to those of industrial arts programs of the 1960s and 1970s?
- What may be said of the current content taught and instructional methods employed in technology education?
- What course titles are currently being used in technology education programs and what do these course titles suggest about the profession?
- To what extent has the rhetoric of the profession been translated into practice?

Note. Source Sanders, 2001.

Just as many of the practitioners today have trouble discretely defining what technology education is among colleagues, let alone to the public, so was the case forty years ago. The differences between prescription and practice often correlated with the differences in implied definition by the profession and inferred definition of industrial arts teachers. To remedy such uncontrollable predisposition, the studies provided a basic definition of “Industrial Arts/Technology Education” to clarify the information being requested. Table 4 depicts the respective definitions of said program that respondents found on their survey tools.

Table 4

Comparison of Program Definitions in the Former Research

- Industrial Arts Laboratory or Course: A classroom, drawing room, shop, or laboratory that has special facilities in which students learn about technology – its tools, material, machines, and industrial processes taught primarily for the purpose of general education (Schmitt & Pelley, 1966).
- Industrial Arts refers to that phase of general education which deals with the basic tools, material, processes, products, and services of industry, which is provided to both youth and adults, and which is not eligible for reimbursement under any of the federal vocational acts (Rudiger, 1961).
- Technology Education is the study of technology, which provides an opportunity for student to learn about the processes and knowledge related to technology that are needed to solve problems and extend human capabilities (Sanders, 2001, as defined by ITEA, 2000)

The importance of reviewing the definitions is paramount to the validity of comparing independent studies. To logically compare [without bias] the results, implications, and conclusions, the surveys must employ a fundamental homogeneity from the start. The definitions compare quite favorably. They describe the purpose of industrial arts as a general education curriculum involving the dissemination of knowledge and skills related to tools, materials, products, and processes of industry. Furthermore, the definitions succinctly express the separation from vocationalism. Although the Schmitt and Pelley included the word "technology" within their definition, which may at this time seem quite relevant and diverging, Foster (1994) argues that definitions for "industrial arts" may differ in wording but have differed very little in meaning. He further argues that the meaning has always included the major elements of education, technology, society, and industry regardless of the subsequent philosophy, prescription, and practice. With this in mind, the studies have at the very least significantly similar if not exact definitions justifying a valid comparison.

What can be said of the comparative nature among industrial arts/technology education (henceforth known as IA/TE) programs in Wisconsin and their national counterparts? In order to determine the major aspects to compare and contrast, similarities among the studies must be identified. Through analyzing the three studies' objectives, definitions, layout, results, and conclusions, five main facets of comparison were followed: program demographics, program purpose, curriculum/content, instructional methodology, and program barriers. Therefore, the following sections provide a description, analysis of results, and comparative conclusions drawn from the three primary studies on IA/TE programs.

Program Demographics

To analyze the nature of industrial arts one must first investigate programs as a whole. An industrial arts program consists of characteristics as simple as a name to more complex ideals as purpose/mission. Other important and related concepts include whether or not schools have industrial arts requirements, program enrollments, and characteristics of faculty and students.

Program Name

Although the national survey of 1962-63 does not explicitly survey the titles of industrial arts program, it is important to note that Foster (1994) describes the program names of post World War II as mainly industrial arts with some prominence in names such as "Industrial Education" and "Shop," but only a limited number referring to "Manual Arts" or "Manual Training." Similarly, Rudiger found "Industrial Arts" as the most prominent title given the program (83%) with "Shop" running a distant second (14%) and "Manual Arts" making up the balance. However, a major change had occurred by the end of the century as Sanders (2001) found that, since the profession name change of 1984, 58.6% of the programs in the nation associate with technology education, 20.2% with Industrial Technology, 11.6% still with industrial arts/industrial education, and 9.6% with a number of other varied names.

The program name data discretely shows that Wisconsin was moving away from the manual training and manual arts paradigms similarly to the profession as a whole on the national level. Sanders' statistics provide information that yet again the IA/TE profession has been undergoing continual change. However, arguements (Foster, 1994; and Petrina & Volk, 1995) have been made that a name change falls well short of a complete paradigm shift. Therefore, further analysis of other program demographics and specifics is necessary.

Program Requirements and Enrollments

A second area of program demographics that is important to discuss involves the proclivity of schools offering industrial arts and the make-up of student enrollment. Nationally, 74% of the public secondary schools in the U.S. had industrial arts programs in 1962-63 (Schmitt & Pelley, 1966). In comparison, Wisconsin high schools offering industrial arts was only 70%. Though this may have been far from what prognosticators mandated or felt essential, in both cases 20-30% of the schools without IA were in the stage of facility planning (Rudiger, 1961). Forty years later shows a marked improvement in program offerings. By 1999, only 2% of the nations schools did not carry an IA/TE program; however, this figure may have been low as a result on non-respondent issues (Sanders, 2001).

Subsequent compulsory requirement of industrial arts in these programs was quite disparaging. Across the nation far less than half of the schools required any form of IA; and a majority of those requirements fell within the junior high school realm: 38% at seventh and eighth grade, 22% at grade nine, and only 8% in grades 10-12. The preceding percentages were the requirements for boys; schools requiring girls to enroll in IA were even less in 1962-63: 7% at seventh and eighth grade, 5% at grade nine, and 4% in grades 10-12. Subsequent total enrollment numbers derived from the survey suggest that only 24% (23.7% of boys and 0.3% of girls) of the total school age population took an industrial arts course offering (Schmitt & Pelley, 1966).

In contrast, Wisconsin schools listing industrial arts as compulsory were scarcer. At the junior high level 17% of the schools required boys to take IA as compared to only 4% of the girls. Even fewer students at the high school level in Wisconsin were required: 4% of boys and 1% of girls at grade nine and 2% of boys and no girls in grades 10-12 (Rudiger, 1961). The Wisconsin survey did not specifically address total enrollment, however, one could easily argue that percentages would be less than that of the national average based upon comparisons of compulsory models. Together these statistics point to a genuine disparity in gender equity and a perceived lack of necessity for industrial arts, but also shows that the state of Wisconsin was quite deficient when compared to the norm.

At the turn of the century, a much-improved balance was occurring. By 1999, 39.3% of middle and high schools were requiring some form of IA/TE for graduation. Middle schools took the lead in requirements at 47.9%, while high school requirements were only at approximately 30%. On average a little more than one-half (51.8%) of all middle and high school students enrolled in IA/TE courses. In addition, the female enrollment statistic had increased to 33.3% and minorities to 26.2%. Where as female enrollment was far less than general US population statistics, minorities paralleled quite well (Sanders, 2001).

Faculty Demographics

Faculty demographics speak to the professionalism behind the instruction. The three comprehensive surveys discussed composition of the IA/TE instructing body, the average age and years of teaching experience, as well as the professionalism of the group in regard to degrees and/or professional affiliations.

Nationally, 94.4% of the IA/TE teachers in the 1960s held teaching certifications with the remainder typically holding a trades/technical degree. Furthermore, of those licensed, 59.5% carried bachelor’s degrees while the remaining held advanced degrees or certifications. The survey noted no female teachers in the IA/TE program areas. The average number of faculty in the surveyed schools was 2.2 with 45.3% of all schools with only one IA/TE teacher. Results further indicated that the average IA/TE teacher had 9.5 years of teaching experience with 38.5% of all teachers having five years or less as compared to only 15.2% with 21 or more years of experience (Schmitt & Pelley, 1966).

Although there is no direct data regarding age of IA/TE faculty, an estimate of relatively young age is consistent with the above findings.

At the state level in Wisconsin, IA/TE teachers compare similarly to their national counterparts at the same period. Rudiger (1961) found that 96.7% of IA/TE instructors held teaching certifications, 64.8% achieved bachelor’s degrees, and 31.9% master’s degree certified. The state survey also noted no female instructors in this area of instruction. The study indicated that the average number of IA/TE teachers per school was 1.58, slightly less than the national average, and 32.7% of all schools with only one teacher in the department. Evidence also denotes that the Wisconsin IA/TE instructors were older and more experienced than on the national level. The average age was 37.5 years old with 12.4 years of teaching experience; 33.9% had less than five years of experience where as 25.0% had 20 years or more. Professionally Wisconsin IA/TE teachers were quite active in organizations: 55.4% members of Wisconsin Industrial Arts Association, 14.1% members of American Industrial Arts Association, and 10.2% members of American Vocational Association.

Nearly 40 years hence, indicators show that the profession has changed dramatically in certain aspects of faculty demographics. Sanders (2001) study indicates that schools averaged 2.8 teachers in the content area, slight increase, and 92% of IA/TE teachers held certification licenses, down only slightly. However, a greater change has occurred in composition of the profession as 10.1% were then female teachers and 5.9% minorities. An even greater change has occurred in the age and experience. At the turn of the century, the typical IA/TE teacher was between the ages of 41-50 and had 17.5 years of teaching experience—both indicators increased drastically supporting the fact that the IA/TE profession is aging. Professionally, teachers in the discipline were less likely to attend conferences and carry membership in organizations than their counterparts earlier; 20.8% members of state organizations, 24.2% members of national organizations, and roughly only one-quarter of all IA/TE faculty had attended a state or national conference from 1995-1999.

Student Ability Level

Student ability level is another area of demographic information researchers emphasized when analyzing IA/TE programs. The earlier studies defined a three tier ability level of students to indicate “special needs” where as the latter study utilized the current model as defined by legislative special education acts. Generally the average student accounts for the middle 50% of the student body while the above and below average ability accounts for the upper and lower quarter percentile of students.

Results at the national level in the 1960s indicated that junior high students enrolled in IA programs were characterized as 11% high, 67% middle, and 22% low ability. The same study found a subtle difference when analyzing the high school IA students: 6% high, 60% middle 31% low (Schmitt & Pelley, 1966).

Rudiger (1961) found Wisconsin students enrolling in industrial arts to have significantly different characteristics regarding ability. At the general comprehensive course level (primarily junior high but may also include ninth grade in some districts) 4% of the students were of high ability, 65% average, and 31% low. Furthermore, in high school unit courses the enrollees’ abilities consisted of 6% high, 55% average, and 39% low ability.

Little had changed at the national level by the end of the century. Sanders (2001) found that IA/TE programs consisted of 22.9% special needs and 12.2% gifted/talented students. It was noted in the study that "special needs" was open for interpretation by respondents even though solid definitions exist.

Why such a disparity when characterizing student ability at different levels? First, junior high ability levels were closer to the norm based upon the higher number of programs requiring IA. Second, industrial arts at upper grade levels was usually elective serving a larger portion of the non-academic student body. Third, the program purposes may point toward a trend within a program; for instance, the next section will examine whether a major emphasis was on pre/vocational training which might correlate to accommodating a higher number of students (with lower ability) for a terminal vocational path.

Program Purpose

Where as a program title may only prove to be skin deep, the program purpose is perhaps a better qualifier of overall philosophy of a given program.

In the early 60s at the national level, Schmitt and Pelley (1966) found that the main purpose of IA programs was to develop in each student a measure of skill in the use of common tools and machines. The top five rounded out with discovering/developing creative technical talents in students, discovering/developing creative technical talents, providing general all-around technical knowledge and skills, and developing leisure-time activities.

Those findings starkly contrast Rudiger's results in Wisconsin. He found that the main purpose of industrial arts to be developing leisure time activities with providing vocational experience to those interested in technical work a close second. Rounding out Wisconsin's top five included providing opportunity for personal exploration and guidance for students who would not otherwise have such, developing consumer knowledge and appreciation of industrial products, and developing personal and social traits within individuals (Rudiger, 1961).

By 1999, the profession had shifted from manual arts and tool/machine skills to problem-solving theory. Other key purpose indicators that point to the fact that perhaps there was more than a mere coincidence in name change. Statements comprising the second through fifth most popular purposes include using technology to solve problems and satisfy needs and wants, making informed educational/occupational choices, understanding the application of science/mathematics, and developing an understanding of the nature and characteristics of technology (Sanders, 2001).

Upon closer analysis, one can easily see that Wisconsin programs in the 1960s were more in line with a manual training/manual arts/vocational philosophy when compared to a national philosophy that, although somewhat concerned with skills, emphasized developing more universal and transferable knowledge and talent. Also noteworthy is the fact that the top five program purposes in 1999 did not even appear, or at the very least, were at the end of a long list; thus, providing sufficient evidence that there may be at least some paradigm transformation on more than a superficial level. However, as stated earlier, name, purpose, and demographic changes may not tell the entire story.

Curriculum and Content

Closely related to program demographics and purpose is a third area of investigation when providing benchmark data for future studies. The curriculum and content developed, supported, and taught within an industrial arts program can often be quite different than what is being prescribed by scholars and professional within the discipline. An examination of course titles, course content, and curriculum guide use at the district level will provide evidence of what is actually being practiced.

Course Titles

Course titles, although not always strictly related to correlative content, can nonetheless provide excellent insight to the education students are receiving in industrial arts. During the 1962-63 school year, Schmitt and Pelley (1966) enumerated a list of the most widely taught courses in IA programs across the nation. General Industrial Arts, which included a more exploratory experience within each of the major content areas, headed the list. Rounding out the top ten course titles were: 2) Woodworking, 3) Drafting, 4) Metalworking, and 5) Graphic Arts, 6) Electricity/Electronics, 7) Crafts, 8) Power Mechanics, 9) Home Mechanics, and 10) Photography.

The Wisconsin study, conducted during the same decade, shows very similar results albeit some variation in rank. The top course in the state was General Woodworking followed by General Drawing and General Comprehensive Industrial Arts. The seven remaining courses included in order: 4) General Metals, 5) General Electricity, 6) Cabinet Making, 7) Mechanical Drawing, 8) Machine Shop, 9) Architectural Drawing, and 10) Graphic Arts (Rudiger, 1961).

Sanders expected to see a dramatic change in course offerings by 1999. Although there was some evidence of change, the top six courses were generally the same as in the 1960s. General Technology Education was the top course followed by Drafting/CAD and Wood Technology. The fourth, fifth, and sixth most taught courses were Metal Technology, Architectural Drawing/Drafting, and Electricity/Electronics. The small change that did occur, started nearly at the end of the top ten courses; 7) Manufacturing, 8) Communications, 9) Automotives, 10) Graphic Communications. Even the small change was quantified by Sanders in that by grouping the communication course categories together, the list all but parallels the previous (Sanders, 2001).

One might have expected a significant change in titles after nearly four decades and major evidence of change as stated in program name, demographics, and purpose. On the contrary, when comparing the three lists, the top ten courses offered in the nation and in Wisconsin over the past four decades were nearly identical. When analyzed along with program name and purpose, none of the studies reflect a strong correlation to the industrial arts/technology education prescription of the time.

Course Content

Whereas course titles are easily researched and enumerated, course content can be and was, as noted by the respective researchers, harder to quantify. In order to decipher content at the national level, Schmitt and Pelley tabulated course offerings into 16 classifications. A further breakdown by subject area and instructional area allowed respondents to identify, from a pre-generated list of 105 instructional/content areas, what they teach in each of their courses. The investigation at the state level utilized a similar method and was simplified by asking respondents to choose the relative importance of content areas. The final study asked respondents to classify course content on the basis of various technological processes to determine the underlying truth to course titles.

The 1960s national study concluded that content within a certain course title often involved instruction in more areas than just the main theme. For example, a Power Mechanics class consisted of power mechanics as well as drafting, electricity/electronics, metalworking, etc. Their study found a concentration of subject content in industrial arts centered in drafting, woodworking, metalworking, and electricity/electronics (Schmitt & Pelley, 1966).

Rudiger found that woodworking, drafting, metal working, electricity were the four most emphasized areas of content within the courses offered by Wisconsin public secondary schools (Rudiger, 1961). Although the relative order may vary slightly, the correlation of content being taught within courses was identical thus supporting the notion that Wisconsin programs compared favorably to the norm.

Sanders (2001), in his effort to determine the information that was being taught under the many course offerings, delineated the following five technological processes: 1) production—woods, metals, materials and processes, manufacturing, construction; 2) communication—drafting, CAD, graphic arts, communication technology; 3) transportation—power, energy, electronics, mechanics, transportation technology; 4) bio-technology—medical, genetics, forensics; 5) other—any course teaching that do not fit the first four. Results indicated that 34.3% of the content being delivered in IA/TE courses is in the area of production while communication accounted for 30.2% and transportation, other, and bio-technology rounded out with 19.8%, 13.8%, and 2.8%

respectively. Here too, the actual content within the courses unexpectedly changed very little over the past many years.

Curriculum Guide Use

An investigation of the curriculum and content is incomplete without reviewing the sources from which curriculum is derived. Do teachers create their own curriculum and content or follow previously prescribed ideals? All three studies sought an answer to this question by determining the utilization of various types of curriculum guides when establishing course content.

Nationally, content was determined mostly through teacher self-preparation followed by local school district guide, state curriculum guide, and textbooks (Schmitt & Pelley, 1966). It is important to note that only 20% of the time a combination of resources were used in compiling content.

The results were quite different in Wisconsin school districts. Rudiger (1961) found that textbooks were the most widely accepted resource followed with professional magazines, colleges, locally prepared guides, and state curriculum guides.

Whereas Sanders does not specifically address this issue in the 1999 study, a similar study conducted in Michigan found that little has changed in the sources of curriculum content. Even with the advent of the International Technology Education Association's <u>Content Standards for Technology Education</u>, most state programs and teachers remain quite autonomous (Cardon, 2001).

Although the national findings would easily support a claim that practice lags behind prescription, when pondering the Wisconsin results, it is harder to find such support. With the major component of content derived from textbooks, professional magazines, and colleges, one would expect Wisconsin IA programs to be more progressive. Perhaps the problem lies within the age of the resources and the fact that a teacher was still choosing what should be part of a course.

Instructional Methodology

In education, student achievement is in part based upon the teaching methods in a particular course. Instructional methods focus on the educator's delivery of the content. The three historic studies reviewed herein have looked at various aspects of content delivery methods including type of instruction, generation/utilization of projects and activities, and use of computers.

Schmitt and Pelley (1966) concluded that teacher-assigned projects and sequential jobs/activities were the most prevalent forms of instructional methodology. Teachers would perform demonstrations and/or lectures based on the projects and activities assigned. The study indicated that student generated projects and cooperative learning activities were few and far in between. Interdisciplinary instruction was unheard of and, although perhaps obvious for the time, there were no computers being utilized.

Rudiger (1961) found similar results in the Wisconsin study. The use of textbooks supplemented the substantial use of teacher generated projects and activities. Consequently, teacher lecture and demonstration were driving components just as they were nationally. Notwithstanding, Wisconsin did have some programs that were relying on cooperative projects and group activities.

Four decades later a major shift had taken place in instructional methodology. Instead of the single project for a whole class or teacher generated sequential activity, over half (56.9%) of all programs engage students in problem-solving. In fact, nearly one-third of those surveyed devote 80-100% of their classroom time to problem-solving activities. Another major area receiving attention was the utilization of computers. By 1999, 88.6% of the IA/TE programs employed computers in instructional activities, 40.1% use a computer as a tool to complete an activity/project or solve a problem, and 60.8% of the programs have access to the Internet. Moreover, modular labs (computer based) account for 16.7% of all program descriptors (Sanders, 2001).

Looking across the three studies and forty years of research, one can see that the earliest forms of teacher generated project-from-plan have been replaced with a problem-solving/design approach. Sanders' (2001) conclusions in this area state that nearly three-fourths of instruction did not utilize the project method by the end of the twentieth century. However there is no one particular method that is dominant; the design and technology approach (student centered design and problem solving) accounts for 36.7% of instruction, the modular approach (teacher/vendor created and computer-based) accounts for 35.4%, and the traditional project method 27.9%.

Program Barriers

Previously discussed facets of IA/TE programs have, up to this point, dealt with concrete evidence of current status: program description, demographics, content, instructional methods and so forth. However, there remains a very key ingredient in the process of determining status: barriers to having an exemplary program. Although perhaps somewhat opinion based, an analysis of the obstacles that prevent programs from either improving or reaching excellence will only feed the fuel to justify the inadequacy of IA/TE programs.

In the early 1960s Schmitt and Pelley (1966) uncovered several difficulties that IA teachers faced. The two most prominent barriers in the findings focused on keeping up with advances in technology and acquiring/teaching modern concepts of industry. Note that even at that time the word "technology" had made it into the rhetoric and was becoming quite the enigma. Other impediments included items based in general pedagogy of the discipline such as finding adequate preparation time, arranging and conducting field trips, finding time to help individual students, providing for the slow learner, and providing career guidance materials.

Industrial arts teachers in Wisconsin felt that the greatest hindrances to an exemplary program lie in area of strategic program planning and the development of course-of-study materials. They were also concerned with student ability and subsequent course flexibility, cooperative exchange of ideas with fellow academic teachers, and teacher quality through diagnosis and improvement of instructional methods. Although to a lesser extent, IA teachers in the state were somewhat concerned with a basic perception issue in regard to effective public relations programs.

Although the latest national study posed questions regarding this issue, no significant results were reported (Sanders, 2001). However, a plethora of recent works in the profession supplant the notions of major barriers. First and foremost is the issue of identity. Markert (2000) speaks of the identity crisis within the discipline of technology education as "a curriculum forever sentenced in adolescence—a time when identity crises seem to prevail—" calling on the profession to develop an articulate mission statement which will once and for all provide meaning and increase public awareness. Scott (2000) argues that the profession is not reaching those who need it the most belying the barriers of lack of programs, content, and quality instructors. Dugger (2000) sees the professions need to defend and justify the call for technological literacy. Zuga (1989) asserts that technology teacher education is yet another area of impediment facing the discipline in regard to quantity, quality, and ability of instruction. The list of current barriers and supporting evidence could continue indefinitely; nonetheless, perhaps the most pointed remark comes from the disciplines elder statesman: Jerry Streichler summarizes the professions problems in the dichotomy of an obsessive connection to and rejection of vocational education. From this one fulcrum, amass the many barriers. To truly solve the impediments, the profession must look to the past, present, and future thereby reasoning through differences, allying with academia, embracing change, and conducting quality research (Streichler, 2000).

Summary and Conclusions

The review of the literature, primary source documents, and research conducted on the issue of historic perspective has shown that in order to know where we are going, we must know where we have come from. McCormick (1992) alluded to this continuing legacy of industrial arts by arguing that much can be learned from the history of various traditions because they encapsulate strongly held views and years of experience that will remain even after technology education has been firmly established. As discussed in the literature, without a significant amount of quantitative and qualitative research it will be hard for our profession to wage a strong and cohesive battle towards adoption as a core curriculum subject.

The question remains, have Wisconsin industrial arts programs paralleled their national programs? By examining the above data within the national and state studies conducted in the early 1960s, one can easily see that Wisconsin programs compared favorably to their national counterparts in program title, course offerings, and course content. However, Rudiger's study also showed that Wisconsin differed from the norm in several areas including program purpose/mission, enrollment of girls, enrollee ability, and curriculum guide use. Furthermore, the previously discussed data indicate that Wisconsin is neither ahead of the norm nor paralleling prescription.

Although many conclusions can be drawn some forty years ago, it is important to note that the above question has only been answered in part because of lack of current state level research. Sanders' study at the turn of the century provides a worthy comparison model for the current research. Only through analysis and henceforth further comparison of current findings at the state level, can true conclusions be made regarding the above question. After such examination has been conducted, a worthy benchmark will have been created for a future study of the current technology education programs in Wisconsin and their comparative nature to previous and current state and national findings.

Chapter 3

Methodology

This chapter addresses information regarding methodology and instrumentation utilized within the progress of current research. Specifically it will expound upon the characteristics and sampling of the population; the purpose, design, validity, and reliability of the survey tool; procedures used in conducting the data collection; and acknowledgment of limitations and extraneous variables/conditions which may have been present in the chosen methodology.

Data for this study were obtained chiefly from two sources. The first part consisted of quantitative research directly obtained from the State of Wisconsin Department of Public Instruction including school directory information and basic demographics/enrollment figures (Wisconsin DPI, 2002a). The second part of the research consisted of surveying a randomly selected sample of the public secondary school technology education programs in Wisconsin as listed in the DPI directory for the 2002-2003 school year (Wisconsin DPI, 2002b).

Subjects

The population identified and sampled in the current research was public secondary technology education programs in the state of Wisconsin. The Wisconsin DPI Public School Directory officially listed 427 public school districts in Wisconsin comprising 513 public secondary schools for the 2002-2003 school year (Wisconsin DPI, 2002a). Of the 513 public secondary schools, 425 were then selected as the population based upon the elimination of charter, alternative, corrective, and academy type of special high schools.

Although the population size was relatively small, due to the limitations of scope, time, and cost, the current research employed a sampling technique. Paralleling modern research theory on sampling, a random stratified sampling technique was utilized to identify sample size. Stratified sampling greatly reduces the random error typically associated with the sampling of a given population (Maisel & Persell, 1996). Furthermore, a random selection of individual units within each category assures that the sample remains systematically unbiased (Maisel & Persell, 1996). This combined technique employs the stratification and/or classification of the population into two or more categories and subsequent random sampling with each category to achieve the chance at a more representative sample. In the case of the current study, such an effort was used by creating three sizes of schools based on enrollment data (Wisconsin DPI, 2002b). Schools with enrollments of 0-249 were classified as small, those with 250-749 students were classified as medium, and enrollments of 750 or more were categorized as large. See Table 5 for the resultant yield of the stratified sampling technique.

Table 5

A Stratified Sampling of Wisconsin Public Secondary School Population

Category	Enrollment	Population
Small	0-249	121
Medium	250-749	159
Large	750-above	145
Total	All	425

Note. Enrollment figures from Wisconsin DPI, 2002b.

Where as the sampling technique employed within a specific study is relatively easily identifiable, the sample size of a given population is not. Neuendorf (2002) stipulates that unfortunately there is no universally accepted set of criteria for selecting the size of a sample and that an all too-common practice is to base sample size on previous parallelisms by others in the area. However, she continues by arguing that a better method of determining proper sample size exists: calculation utilizing formulas/tables that account for standard error and confidence intervals. Table data and calculation formulas for random samples show that 384 responses would guarantee a finding at the 95% confidence level 65%. Further analysis showed that 96 responses would guarantee findings at the 95% confidence level 610% (Neuendorf, 2002). Based on this data and the limitations of the study including scope, time, cost, and population size, the solicitation of approximately 100 responses would maintain a confidence level at 95% and be between a five and ten percent error interval.

With the target response number of 100 determined, the limitations listed previously were analyzed again in regard to an assumed response rate of approximately 50% ("Ten Ways," 1990). On final review, a sample size of 175 was determined to be sufficient for the size population, confidence level, minimization of errors, and compromise due to limitations of scope, time, and cost. Based on the theory behind random stratified sampling, Table 6 illustrates the respective number and percentages of the population and sample sizes within the various classifications. Note that because of random stratified sampling, the various classifications' percentage of total population approximates the percentage of samples to the total sample size.

Table 6

The Random Stratified Sample of Wisconsin Secondary Schools

School Classification	Population (N)	% of Total Population	Sample Size (n)	% (n) of Class. Pop.	% (n) of Total Sample
Small	121	28.5%	50	41.3%	28.6%
Medium	159	37.4%	65	40.9%	37.1%
Large	145	34.1%	60	41.2%	34.3%
Total	425	100.0%	175	41.2%	100.0%

Note. Calculations based upon numerical data from current study and Neuendorf, 2002.

Instrumentation

A three-page, 65-question survey instrument was developed to assess the current status of public high school technology education programs in Wisconsin (see Appendix A). The questionnaire items were written to correspond to previous studies (Rudiger, 1961, Schmitt & Pelley, 1966, Sanders, 1999). Specifically it was designed to solicit the information listed in Table 7.

The questionnaire was designed to maintain respondent confidentiality in that each were identifiable to the researcher via a survey number only. The instrument was divided into three parts. Part I requested the sample respondents to answer 16 multiple choice/numerical, fill-in-the-blank questions and respond to 10 Likert scale statements regarding program name, student enrollment, and faculty/student demographics within their program. Part II asked the chairpersons to respond to 18 Likert scale statements regarding curriculum content, instructional methodology, and resources used to develop each. Also in this section, respondents were asked to list their program's five most popular/frequently taught classes within their program. Part III of the survey solicited

Table 7

Industrial Arts/Technology Education Survey Objectives

- Identify the demographic characteristics of the high school Industrial Arts/Technology Education (IA/TE) Programs located therein.
- Examine the current technology education curricula, content, instructional methods, and resources used in developing such.
- Determine the most frequently taught courses in each program.
- Examine the opinions of the directors and teachers regarding their program's purpose and barriers to having an exemplary program.

Note. Objectives based on review of literature in Chapter 2 of current research.

opinions by requiring respondents to verify importance, on a Likert scale of 26 statements, regarding their technology education program's purpose and barriers to having an outstanding program.

The development of this instrument followed a process of research, design, and revision as purported by Dillman (2000). In addition, consistency in scale, text, font, and spacing as well as clear/concise short statements were utilized to improve layout, readability, and the subsequent response rate (Dillman, 2000). A careful review of Rudiger's (1961), Schmitt & Pelley's (1966), and Sanders' (1999) instruments was conducted in order to determine content. Since many of the purposes and items in these previous studies were similar in scope and have been widely used in the past, the inherent content validity and reliability are very high; consequently, 90% of the current instrument was designed through the use of such items in order to obtain proper data for answering the research questions and drawing comparisons to the previous research. The remaining 10% of the instrument's questions, although developed solely for the purpose of the current study, are highly relevant to this research as indicated by the review of literature and the Department of Public Instruction. Although a pilot test, argued by Dillman (2000) as an invaluable tool, was not conducted due to time constraints, critical analysis of the instrument by the research advisor, DPI liaison, Wisconsin Technology Education Association board of directors, UW-Stout Institutional Review Board, UW-Stout Director of Academic Computing Services, and two technology education teachers, provided further input on design and content validity.

The instrument review resulted in a number of changes that aided in the readability and appropriateness for the respondents. Alterations were made to shorten the survey from 75 questions and four pages to 65 questions over three pages. This was done with the hope of enhancing the rate of return as well as paralleling the instrument more closely with the previous three studies. Furthermore the wording of some questions were modified to help solicit the necessary response without confusion. White space and grouping of questions were added to further help the layout and readability for respondents.

Procedures

Survey implementation research has shown that certain measures can be employed to affect response rate for mailed surveys. Dillman (2000) states five elements of achieving high response rates: 1) respondent-friendly questionnaire; 2) multiple contacts; 3) return envelopes with real first-class stamps; 4) personalization of correspondence; 5) incentives. Although a major portion of a successful survey, the user-friendly questionnaire, covered in the previous section, is only one element in the crucial process of soliciting results. Multiple contacts regarding the survey are integral in the overall process. Dillman (2000) further argues for an adherence to a stepped process of pre-notice, questionnaire mailing, thank you contact, replacement questionnaire, and personal “special” contact to improve rate of return. Research has reported that sending return envelopes with real stamps represents a good will gesture and can improve response by several percentage points over a business return envelope especially if a carefully timed thank you is sent (Dillman, 2000). Personalization of correspondence has also been proven an important link in response rate improvement. Studies have shown that an additional token, prepaid material, financial, or other incentive offered along with the survey has also increased results. Offerings such as a dollar or two, payment upon receipt, or offering of a summary of results can significantly influence the return rate (Dillman, 2000).

The individual subjects were chosen randomly within the three groups (see Table 6) by employing a random number generator to create respective “n” lists. The three lists were then matched with a alphabetic list with each of the respective category to generate the sample contacts. In accordance with the above research, a pre-notice letter was sent to the 175 subjects. The pre-notice letter was sent on May 2, 2003, in a standard business envelope and was addressed to the “Technology Education Department Chairperson” at each of the selected schools. Following Dillman’s (2000) methodology, the letter (see Appendix B) consisted of a description of the survey, its importance and significance, what will be happening, and a thank you.

Five days later, on May 7, 2003, the three-page 65-question survey was mailed to the selected schools in a business envelope. Included in the mailing was an 11x17 folded booklet: Page one—cover letter; pages two through four—questionnaire (see Appendix

C). The cover letter briefly reviewed the survey purpose and significance as well as emphasized the confidentiality of the respondents' contribution. Also present in the mailing was a separate colored sheet stuffed in the folded booklet containing the informed consent clause, which was to be returned with the completed survey (see Appendix D). In addition, an envelope affixed with a first class stamp was included for returning the completed survey. In an effort to enhance response, each of the responders was offered the chance to include their email address on the informed consent if they so chose to receive a summary of the results. The selected sample of IA/TE department chairpersons was asked to complete and return the survey by May, 16, 2003. Each survey, informed consent form, and return envelope were identified only with a number to enhance confidentiality and determine which schools completed their surveys.

In an effort to reduce the non-response bias, between May 20 and May 22, 2003, email and/or phone call reminders were then sent/made those who still had not returned a completed survey. A fourth contact then ensued to those who still had not responded by May 27, 2003. At that time, a follow-up letter and second copy of the survey were mailed, in similar fashion to the first mailing, with a completion date of June 4, 2003 (see Appendix E for a copy of the follow-up letter). The final cut-off date for returns was June 11, 2003.

Data Analysis

Completed surveys were documented in an Excel file of the selected schools. All acceptable surveys were then checked for completeness and legibility. Phone calls/emails were made in an effort to clear up any missing information, misinformation, or miscommunication. A separate colored demographic sheet was attached to each confirmed, completed survey and data provided via the Wisconsin DPI (2002b) and the U.S. Census Bureau (2000) statistics (see Appendix F). The information included the survey number, school classification size (small, medium, large), community classification (based on population: 0-2,499 rural; 2,500-19,999 small city; 20,001-49,999 medium city; 50,000-99,999 large city; 100,000-up urban), total school enrollment, total district enrollment, and male/female enrollment per school. The course listings for question 45 were tabulated and cross-referenced into 30 major categories for ease of comparison and given a respective number for data entry/analysis (see Appendix G for the course category listing). All completed surveys were then delivered to UW-Stout Academic Computing Services for data entry.

The data was analyzed utilizing SPSS software which generated reports of frequency, percentage, mean, median, standard deviation, etc. Crosstabulation reports among the various school and community classification and survey questions were created.

Limitations

1. Although assumed, it is unknown whether or not the correct person received and/or completed the survey.
2. Although the study solicited each professional to answer with forthright data on behalf of his/her colleagues from the standpoint of the entire department, it is unknown if such care was taken.
3. This study is restricted to the technology education programs in Wisconsin public secondary schools without regard to private/parochial and junior high schools and thus may not be generalizeable to a larger population.

4. The survey used in requesting information for this study is a compilation of previously tested survey questions and researcher-developed questions resulting in an instrument that has not been pilot tested in depth.
5. The information received from respondents is limited to the biases, opinions, and insights revealed by the teaching professionals.
6. The study conducted through a sampling technique of the Wisconsin public secondary school population strives to ensure high validity and reliability, but may still include sampling error.

Chapter 4

Results and Discussion

This chapter explains the findings and analysis of results as derived from a quantitative statistical analysis conducted with SPSS software of the research previously described. Specifically the following sections will examine the rate of response and descriptive statistics related to program demographics, current practice, curriculum and content, instructional methodology, and program purpose and barriers. Also included in this chapter will be a discussion section relating the current findings to previous research as discussed in the review of literature.

Results

Respondents were asked to answer 65 items on the questionnaire in the form of multiple choice, fill-in-the-blank (numerically), and Likert scale statements. Multiple choice related items were statistically analyzed by frequency and percent. Numerical items were examined through statistical calculations including mean and/or median and standard deviation. Likert items were analyzed through mean, weighted mean and standard error of the mean. The following subsections provide the results, discussion, and respective analysis of the descriptive statistics found regarding this study. The items directly follow the layout of the questionnaire sections. Note that the results include analysis of the total group as well as the respective subcategories as discussed in chapter three.

Rate of Response

From the initial and follow-up mailings to the sample of 175 technology education program chairpersons, 125 responses were returned. The calculated response rate for the entire group was 71.4%. Although respondents returned 125 surveys, not all were useable for data analysis. Questionnaires were considered useable when returned with a signed consent form and five or fewer items were either incomplete or illegible. Within these parameters, 113 of the 125 responses were deemed useable for a calculated useable response rate of 64.6%. The twelve unusable surveys consisted of six schools completing a survey without a signed consent form, four schools with no technology education program, and two schools with incomplete surveys.

Upon further analysis, 86 responses were returned after the first mailing and phone-call reminder while 39 were returned after a follow-up mailing. Small schools returned the surveys at a higher overall rate and a higher useable rate (See Table 8). Medium schools on the other hand, responded at the lowest rate in both total and useable response categories. Finally, with a useable response rate of nearly 65% and almost 115 useable responses, this study was reliable and valid within the error guidelines discussed in the methodology and assumed, at or above, a 95% confidence level with less than a 610% error.

Table 8

Survey Response Rate by School Size

School Size	Total Population	Sample Size	Total Responses	Useable Responses	Useable Response Rate
Small	121	50	37	34	68.0%
Medium	159	65	48	41	63.1%
Large	145	60	40	38	63.3%
Total	425	175	125	113	64.6%

Table 9 shows the crosstabulation of the school sizes with community classification sizes regarding rate of response. Note that the most prevalent classification of schools within the state is rural (populations up to 2,499) followed by small cities (2,500-19,999), medium cities (20,000-49,999), large cities (50,000-99,999), and urban (100,000 and up). Originally, this research was to provide three sets of data: whole group, school size cohort groups, and community classification cohort groups. However, as illustrated in Table 9, the three largest community classification categories contain relatively small sample sizes. These small sample sizes not only pose a threat to generalizability, but also upon analysis of the statistical data represented within each of the community classification categories, standard deviations and standard errors of the mean reach unacceptable levels.

Table 9

Survey Response Rate by School Size and Community Classification

	Community Classification				
School Size	Rural	Small City	Medium City	Large City	Urban
Small	33	0	0	0	1
Medium	27	14	0	0	0
Large	1	17	9	7	4
Total N_1	61	31	9	7	5
Total %	54.0%	27.4%	8.0%	7.0%	4.4%

Note. Total N_1 is the various community classification cohort sample sizes. Total % is the percentage of the Total N_1 with respect to the total useable sample of the study (N=113).

Therefore, in order to present statistically sound data that proves to be a reliable source for generalizations and applications to technology education programs in the state as a whole, this chapter will focus on data extracted from the entire sample population and be represented in two sets of statistical information only: all schools and school size cohort groups, thus eliminating the possibility of falsehoods with respect to community size.

Program Demographics

Respondents were asked in Part I of the Technology Education Program Survey to answer four multiple-choice questions and 22 Likert items regarding program demographics (see Appendix A for the survey instrument). The first subsection of questions solicited information covering program descriptors such as name, mission, laboratory facilities, as well as graduation requirements. In a second subsection, an inquiry was made into the recent relative change regarding school and program enrollment, class sizes, course offerings, faculty, funding, and professional conference attendance. Chairpersons were asked to respond whether the Likert statement had decreased, remained the same, or increased over the previous five-year period. In a third and final subsection to Part I of the instrument, participants had the opportunity to provide numerical data involving faculty demographics such as age, staff size, teaching experience, and professional involvement as well as student demographics consisting of enrollment, class size, gender, minority, and special needs students.

Program Descriptors

Items one through three of the instrument focused on specific aspects of program demographics known as descriptors. Descriptors are generalized associations to a given program that reflects and provides insight to the overall program definition. The questions solicited information regarding program name, mission, and facilities. The following three subsections address the findings in those areas.

Program name. Technology Education was by far the most prevalent name associated with Wisconsin programs at 81.4% (see Table 10). In addition, over 85% of the schools had the word technology associated with program name in some fashion. Although statistics were similar across school size cohorts large schools were more apt to call their programs something other than technology education such as pre-engineering, engineering, or material science. Another important aspect of program name is that no Wisconsin programs associated themselves with Industrial Arts.

Table 10

Program Name

School Size	Industrial Arts	Industrial Education	Technology & Industrial Education	Technology Education	Other
Small	0.0%	2.9%	8.8%	82.4%	5.9%
Medium	0.0%	9.8%	2.4%	85.4%	2.4%
Large	0.0%	2.6%	2.6%	76.3%	18.4%
All Schools	0.0%	4.4%	5.3%	81.4%	8.9%

Note. Percentages along rows may not add up to 100.0% due to multiple responses to the question being eliminated from the results.

Program mission. When asked in question two about their program's educational mission/alignment, respondents most closely associated their programs with preparation for vocational/technical education. Association with general education accounted for only 16.1% of the responses in comparison to 50.9% associating with preparatory vocational/technical education (see Table 11). Alignment with direct vocational/technical education was also quite important in Wisconsin schools as it accounted for a little over one-quarter (26.8%) of the program missions. Large schools were most predominantly associated with vocational/technical preparatory education where as small schools, although highly aligned with vocational/technical preparation (39.4%), viewed general education association nearly as important (30.3%).

Table 11

Program Educational Mission/Alignment

School Size	General Education	College Preparatory	Vocational/ Technical Preparatory	Vocational/ Technical Education
Small	30.3%	0.0%	39.4%	30.3%
Medium	14.6%	2.4%	48.8%	26.8%
Large	5.3%	5.3%	63.2%	23.7%
All Schools	16.1%	2.7%	50.9%	26.8%

Note. Percentages along rows may not add up to 100.0% due to rounding error.

Program Facilities. Question three on the Technology Education Program Survey solicited information from respondents regarding their program equipment and facilities. They were asked to specify the types of laboratories that were present in their facility as well as the single best description of their entire program based upon laboratories. Possibilities included unit labs (i.e. woods, metals, electronics, drafting, etc.), system labs (i.e. bio-technology, communications, construction, manufacturing, transportation), general labs (wide variety of equipment in each lab), and modular labs (i.e. Paxton-Patterson, Synergistics, etc.).

When asked to specify all types of laboratories within their program, respondents in Wisconsin most often selected unit labs as being present (74.3%). General labs and system labs followed at 38.1% and 33.6% respectively. Although relatively uncommon, modular labs did account for approximately one in six program laboratories. Note that little change in statistics took place when analyzing the data for school size. Table 12 illustrates the relative percentages of the types of laboratories within a given school's program.

Question three results indicated similar findings when analyzed by single best descriptor variable. Unit laboratories were the most prevalent description of Wisconsin secondary TE programs at 56.0%. General labs were second, system labs third, and a distant fourth were modular labs at 25.7%, 15.6%, and 2.8% respectively. Table 13 illustrates the overall findings as well as those relative to school size categories.

Table 12

Program Laboratory Facilities: All Types Represented

School Size	Unit Labs	System Labs	General Labs	Modular Labs
Small	64.7%	32.4%	41.2%	8.8%
Medium	75.6%	34.1%	43.9%	24.4%
Large	81.6%	34.2%	28.9%	10.5%
All Schools	74.3%	33.6%	38.1%	15.0%

Note. Percentages in rows will not equal 100% as question three asked respondents to select all types of labs that are represented in their program allowing for multiple answers.

Table 13

Program Laboratory Facilities: Single Best Descriptor

School Size	Unit Labs	System Labs	General Labs	Modular Labs
Small	54.5%	12.1%	33.3%	0.0%
Medium	53.8%	15.4%	28.2%	2.6%
Large	59.5%	18.9%	16.2%	5.4%
All Schools	56.0%	15.6%	25.7%	2.8%

Note. Percentages along rows may not add up to 100.0% due to rounding error.

Program Characteristics

In questions 4, 7-10, 13, and 22, chairpersons provided additional program demographic information. Program characteristics in the form of graduation requirements, course offerings, class sizes, and funding aid in the overall description of a program. The following four subsections and corresponding support data address the current findings in those areas.

Program graduation requirements. Graduation requirements, as asked in question four, were for the most part non-existent in Technology Education Programs and their counter parts. Nearly nine out of ten schools (88.5%) require no credits for graduation in technology or related education. Approximately 10% of Wisconsin schools require some form of vocational education – typically one-half credit or less. Less than one percent required more than one credit.

Course offerings. Questions nine and ten in the second subsection of Part I focused on the change in entire school and TE program course offerings over the most recent five year period. Based on a Likert scale (+/1.0 = decreased, 0/2.0 = remained same, and -/3.0 = increased), responses indicated that course offerings had been on the rise in both the technology education programs as well as the entire school. A mean statistical average of 2.19 (see Table 14) for the programs, however, indicated that technology education departments are not adding course at the same rate as their counterparts (mean = 2.33). Furthermore, where as programs in larger schools did not match up to the state as a whole, small rural schools outpaced their counterparts in regard to program offerings.

Table 14

Course Offerings: School and Program Past Five Years

	Entire School Offerings		Tech Ed Program Offerings	
School Size	Mean	Std. Error	Mean	Std Error
Small	2.12	.145	2.15	.113
Medium	2.29	.117	2.20	.117
Large	2.55	.098	2.24	.110
All Schools	2.33	.070	2.19	.065

Note. Mean score is based on a Likert scale (1.0=decreased, 2.0=remained same, and 3.0=increased).

Class size. Closely related to program course offerings is the size of classes. Table 15 represents a summary of results for items seven, eight, and twenty-two regarding recent changes to and average class sizes therein. Overall, class sizes had been on the increase for both TE programs and their counterparts within the entire school. In fact, TE programs outpaced the entire school by a small margin (2.34 to 2.23). Further analysis showed that as the schools and increase in size so do the class sizes.

More specifically, the average class size for TE programs in Wisconsin is 17.4 students (see Table 15). Over one-third (38.1%) of Wisconsin schools have an average class size of 15 or less and four out of five (80.5%) possess 20 students or less in each TE class. Here too, the class average, in referring to Table 15, increased directly in proportion to school size.

Table 15

Class Sizes: School/Program Past Five Years and Average Class Size

School Size	Entire School Class Size		Program Class Size		Program Avg. Class Size
	Mean	Std. Error	Mean	Std Error	
Small	1.82	.119	2.06	.126	13.2
Medium	2.20	.127	2.46	.105	17.1
Large	2.63	.103	2.45	.098	21.5
All Schools	2.23	.074	2.34	.065	17.4

Note. Mean score is based on a Likert scale (1.0=decreased, 2.0=remained same, and 3.0=increased).

Program funding. In a similarly worded question in the second subsection to Part I of the survey, participants responded to their recent changes in department funding. As a group, Wisconsin TE programs reported a decrease in departmental funding (mean = 1.73). In fact, further analysis, as depicted in Table 16, of subcategories show similar findings with relatively low standard mean errors.

Table 16

Funding: School and Program Past Five Years

School Size	Program Funding	
	Mean	Std. Error
Small	1.94	.059
Medium	1.76	.097
Large	1.89	.118
All Schools	1.73	.071

Note. Mean score is based on a Likert scale (1.0=decreased, 2.0=remained same, and 3.0=increased).

Because the question did not specifically address where and how much funding had decreased, it is unknown whether school/district and/or Carl Perkins/federal support was the culprit. Nonetheless, it is important to note that funding has significantly decreased statewide while course offerings and class sizes are increasing. It may also prove to be an important aspect when looking at the following analysis of faculty and student demographics.

Faculty Demographics

A third component necessary to properly define a program centers on faculty demographics. Survey items 11, 12, 14, and 15-21 address facets of faculty demographics such as staff size, staff gender and ethnicity, age, experience, teacher licensure, and professional affiliation/activity. The following five subsections and respective data address the results in those areas.

Staff size. In general, the size of the entire staff of Wisconsin schools, as indicated by the results in Table 17, has decreased over the past five years. The results (mean=1.95 entire school to mean=1.86 TE program) also show a similar but more pronounced decrease in the schools' respective TE programs. Subcategory analysis shows that in all but one case, a decrease in TE staff has outpaced their counterparts. Small schools' TE programs have enjoyed a slower decrease over the pas five years in staff than the remainder of the school.

Table 17

Staff Size: School and Program Past Five Years

School Size	Entire School Staff Size		Tech Ed Program Staff Size	
	Mean	Std. Error	Mean	Std Error
Small	1.68	.132	1.94	.059
Medium	1.83	.130	1.76	.097
Large	2.32	.123	1.89	.118
All Schools	1.95	.078	1.86	.056

Note. Mean score is based on a Likert scale (1.0=decreased, 2.0=remained same, and 3.0=increased).

A truer picture of faculty demographics arises from the numerical data supplied by the respondents in question 15. According to the results illustrated in Table 18, Wisconsin Technology Education Programs average just over three (3.2) staff people per department. One-person programs account for 37.2% of all schools; however, they make up only 11.7% of the total staff population. Wisconsin schools range from one to 23 members per program with a typical spread of three to seven faculty accounting for 40.7% of all schools but 57.7% of the staff population.

Table 18

Faculty Demographics: Average Staff Size, Gender, Ethnicity, Certification

School Size	Question 15 Avg. Staff Size	Question 16 Percentage Female	Question 17 Percentage Minority	Question 18 Percentage Emergency Licensed
Small Sch.	1.1	2.7%	0.0%	0.0%
Medium Sch.	2.3	4.3%	0.0%	4.3%
Large Sch.	5.9	3.0%	3.5%	4.5%
All Schools	3.2	3.5%	2.2%	4.1%

In addition, it is quite evident, as depicted in Table 18, that larger school sizes directly equate to increased staff sizes. For instance, medium schools typically carried twice as many TE staff members as small schools and large schools nearly six times the rate.

Gender and ethnicity. To continue the analysis of Wisconsin technology education staff, it is important to discuss gender and ethnicity. The summary of these results in Table 18 show that the state's staff is mostly Caucasian male dominated. Only 3.5% of the state's TE teachers are female and 2.2% minority. Large schools were more likely to employ female teachers than their counterparts. The large schools were the only type to contract with minorities as TE instructors.

Teacher certification. The final column in Table 18 denotes the presence of emergency licensed professionals teaching in Wisconsin TE programs. Just under five percent (4.1%) of all schools currently have non-technology education licensed professionals instructing students. Small schools tend to employ only properly licensed individuals where as larger schools resort to emergency licensing as the need for larger staff increases.

Age and experience. Questions 19 and 20 on the Technology Education Program Survey asked respondents to calculate their staff's average number of years of experience teaching TE/IA and the average staff's age. Table 19 represents the results of those answers showing that Wisconsin TE instructors were found to be in their lower forties (42.4 years old) and possess approximately sixteen years (16.4) of experience. More specifically, the thirty and under age group accounted for 11.9% of all teachers and the fifty and over cohort was 17.4%. Similarly, one to five years of experience accounted for 11.7% of the entire population with 21.7% holding 25 years or more behind them. Finally, Table 19 affirms age and experience are quite similar across all subcategories.

Table 19

Faculty Age and Experience

School Size	Average Age	Average Experience
Small	45.4	17.1
Medium	42.0	16.4
Large	40.1	15.8
All Schools	42.4	16.4

Professional affiliation. Although not addressed for specific affiliations, items 14 and 21 asked respondents to answer questions regarding activity and membership in professional organizations; they might include organizations such as Wisconsin Technology Education Association, International Technology Education Association, Wisconsin Association of Career and Technical Education, Association of Career and Technical Education, etc. Even though 27.3% of schools had no TE staff members that carried membership in professional organizations, approximately one-half (48.5%) of all technology education teachers in Wisconsin are affiliated with at least one professional organization. Table 20 further points to a trend that smaller rural schools have more professional affiliations than larger schools/cities.

Subsequent to the membership in professional organizations is the activity therein. According to the findings in Table 20, there has been a small increase (mean=2.11) in attendance at professional conferences offered by the above organizations for all schools. Furthermore, it is perhaps a bit ironic that although small rural schools may boast higher membership rates, they tend to show a decrease in participation at events when compared to other cohort groups.

Table 20

Faculty Professional Affiliation

School Size	Membership in Professional Organizations	Professional Activity over Past Five Years	
		Mean	Std. Error
Small	55.3%	1.94	.094
Medium	49.5%	2.17	.098
Large	46.9%	2.18	.099
All Schools	48.5%	2.11	.057

Note. Mean score is based on a Likert scale (1.0=decreased, 2.0=remained same, and 3.0=increased).

Student Demographics

A fourth and final facet in the process of defining a program is student demographics. Items five, six, and 23-26 focus on aspects of student demographics in Wisconsin TE programs. Based on these questions, generalized results were obtained regarding trends in student enrollment, female/male student information, minority student figures, and special needs student data. The following four subsections address the findings in those areas.

Student enrollment. Compiled results associated with respect to entire school enrollment show that there has been a very slight increase reported (see Table 21). Collectively, technology education programs show a more significant increase in department student enrollment with a mean score of 2.33 versus 2.05 for the school as a whole. Moreover, school and TE program enrollments were on the incline proportionately when examined via various school sizes. In no cases was there a decrease in technology education enrollment over the past five years.

Table 21

Student Enrollment: School and Program Past Five Years

School Size	Entire School Enrollment		Tech Ed Program Enrollment	
	Mean	Std. Error	Mean	Std Error
Small	1.68	.125	2.29	.123
Medium	1.95	.139	2.29	.122
Large	2.50	.129	2.39	.116
All Schools	2.05	.082	2.33	.069

Note. Mean score is based on a Likert scale (1.0=decreased, 2.0=remained same, and 3.0=increased).

Question 23, when analyzed in conjunction with school enrollment data indicated that slightly less than one-half (47.2%) of all Wisconsin students enrolled in at least one technology education course during the 2002-2003 school year. Table 22 further indicates that there is no specific trend based upon school sizes other than small schools tending to be at or above the norm.

Although the statistics represented in the table, as obtained from data provided by respondents, are accurate, the numbers may tend to differ from the actual as chairpersons were not asked to specify between students and units. A student enrolled in more than one technology education course may or may not have been counted more than the once. In addition, it is unclear, even though asked to do so, whether respondents did in fact provide the enrollment data for the entire year or the semester at hand. In either case, errors in reporting data may cause the results to be higher or lower in Table 22. All aside, it can be noted that TE program enrollments are clearly not reaching a good portion of the student population.

Table 22

Student Enrollment: TE Enrollment as a Percentage of Entire School Population

School size	Percentage of Entire Student Population Enrolled in TE Programs
Small	48.7%
Medium	44.8%
Large	48.6%
All Schools	47.2%

Gender related enrollment. Generally speaking, Wisconsin TE programs attracted and consisted of a fairly high percentage of male students. Over eight out of every ten (82.7%) students in a technology education course were male (see Table 23). Conversely, only 17.3% of the students enrolling in TE classes were female. Where as most cohort groups drop below the latter percentage, small sized schools tend to have more female students than the norm.

Also noteworthy in discussing TE program gender related enrollment figures is analysis by gender groups within the entire school. Table 23 also provides information regarding the percentages of males and females within a given school who enroll in technology education courses. Overall, roughly one in five (19.2%) females as opposed to nearly three-quarters (73.9%) of male students enrolled in TE classes during the 2002-2003 school year in Wisconsin. Subsequent cohort analysis indicated that small schools again tended to outpace other groups in marketing their programs to female students.

Table 23

Gender Enrollment Statistics in Technology Education Programs

School Size	Total TE Program Enrollment as a Percentage by Gender		Percentage of Females and Males, Per Respective School Population, who Enroll in TE Program	
	Female	Male	Female	Male
Small	19.6%	80.4%	22.8%	72.8%
Medium	16.3%	83.7%	15.2%	72.7%
Large	16.2%	83.8%	20.3%	76.3%
All Schools	17.3%	82.7%	19.2%	73.9%

Note. Totals in the two right most columns will not equal 100% as the percentages are based on number of females and males in a given school enrolling in TE courses.

Ethnicity related enrollment. As provided in Table 24, current findings indicated that Wisconsin TE programs serve mostly Caucasian white, non-Hispanic students. As a whole, only 5.6% of all minorities enroll in technology education classes. As one might expect large schools supported higher minority enrollment figures. Percentages jump from only 4.7% at the small school level to over three times that (16.5%) in large schools. Noteworthy is the relative lack of minority participation at the middle school level.

Table 24

Minority Enrollment in TE Programs

School Size	Total TE Program Enrollment as a Percentage by Ethnicity	
	Minority	Caucasian
Small	4.7%	95.3%
Medium	2.7%	97.3%
Large	16.2%	83.8%
All Schools	5.6%	94.4%

Special needs enrollment. Question 26 of the survey, asked respondents to provide the number of special needs students enrolled in their TE/IA program in 2002-2003. Although left to individual interpretation, it was expected that “special needs” status would have been based on federal, state, and school defined classifications. Without knowing for sure, Table 25, a summarization of special needs enrollment, should be viewed skeptically. In general, enrollments of Wisconsin TE programs consisted of one in six students (16.5%) being classified as special needs. Further examination revealed that small school programs contained more special needs students than their cohorts. The largest of schools showed the least participation of special needs students per cohort analysis.

Table 25

Special Needs Student Enrollment in TE Programs

School Size	Percentage of Special Needs Students enrolled in TE Programs
Small	18.3%
Medium	16.3%
Large	15.1%
All Schools	16.5%

Current Practice

In this section of the questionnaire, chairpersons were asked to respond to 18 Likert statements addressing two main categories: 1) resources used in preparing course curriculum and content; 2) teaching and instructional methods utilized within their program. Likert scale items were analyzed by calculating the mean and standard error of the mean for each item and are presented in the following tables in as an aggregate figure and in conjunction with school size cohort groups.

Preparation of Course Curriculum and Content

Preparing course content and curriculum is central to an instructor's role in providing a high quality education for his/her students. Correspondingly, the information and resources used to develop the content plays a pivotal role as well. According to results from survey questions 27-34 regarding this information, Wisconsin TE instructors indicated that self or locally prepared guides/information (mean=4.11), textbooks (mean=3.93), and professional magazines (mean=3.88) where most useful in creating curriculum for delivery (see Table 26). In fact over four out of five (83.2%, 80.5%, and 83.2% respectively) agreed or strongly agreed that these forms of resources were beneficial. Rounding out the top five, roughly one-half agreed or strongly agreed that resources such as advisory committees and college/university course offerings were quite advantageous as well.

The top three resources, self/locally prepared information/guides, textbooks, and professional magazines, varied little when results were analyzed by school size classification (see Table 27). The fourth, fifth, and sixth most popular curriculum and content preparation materials fluctuated a bit more, but remained close to the overall picture nonetheless. However, small schools tended to agree that professional magazines were quite helpful in creating course content. It is important to note that DPI, state, and national curriculum information/guides were deemed least useful across all cohort groups and Wisconsin TE educators as a whole.

Table 26

Resources Used in Preparing Course Curriculum and Content: All Schools

Resource	Mean	Std Err	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Self/locally prepared info/guides	4.11	.062	0.0%	0.0%	16.8%	55.8%	27.4%
Textbooks	3.93	.066	0.0%	4.4%	15.0%	63.7%	16.8%
Professional Magazines	3.88	.051	0.9%	0.0	15.9%	76.1%	7.1%
Advisory committees	3.46	.075	1.8%	7.1%	41.6%	42.5%	7.1%
Higher education course offerings	3.45	.089	4.4%	10.6%	28.3%	48.7%	8.0%
DPI info/guides	3.19	.090	5.3%	17.7%	34.5%	38.1%	4.4%
National curriculum info/guides	3.12	.092	7.1%	15.9%	40.7%	31.0%	5.3%
State curriculum info/guides	3.06	.098	8.0%	20.4%	35.4%	30.1%	6.2%

Note. Mean score is based on a Likert scale (1.0=strongly disagree, 2.0=disagree, 3.0=neutral, 4.0=agree, and 5.0=strongly agree). Rank is based on mean Likert score – highest mean equals highest rank.

Table 27

Resources Used in Preparing Course Curriculum and Content: By School Size

Resource	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Self/locally prepared info/guides	4.11	3.91	.122	4.15	.102	4.24	.096
Textbooks	3.93	3.82	.115	3.95	.098	4.00	.131
Professional Magazines	3.88	3.97	.099	3.78	.096	3.92	.069
Advisory committees	3.46	3.12	.132	3.54	.126	3.68	.120
Higher education course offerings	3.45	3.38	.140	3.73	.135	3.21	.173
DPI info/guides	3.19	3.26	.165	3.10	.134	3.21	.173
National curriculum info/guides	3.12	3.09	.148	3.00	.164	3.26	.163
State curriculum info/guides	3.06	3.09	.160	2.85	.177	3.26	.163

Note. Mean score is based on a Likert scale (1.0=strongly disagree, 2.0=disagree, 3.0=neutral, 4.0=agree, and 5.0=strongly agree). Rank is based on mean Likert score – highest mean equals highest rank.

Teaching and Instructional Methods

A second important component of current practice within an educational program is the instructional methods utilized by educators. Items 35-44 in the survey offered Likert statements regarding teaching methods exercised within the TE program. Respondents were asked to determine whether the practices were employed never, seldom, occasionally, often, or daily. Table 28 summarizes the results obtained from the analysis of the Likert statements.

The analysis revealed that the most common teaching practice in Wisconsin TE programs involved employing computers as tools for student activity completion. Teacher generated problem-solving activities and student projects from teacher created plans rounded out the top three methods. Those methods were followed by the utilization of computers as a form of instruction, student generated problem-solving activities, and teacher created workstations. Noteworthy is the relatively under utilization of interdisciplinary instruction and vendor created modules as forms of teaching.

Analysis of the teaching and instructional methods by school size indicated varied results from the general picture in some cases. Small schools wavered from the norm in that problem-solving activities generated by both teacher and student cornered the top teaching method billings while computers as tools for student activity completion placed fifth overall (see Table 29). Medium sized schools lent more weight to the method of student generated problem-solving activities as well, placing fifth in the standings. The first four remaining the same as the overall picture.

Table 28

Teaching and Instructional Methods used within TE Programs: All Schools

Teaching/Instructional Methods	Mean	Std Err	Never	Seldom	Occasionally	Often	Daily
Computer as a tool for student activity completion	4.11	.086	1.8%	3.5%	15.0%	41.6%	38.1%
Teacher generated problem-solving activities	3.86	.057	0.0%	0.9%	23.9%	63.7%	11.5%
Student projects from teacher created plans	3.68	.066	0.0%	4.4%	31.9%	54.9%	8.8%
Computer as form of instruction	3.49	.094	1.8%	17.7%	24.8%	41.6%	14.2%
Teacher created workstations	3.46	.090	3.6%	10.7%	32.1%	42.9%	10.7%

Note: Table continues on next page.

Table 28 (Continued)

Teaching/Instructional Methods	Mean	Std Err	Never	Seldom	Occasionally	Often	Daily
Student generated problem-solving activities	3.46	.079	0.0%	13.3%	36.3%	41.6%	8.8%
Lecture/demonstration (not hands-on activities)	3.30	.076	0.9%	12.4%	49.6%	30.1%	7.1%
Internet as form of instruction	3.26	.080	3.5%	13.3%	39.8%	40.7%	2.7%
Interdisciplinary instruction	2.63	.080	7.1%	39.3%	38.4%	14.3%	0.9%
Vendor created modules	2.22	.080	27.7%	34.8%	28.6%	5.4%	3.6%

Note: Mean score is based on a Likert scale (1.0=never, 2.0=seldom,, 3.0=occaisionally, 4.0=often, and 5.0=daily). Rank is based on mean Likert score – highest mean equals highest rank

Table 29

Teaching and Instructional Methods used within TE Programs: By School Size

Teaching/Instructional Methods	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Computer as a tool for student activity completion	4.11	3.50	.175	4.29	.122	4.45	.105
Teacher generated problem-solving activities	3.86	3.91	.107	3.76	.097	3.92	.095
Student projects from teacher created plans	3.68	3.65	.119	3.66	.129	3.74	.090
Computer as form of instruction	3.49	3.03	.182	3.68	.158	3.68	.131
Teacher created workstations	3.46	3.59	.159	3.32	.158	3.51	.148

Note. Table is continued on next page.

Table 29 (Continued)

Teaching/Instructional Methods	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Student generated problem-solving activities	3.46	3.76	.120	3.41	.110	3.24	.162
Lecture/demonstration (not hands-on activities)	3.30	3.41	.141	3.20	.132	3.32	.126
Internet as form of instruction	3.26	2.91	.171	3.39	.130	3.42	.104
Interdisciplinary instruction	2.63	2.65	.157	2.68	.136	2.55	.129
Vendor created modules	2.22	1.82	.143	2.48	.179	2.32	.160

Note. Mean score is based on a Likert scale (1.0=never, 2.0=seldom,, 3.0=occaisionally, 4.0=often, and 5.0=daily).

Curriculum and Content

Also existent in Part II of the instrument was question forty-five which related to program courses being taught. In following previous research models and without undertaking the time-consuming task of investigating each program's courses with respect to content and curriculum, respondents had the opportunity to list the five most frequently-taught/popular courses in their TE/IA over the past five-year period in an effort to glean an understanding into their current philosophical practice. Although asked to rank them (one being the most frequent/popular), the plethora of different courses made ranked analysis almost impossible; therefore, courses were not considered as ordinal data. In fact, the examination of course names resulted in 553 courses from the 113 responses. Of the 553 courses, there was a vast majority with unique names. In order to remain consistent with past studies and for comparison purposes henceforth, course names were analyzed categorically as explained in Chapter 3. Appendix G provides a listing of the 30 course categories that the 553 courses were divided into.

Wisconsin TE programs most predominantly teach manufacturing and communication technology. Nearly one-third (30.9%) of the technology education classes taught in the state can be categorized by manufacturing related technology. Communication related technology courses follow at a close second with 26.8%. The five remaining areas of technology account for only 42.3% of the total courses taught in Wisconsin and run quite distant from the top two categories: General technology 13.6%, transportation 11.9%, construction 10.1%, power and energy 6.7%, and bio-technology 0.0%. Noteworthy, bio-related technologies did not make the list of the 553 courses even once.

The subsequent analysis of the major technology education focal areas revealed that the top course category was wood technology. Some course names that comprised the top category included, introductory, intermediate, and advanced woods/woodworking; beginning and advanced cabinet making; woods processes I and II; furniture construction; hobby woods; etc. The second most popular TE course category in Wisconsin was CAD/drafting. Interestingly the computer aided drafting courses accounted for more than three-quarters of this category as compared to the technical/board drafting (23.3%). Rounding out the top five course categories were metal technology (including metalworking, machining, welding, fabrication, etc.), general technology education (introduction to tech ed), and graphic communications. Table 30 provides the top ten course categories along with the relative frequency of courses within each area. The top ten accounted for 64.0% of all courses.

Table 30

Top Ten Most Frequent/Popular Courses in Wisconsin TE Programs: All Schools

Course Title Category	All Wisconsin Schools	
	Rank	Frequency
Wood Technology	1	80
CAD/Drafting	2	51
Metal Technology	3	47
General Technology Education	4	39
Graphic Communications	5	25
Construction Technology	6	24
Small Engines	7	23
Auto-Mechanics	8T	22
Building Construction/Trades	8T	22
Materials & Processes	10	21

Table 31 shows the second ten most frequent/popular courses taught in Wisconsin. Interestingly, the course titles with the more contemporary nomenclature such as “technology,” “systems,” or “design” associations were more apt to be included in this list than the previous one. Where as only construction technology (woods and metals still being considered industrial arts style) and materials and processes where evident in the top ten, seven of the next ten were more contemporary in nature. All remaining course title categories contained frequencies of ten or less and comprised only 8.9% of the total course names as supplied by respondents. At the very bottom were courses in aviation, enterprise/entrepreneurship, modular technology, and adaptive TE.

Table 31

Second Ten Most Frequent/Popular Courses in Wisconsin TE Programs: All Schools

Course Title Category	All Wisconsin Schools	
	Rank	Frequency
Consumer Automotive	11	19
Architectural/Mechanical Design	12	18
Manufacturing Technology	13T	17
Visual Communications	13T	17
Communications Technology	15	15
Computer Technology	16T	14
Power & Energy Systems	16T	14
Transportation Systems	18	13
Electricity/Electronics	19	12
Auto Technology	20	11

Examination of course titles by school size still revealed that wood technology classes were the most frequently taught (see Tables 32-34). Small schools tended to slightly more contemporary in their philosophy as general technology education courses moved up to second, materials and processes moved up into a tie for fifth, and manufacturing technology, architectural/mechanical design, and technological design/R&D/problem solving courses moved into the top ten. Furthermore, where as medium schools resembled the general picture, large schools were more inclined to move away from the current technology education philosophy and focus on vocational courses in the areas of automotive and communication.

Table 32

Top Ten Most Frequent/Popular Courses in Wisconsin TE Programs: Small Schools

Course Title Category	Small School Rank
Wood Technology	1
General TE	2
CAD/Drafting	3
Const Technology	4
Materials & Proc	5T
Metal Technology	5T
Manuf Tech	7
Arch/Mech Design	8T
Small Engines	8T
Tech Design/R&D	8T

Note. "T" denotes tie in ranking.

Table 33

Top Ten Most Frequent/Popular Courses in Wisconsin TE Programs: Medium Schools

Course Title Category	Medium School Rank
Wood Technology	1
Metal Technology	2
CAD/Drafting	3
General TE	4
Bldg Const/Trds	5
Materials & Proc	6
Auto Mechanics	7T
Graphic Comm	7T
Small Engines	7T
Comm/Const Tech	10T

Note. "T" denotes tie in ranking.

Table 34

Top Ten Most Frequent/Popular Courses in Wisconsin TE Programs: Large Schools

Course Title Category	Large School Rank
Wood Technology	1
Metal Technology	2
CAD/Drafting	3
Graphic Comm	4
Auto Mechanics	5T
Consumer Auto	5T
Visual Comm	5T
General TE	8T
Small Engines	8T
Auto/Const Tech	10T

Note. "T" denotes tie in ranking.

Program Purpose

In a further effort to gain an understanding into the current practice and philosophical pedagogy in technology education in the state of Wisconsin, the first section in Part III of the survey instrument requested participants to respond to Likert statements regarding their programs' purpose. Chairpersons responded to each Likert statement based on a scale of one to five (1 being unimportant, 2 somewhat important, 3 important, 4 very important, and 5 essential). The ten items concerning purpose included such central themes as enhancing technological literacy, improving career awareness, providing vocational skills/training, offering higher education preparation, applying core academic standards, and developing contemporary technological skills in students.

The findings from the current study indicated that Wisconsin TE programs were most concerned with providing for the development of design, problem-solving, and critical thinking skills in students (mean = 4.44, see Table 35). Research and analysis indicated that the second most important purpose was developing career and post-secondary educational awareness. Programs in Wisconsin remained quite focused on a set of vocational ideals by following the first to with: 3) providing technical, machine, and tool knowledge and skill; and 4) providing vocational training and/or pre-vocational experiences. The current mantra of technology education purpose, "technological literacy" was not deemed as highly placing sixth. Interestingly, the purpose of developing worthy leisure time interests and creative talent registered very low in importance; however, it was surprisingly not superceded by what was concluded the least important purpose, the more contemporary idea of evaluating the impacts of technology. Table 35 provides the ranked list of purposes as selected by the participants.

Examination of the program purpose data through the filter of school size showed very little divergence from the group as whole. Table 36, in fact illustrates medium and large school divisions where nearly identical with only one adjacent rank change in each category. Small schools were similar too except for the purpose of developing leisure time interests and creative talent which moved up to fifth position causing a shift in purposes six through nine downward.

Table 35

Technology Education Program Purpose: All Schools

Program Purpose	Mean	Std Err	Not Important	Somewhat Important	Important	Very Important	Essential
Develop design, problem-solving, and critical thinking skills	4.44	.070	0.0%	0.9%	12.4%	28.3%	58.4%
Develop career and post-secondary educational awareness	4.19	.078	0.9%	2.7%%	13.3%	42.5%	40.7%
Provide technical, machine, and tool knowledge/skill	4.07	.078	0.0%	3.5%	20.4%	41.6%	34.5%
Provide vocational training and/or pre-vocational experiences	3.95	.079	0.0%	5.3%	22.1%	45.1%	27.4%
Support the application of science and mathematics	3.88	.071	0.0%	3.5%	24.8%	52.2%	19.5%

Note: Table continues on next page.

Table 35 (Continued)

Program Purpose	Mean	Std Err	Not Important	Somewhat Important	Important	Very Important	Essential
Develop technological literacy	3.84	.076	0.0%	6.2%	23.0%	51.3%	19.5%
Recognize that problems and opportunities relate to technology	3.78	.077	0.0%	5.3%	31.0%	44.2%	19.5%
Identify, select, and use resources to create technology	3.71	.073	0.0%	7.1%	27.4%	53.1%	12.4%
Develop worthy leisure time interests and creative talent	3.38	.098	3.5%	17.7%	29.2%	36.3%	13.3%
Evaluate the positive/negative impacts of technology	3.25	.073	0.9%	15.0%	45.1%	36.3%	2.7%

Note: Mean score is based on a Likert scale (1.0=unimportant, 2.0=somewhat important, 3.0=important, 4.0=very important, and 5.0=essential). Rank is based on mean Likert score – highest mean equals highest rank.

Table 36

Technology Education Program Purpose: By School Size

Program Purpose	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Develop design, problem-solving, and critical thinking skills	4.44	4.21	.139	4.59	.099	4.50	.124
Develop career and post-secondary educational awareness	4.19	4.06	.158	4.27	.126	4.24	.128
Provide technical, machine, and tool knowledge/skill	4.07	4.00	.146	4.02	.142	4.18	.118
Provide vocational training and/or pre-vocational experiences	3.95	3.79	.132	4.02	.142	4.00	.136
Support the application of science and mathematics	3.88	3.53	.135	4.10	.109	3.95	.113

Note. Table is continued on next page.

Table 36 (Continued)

Program Purpose	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Develop technological literacy	3.84	3.50	.135	4.00	.131	3.97	.116
Recognize that problems and opportunities relate to technology	3.78	3.44	.135	4.00	.121	3.87	.133
Identify, select, and use resources to create technology	3.71	3.47	.128	3.98	.113	3.63	.127
Develop worthy leisure time interests and creative talent	3.38	3.68	.156	3.46	.160	3.03	.175
Evaluate the positive/negative impacts of technology	3.25	3.15	.141	3.29	.112	3.29	.130

Note. Mean score is based on a Likert scale (1.0=unimportant, 2.0=somewhat important, 3.0=important, 4.0=very important, and 5.0=essential). Rank is based on mean Likert score – highest mean equals highest rank. “T” denotes tie in ranking.

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Program Barriers

The final section of the last portion of the survey instrument attempted to gather a collective opinion from the given programs about possible barriers that affect having an outstanding TE program at their school. Participants had the opportunity to state their level of agreement with ten Likert statements which provided various possible obstacles to their quest for building, maintaining, and improving upon an exemplary program. Potential impediments included financial and non-financial support, quality and consistency of faculty, perception and identity issues, resources, and students.

According to the compiled results of items 56-65, Wisconsin TE professionals were in general agreement that the impact of increasing academic requirements presented the greatest barrier to technology education. Four out of five respondents (80.4%) chose to either agree or strongly agree with the statement. Although to a lesser degree, based on the mean scores per Table 37, TE chairpersons agreed that four other barriers where major impediments. Approximately two-thirds (65.2%) agreed or strongly agreed) of the chairpersons viewed lack of financial support as a problem. Perceptions and identity in regard to TE programs tended to be noteworthy encumbrances as well. Over half (58.4%) of the subjects agreed or strongly agreed that TE program perceptions by colleagues was considered to be a hindrance while 46.4% thought along the same lines when questioned about the role identity/status of the profession within society plays. The quality of students enrolling in TE program courses also tends to be thought of as an impediment with 57.1% in agreement/strong agreement.

Wisconsin TE professionals remained predominantly neutral as to whether the remaining obstacles play roles in hindering their programs' potential for success play roles in preventing the ability to maintain excellence in technology education. Mean scores as depicted in Table 37 show that the final five potential program barriers were very tightly grouped around neutrality (mean = 3.0) when taking into account the standard mean error. Surprisingly, respondents viewed the quality and consistency of TE program faculty as a slightly larger obstacle than lack of administrative support and lack of appropriate curriculum/instructional resources.

Subsequent analysis of program barriers by school size showed that the five most agreed upon obstacles varied little from the entire group. Medium sized schools placed the quality and consistency of TE personnel in the top five while small schools nudged lack of financial support into first place (see Table 38). Similarly, the latter five as established by the whole were adjusted only one or two positions when examined through the lens of school size. Furthermore, lack of administrative support and lack of appropriate curriculum and instructional resources remained at or near the bottom of the list in all cases.

Table 37

Barriers to an Exemplary/Outstanding TE Program: All Schools

Potential Program Barriers	Mean	Std Err	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Impact of increasing academic requirements	4.08	.150	0.9%	6.3%	12.5%	44.6%	35.7%
Lack of financial support	3.76	.111	3.6%	15.2%	16.1%	32.1%	33.0%
Program perceptions by others within the school	3.57	.168	4.5%	17.0%	19.6%	34.8%	24.1%
Quality of students enrolled in TE	3.46	.092	3.6%	14.3%	25.0%	47.3%	9.8%
Identity and status problems of the TE profession within society	3.38	.134	1.8%	17.0%	34.8%	34.8%	11.6%

Note: Table continues on next page.

Table 37 (Continued)

Potential Program Barriers	Mean	Std Err	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Program identity and status within the community	3.22	.174	6.3%	22.3%	28.6%	28.6%	14.3%
Lack of in-service/advanced training opportunities	3.17	.102	3.6%	27.7%	29.5%	26.8%	12.5%
Quality and consistency of TE program faculty	3.11	.123	11.6%	25.9%	20.5%	24.1%	17.9%
Lack of administrative support	3.03	.126	16.1%	21.4%	24.1%	20.5%	17.9%
Lack of appropriate curriculum and instructional resources	2.95	.096	4.5%	34.5%	27.3%	29.1%	4.5%

Note. Mean score is based on a Likert scale (1.0=strongly disagree, 2.0=disagree, 3.0=neutral, 4.0=agree, and 5.0=strongly agree).

Table 38

Barriers to an Exemplary/Outstanding TE Program: By School Size

Potential Program Barriers	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Impact of increasing academic requirements	4.08	3.88	.151	4.07	.150	4.27	.138
Lack of financial support	3.76	4.03	.186	3.54	.185	3.76	.199
Program perceptions by others within the school	3.57	3.44	.199	3.46	.168	3.81	.204
Quality of students enrolled in TE	3.46	3.35	.152	3.51	.136	3.49	.192
Identity and status problems of the TE profession within society	3.38	3.26	.165	3.37	.134	3.49	.176

Note. Table is continued on next page.

Table 38 (Continued)

Potential Program Barriers	All Schools Mean	Small Schools		Medium Schools		Large Schools	
		Mean	Std Err	Mean	Std Err	Mean	Std Err
Program identity and status within the community	3.22	3.21	.173	3.17	.174	3.30	.212
Lack of in-service/advanced training opportunities	3.17	3.15	.159	3.24	.174	3.11	.197
Quality and consistency of TE program faculty	3.11	2.74	.190	3.46	.204	3.05	.226
Lack of administrative support	3.03	3.15	.185	2.85	.220	3.11	.244
Lack of appropriate curriculum and instructional resources	2.95	3.12	.183	3.03	.136	2.70	.177

Note. Mean score is based on a Likert scale (1.0=strongly disagree, 2.0=disagree, 3.0=neutral, 4.0=agree, and 5.0=strongly agree).

Discussion

The Technology Education Program Survey of 2002-2003 has provided an plethora of significant information about Wisconsin TE programs. However, without discussing the current findings in relation to previous state and national research, it is unknown as to how Wisconsin is actually functioning and at what level. The following discussion and figures will provide interpretations and comparisons of the results provided earlier in this chapter with those of Rudiger's 1961 study of Wisconsin Industrial Arts Programs, Schmitt and Pelley's 1963 national research on Industrial Arts Programs, and Sanders' 1999 national survey of Technology Education Programs. The discussion will focus on parallel areas of research including program names, requirements, enrollments, purpose, and barriers; faculty age, experience, gender, ethnicity, and professionalism, student enrollment and ability; and course names and titles, curriculum guide use, and instructional methodology.

Program Demographics

In the 1960s, Industrial Arts programs were not necessarily a given curriculum within schools. Programs ran in only seven out of ten schools at both state and national levels. By 1999 that figure rose to over nine out of ten. The current study indicated Wisconsin TE programs were offered in nearly all schools (98.3%). This increase over the past forty years and subsequent parallel comparison to current national levels perhaps indicates an increasing importance in the educational domain.

Another area of program demographics centers on program name. Where as program names in the 1960s typically followed the nomenclature of the time "Industrial Arts" by 1999 Sanders (2001) had found that less than 60% of the programs carried the

"Technology Education" name. Current findings clearly showed that Wisconsin programs had outpaced the national trend of moving toward contemporary name change. Furthermore, no Wisconsin programs still called themselves "Industrial Arts" while nationally, 11.6% remained under the old school of thought. In name and program presence, Wisconsin has provided evidence of a paradigm shift, however, many other characteristics must also be taken into account.

Requirements in the discipline have certainly not increased as academic areas have. In the early 60s, less than one in ten schools required industrial arts credits for graduation nationally. Wisconsin's figures at the time were even lower. By 1999, three in ten schools had made technology education a requirement further indicating a renewed importance in the profession. The current findings for Wisconsin proved to be quite disappointing as only 1 of every ten schools in the state have a vocational education requirement.

Faculty Demographics

The historical studies of the 1960s also provided a wealth of information regarding faculty demographics with which to compare the current research. This second area of information includes such items as staff size, faculty composition, teacher age and experience, certification, and professional involvement. The following paragraphs will discuss how faculty demographics have changed over the years.

The former studies found that programs were relatively small. On average, only two members typically formed the IA departments within schools nationally, and even fewer at the state level. Forty years later, Sanders discovered those numbers had risen to nearly three per department. The current findings support an even more marked improvement with 3.2 TE staff members per school.

Closely related to the staff size is the composition therein. In the past, the profession at the high school level accounted for only white, male instructors at both national and state levels. By 1999, there was only a slight improvement with one in 10 being female and one in 17 minority. This study showed that Wisconsin improved even less regarding composition of the faculty body. 2003 results revealed only one in 29 TE teachers were female and one in 45 minority.

The studies of the 1960s found that experience was rather low. Nationally, TE teachers possessed just under ten years of experience while the Wisconsin cohort group averaged over 12. At the end of the 90s Sanders discovered that the profession had aged slightly as instructors were more apt to have nearly 18 years of experience and be in their forties. Similarly, the recent study indicated that Wisconsin teachers were in their early forties and held over 16 years of professional experience. Furthermore, with one in five Wisconsin TE teachers having 25 years or more experience and nearing the 55 year old mark, the data may indicate chance for a more significant paradigm shift.

The former studies provided evidence that teacher certification has always been a part of the profession. In the 60s, one in twenty TE staff members were not certified at the national level. In Wisconsin at the same time, a little over three percent found themselves with the same dilemma. By 1999, Sanders discovered that the number of emergency licensed faculty within the profession had more than doubled. With this much spoken of lack in available personnel, it is quite surprising that Wisconsin figures revealed that the problem is not as widespread as the rest of the nation. In 2003, only one in 25 Wisconsin TE teachers were under an emergency license. Perhaps this is because of the close proximity to the University of Wisconsin-Stout teacher education program, and stricter licensing policies by the DPI or possibly due to retirement, attrition, and non-continuation with aspects of or entire programs.

Professionally, the IA/TE discipline has not necessarily been staunch supporters of memberships in organizations. Professional organizations related to the IA profession experienced roughly only one-half of all teachers actively participating at the state and national levels. In 1999, those figures had fallen to a bleak one-quarter nationally. However, the recent findings have shed a ray of hope in the area of professional affiliation. Wisconsin figures, although still relatively low, outpaced their national counterparts two to one.

Student Demographics

A third aspect of comparison focuses on student demographics. Knowing how Wisconsin compares to the larger picture in areas of enrollments, gender and minority equity, and student ability levels may further indicate how well the state is functioning in the TE profession.

Enrollments of the early 1960s in the Industrial Arts departments were relatively low in comparison with total school enrollment. Local and national surveys of the time revealed that approximately one-forth or less of the entire student population enrolled in industrial arts courses. In 1999, those figures had risen to just over one half. Wisconsin programs in 2003 indicated that only 47.2% of the state student population participated in at least one TE course, falling behind their national cohorts.

Further results from the '60s provided data showing that female students were grossly underrepresented in the discipline. Schmitt and Pelley found only one in 300 girls participating in industrial arts courses. The Wisconsin comparison at the time held only a bit more optimism with one in 100 enrolling in the IA departments. Both studies failed to indicate any minority population participating within the profession as well. Forty years hence, a slight improvement had occurred. Sanders detected, by 1999 one third of all females and one quarter of the minority students were taking TE related courses. However, only four years later, Wisconsin school figures were less impressive. By 2003, less than two in ten students were female and one in 20 of minor ethnicity.

Student ability level is another component worth comparing as the perceptions of programs are often related to the type of students actively partaking in a program. The early '60s saw a considerably high number of low ability students enrolling in IA courses at both the national and state levels. Well over one-third of all IA students were considered low ability. By 1999 the special needs component had fallen to just over one in ten. In 2003, Wisconsin programs consisted of only 16.5% special needs students. However, the information in these sections were left to interpretation and therefore could have skewed results.

Curriculum and Content

A fourth aspect of program comparison focuses around current practices in curriculum and content. Through discussion in this section, it is possible to better understand the philosophy within the given programs by looking at such areas as course titles, curriculum preparation guides, and instructional methodology. Through these lenses, further evidence of current Wisconsin TE program progression ensues.

Course titles offer the quickest and easiest, although most simplistic, analysis of educational philosophy. The studies of the 1960s revealed that the most prominent courses included General Industrial Arts, Woodworking, Metalworking, Drafting, Graphic Arts, Electricity/Electronics, and other skill based classes. Although Sanders expected to see a dramatic change over the 40 year period prior to his study, relatively little had changed. When grouped by category, his results in 1999 almost exactly paralleled the earlier findings. Similarly it was expected that Wisconsin TE programs were perhaps more progressive than their counterparts. Disappointingly, the current findings showed a relative lack of progress too. Nearly all of the top ten courses matched the previous findings, especially when appropriate groupings were applied. Contemporary nomenclature and subsequent philosophy were present only towards the end of the top ten list and in the second ten course listing.

A second significant component of current practice involves the sources from which curriculum content is derived. The early study at the national level indicated that self prepared, local district, and state curriculum guides were widespread. Rudiger found in his state study that textbooks, professional magazines, and college offerings were predominant sources of content. The latter studies, including the current research, have indicated little change from these views. Even with the advent of the ITEA standards, Wisconsin TE instructors utilize self prepared guides, textbooks, and professional magazines primarily.

Where as little progress had been made in areas of course offering and curriculum preparation, some important new measures were being utilized in instructional methodology. The previous studies conducted in the ‘60s discovered that teacher assigned/developed projects/activities and lectures/demonstrations were most often used. By the turn of the century, Sanders indicated a major shift in methodology toward problem-solving activities. Also noteworthy was the increased utilization of cooperative learning approaches and computer/Internet usage. Similarly, the current research revealed that teacher generated problem-solving activities were the principal form of instruction followed by computers as tools to complete projects. Student projects from teacher created plans had been relegated to a lower position but still used within the state.

Program Purpose

A fifth important facet of comparative analysis involves the interrelated aspects of mission and purpose. Forty years ago, programs focused on developing tool and machine skills, broadening leisure time activities, and providing vocational experiences. By 1999, a national shift in the profession had taken place lifting the development of problem solving theory and related skills to the forefront. Wisconsin now as well puts most emphasis on developing design, problem-solving, and critical thinking skills. However, providing technical, machine and tool knowledge and vocational training/pre-vocational experience still ranked in the top four proving that state programs remain quite connected to the industrial arts legacy.

Program Barriers

Although perhaps more opinion based, barriers to building, maintaining, and improving upon exemplary TE programs provide evidence of potential issues that need addressing. Historically, impediments were quite concrete and focused. In the 1960s they included such things as remaining current with the advances in the profession, strategic program planning, development of course-of-study materials, adequate preparation time, and providing for individual student ability. By the end of the millenium, the previously concrete and concise problems had become more abstract and dubious. Issues regarding identity, perceptions, misconceptions, marketing, as well as indirect effects like funding, academic graduation requirements. In fact, currently in Wisconsin, the five greatest barriers were not in the direct control of the educator: increasing academic requirements, lack of financial support, program perceptions by colleagues, quality of enrolled students, and profession identity/status within society.

Summary

The findings from the current research as presented and discussed within this chapter have provided a sound and reliable source of data regarding information from Wisconsin TE programs. The adequate representative sample size, high rate of response, and low standard and confidence errors further support the reliability and validity of the analyzed data. Moreover, based upon the these details, the current findings can fully support valid generalizability to programs within the state of Wisconsin as a whole and provide significant data for comparative frameworks with previous studies.

The findings included in this chapter provided benchmark data in three primary areas: program demographics, current practice, and program purpose/barriers. Program demographics focused on program descriptors such as name, mission, and facilities; program characteristics including enrollment, class size, funding, and requirements; faculty demographics regarding staff size, age, experience, professional affiliation, and certification; and student demographics consisting of gender, ethnic, and special needs enrollments. Current practice centered on curriculum preparation resources, instructional methodology, and course titles. The third section being self explanatory.

Subsequent comparative analysis showed that Wisconsin TE programs have neither remained entirely stuck in the Industrial Arts paradigm of the past nor progressed to the point of being completely under a new philosophy. Comparisons of the above characteristics show that Wisconsin has been both a follower and a leader.

Chapter 5

Summary, Conclusions, Recommendations

This final chapter will provide a synopsis of the current research as well as conclusions supported by the findings and recommendations for future research. Specifically, the summary will address the problem, methodology, and findings. The conclusion section will discuss how the findings answer the research objectives. Finally recommendations related to the study and future study will be presented.

Summary

This section will briefly summarize the main points of the current research as presented in the previous chapters. The following summary will include subsections discussing the problem statement, methods and procedures, and major findings.

Restatement of the Problem

Scholars have argued for decades on both sides of an issue regarding whether or not the TE profession has truly transformed into a new paradigm. One can find equal numbers on each side of the line. Yet, others are vying for more research from which such claims can be substantiated. As the discipline name and subsequent curriculum theory has changed, prescription within the technology education profession is not necessarily synonymous with practice. Furthermore, a relatively marginal amount of questionable data currently exists regarding the status of technology education practice at the state level. This precarious position prohibits program evaluation, proper comparative analysis, and subsequent future program progress. Therefore research such as that conducted herein then is the necessary evidence to support such claims.

The purpose of this research was to describe current programs and practices of public high school technology education in Wisconsin and compare the findings with those of previous national and state studies. This study was based upon previous investigations conducted by Rudiger (1961), Schmitt & Pelley (1963), and Sanders (2001), which examined technology education/industrial arts programs at the state and national levels. The results of the current research and comparisons to that of previous state and national studies of the current research can therefore be utilized in evaluation of course content, instructional practices, and overall program effectiveness.

Methods and Procedures

This study solicited information from a representative sample of Wisconsin TE program chairpersons regarding program demographics, current practice, and program purpose/barriers. A 65-question survey was mailed to 175 subjects requesting feedback on program name, mission, facilities, enrollment, class sizes, faculty and student demographics, current instructional methodology, curriculum preparation, current course offerings, program purpose, and barriers to building, maintaining, and improving upon an exemplary TE program.

Survey data was compiled and subsequently analyzed utilizing SPSS software. Reports of frequency, mean, median, percentages, standard errors were generated. The resulting information was then presented in two formats: a) as a conglomerate group and b) by school size (small, medium, and large cohorts).

Major Findings

Wisconsin TE programs neither significantly outpaced nor fell behind their national counterparts. Generally speaking, Wisconsin secondary school IA/TE programs were considered “Technology Education” in name. They were most closely aligned with preparatory vocational and technical education and most often have unit labs such as woods, metals, automotive, etc. Wisconsin TE programs typically did not have a graduation requirement. Class size and course offerings within the department have been on the increase even though funding is continually being cut. The current programs on average had just over three staff members per school. The typical TE teacher was white, male, in his early forties, and possessed just over seventeen years of teaching experience. He was legally certified to teach and was just as likely to be involved with professional organizations as not. Less than half of the entire school age population participated in TE courses; programs served mainly male Caucasian students of average ability.

Preparation of course curriculum and content was primarily conducted through self preparation and textbooks. Teachers most often used computers as tools for student activity completion and generated problem solving activities as instructional methods. Course titles were predominantly unchanged since the 1960s with woods technology, CAD/drafting, metals technology, general technology education, and graphic communications the top five course categories.

The overall purpose of Wisconsin TE programs, as reported by participants, had shifted to developing design, problem-solving, and critical thinking skills as well as developing career and post-secondary educational awareness. However, other portions of the survey such as course titles, mission alignment, and lower ranking purposes point toward a relatively traditional style program. The greatest impediments to outstanding TE programs in Wisconsin were the impact of rising academic requirements, lack of financial support, program perceptions, quality of students, and identity of the profession.

Conclusions

Research objectives effectively framed the study and subsequent review of literature, methodology, instrumentation, and presentation of results. It is through those five objectives that conclusions can therefore be based. The following sections will restate each objective and provide related conclusions based thereupon.

Research Objective One

Objective. Identify the demographic characteristics of the school, technology education program, faculty, and students.

Conclusions. The study outlined the various demographic statistics related to Wisconsin secondary schools' TE programs, TE faculty, and TE students. Tables 10-16 and respective discussion in Chapter provide data regarding program demographics such as name, mission, facilities, graduation requirements, course offerings, class sizes and funding. Next, Tables 17-20 along with related discussion cover faculty demographics including staff size, gender and ethnicity characteristics, certification, age and experience, and professional affiliation. Finally, discussion and Tables 21-25 depict results surrounding student demographics consisting of general enrollment, gender and ethnicity related enrollment, and special needs enrollment.

Where as the program name has changed in most cases to "Technology Education," the mission of Wisconsin programs is clearly entrenched in the vocational/technical preparatory and education realms. Philosophically and pedagogically little has changed especially when taking into account facilities as well. Unit labs (woods, metals, drafting, auto, etc.) and general labs (wide variety of equipment) still dominate the laboratory landscape rather than systems labs.

Furthermore, relatively few schools in Wisconsin required technology education for graduation. Only one in ten obligate some form of vocational education (not specifically technology education at that) for graduation. While course offerings have risen slightly, they have still fallen behind that of other departments within the school. Class sizes in TE departments have risen yet at a faster rate than their counterparts. Correspondingly, TE funding is decreasing. These findings perhaps point towards renewed interest by students with a lack of support and understanding by administrators regarding safety, liability, and requirements of project-based hands-on activities.

In relation to the changes in course offerings and class sizes, the TE staff sizes in Wisconsin programs have decreased at a faster rate than other departments. The faculty demographics point toward an aging population of white, male predominance. This may have somewhat of a silver lining as schools may have the opportunity to hire non-traditional personnel in the future as retirements ensue. Contrary to popular belief, emergency certifications were historically more prominent. Also noteworthy was a relative lack of professional affiliation and activity. Might it be that rising age and experience has caused a decrease in professionalism?

A bright light on the horizon further hinting at a renewed interest in the field is that student enrollment in TE programs has risen recently. Wisconsin TE departments enrolled nearly half of the student body in 2002-2003. Although primarily a Caucasian, average ability, male student dominated program, the minority and female presence has also risen yet not to substantial levels by any stretch of the imagination. Perhaps a concentrated effort in faculty replacement as noted above would have an impact on student enrollment as well.

Research Objective Two

Objective. Examine the current technology education curricula, content, and instructional methods followed in the state of Wisconsin at the high school level.

Conclusions. Wisconsin TE professionals prepared curriculum similarly to their counterparts of the 1960s. Self prepared guides, textbooks, and professional magazines remained at the forefront in curriculum development (see Tables 26 and 27). It is quite obvious that this data perhaps supports the notion that the concerted effort of ITEA and WTEA may not be reaching individual teachers as well as one might be inclined to think. On the other hand, the current research found a definite shift in instructional methodology. Wisconsin TE teachers were more likely to utilize computers as tools rather than the traditional tools for students to complete projects (see Tables 28 and 29). In addition, more emphasis was placed on problem-solving activities than skill development.

Research Objective Three

Objective. Determine which course titles are currently being used in Wisconsin public secondary technology education programs and decipher what these titles suggest about the status of the profession.

Conclusions. The current study revealed surprising evidence that course titles had not changed much over the past forty years. Wisconsin TE programs remain industrial arts/skill based in so much as the course names predicate. Tables 30-34 and corresponding discussion in Chapter 4 indicated that seven of the top ten course titles bore no resemblance of contemporary theory/philosophy. Contemporary nomenclature of true “technology,” “systems,” and “design” were present only further down the list. Regardless of right or wrong, Wisconsin TE program tended to offer traditional courses despite the movement in the profession toward standards, systems, and technological literacy concepts.

Research Objective Four

Objective. Examine the opinions of the technology education programs regarding purpose and barriers to having exemplary curriculum.

Conclusions. Tables 35-38 and respective discussion explain the findings in the current study surrounding purpose and barriers. Generally, Wisconsin TE programs have moved more toward a design, problem-solving, and critical thinking purpose. Also important was the prospect of developing career and post secondary educational awareness. However, the purposes of providing technical, machine, and tool knowledge/skill and providing vocational training/experiences were not far behind. Perhaps, when taking into account course names, Wisconsin TE programs incorporate new theory and philosophy into traditional methodology and courses.

Research Objective Five

Concluding with the analysis of barriers to developing, maintaining, and improving upon outstanding TE programs in Wisconsin may be most prudent. The answers provided may be reasons that Wisconsin has fallen behind or not progressed in the field as much as once thought. Table 37 and 38 present the current results regarding barriers. In sum, Wisconsin TE programs fight against increasing academic requirements, lack of financial support, misconceptions by colleagues and others within the school, quality of students, and identity/status issues of the profession. Perhaps one must not be to quick to blame those within the profession as the greatest barriers tend to be indirectly affect technology education.

Objective. Upon determining the characteristics of current technology education programs within the state of Wisconsin, establish a comparison with those of the industrial arts/ technology education programs of the 1960s and 1990s nationally and 1960s statewide.

Conclusions. The discussion section of Chapter 4 discusses the comparisons and contrasts with previous findings in depth. In general, current Wisconsin TE programs have grown in great strides since the 1960s in some areas yet continues to lack a concerted effort in others. Wisconsin has paralleled, outpaced, as well as fallen short of the present national norms depending upon the demographic area.

Collectively, it is difficult to clearly say that Wisconsin TE programs have made a complete shift in paradigm. However, it can be said that definitive movements have begun. Program name changes along with revisions in mission, purpose, and instructional methods support the fact that Wisconsin TE instructors are moving forward. However, significant barriers must be overcome to truly propagate technological literacy in all students.

Recommendations

The results of this study poses several possible recommendations for those professionals affected by or working in the technology education field. In addition there are other recommendations identifiable for future research. The recommendations proceeding from the findings are listed in the following two sections in a numbered format.

Recommendations Related to the Study

1. The study revealed a relatively low number of teachers in the field who belonged to and surprisingly less who actively participated in professional affiliations and conferences related to technology education. TE instructors can only improve not only their own programs but the field as a whole by coming together, discussing topics, and formulating plans to enhance the profession. Educators must find it within themselves to unite, cooperate, and share with one another to build excellence.
2. Further findings in the study indicated very low female and minority student involvement. TE instructors have a plethora of information, initiatives, and people willing to aid in the promotion of programs with respect to gender and minority equity. Faculty should continue to improve laboratory conditions, curriculum content, and teaching methods to enhance the likelihood that more students in general and specifically females and minorities will participate in TE courses.
3. Program barriers as discovered by the current study will continue to grow if not remedied or at the least diminished. Effective program marketing,

improved community, business, and industry relationships, and contact with parents, administrators, and colleagues by TE faculty will aid in the resolution of many barriers which are unnecessary at such a critical time in this professions history.

4. TE instructors have a plethora of new and exciting information often at their fingertips. They must learn and understand the contemporary theory and philosophy of technological literacy for all; not necessarily blindly accepting nor completely writing it off, but to add or improve upon current curriculum which will inevitably benefit the minds and bodies of students and the future of society. Only through discovering and teaching what is truly important will the profession advance toward the core of academia.

Recommendations for Further Study

1. Although valid and highly reliable, it is suggested that a repeat of this study on a complete statewide basis will provide even more feedback with greater validity for generalizations. Having been piloted, the instrument with minor revisions in wording and readability could easily be targetted to all TE instructors via e-mail to further validate findings.
2. This study was the first in over forty years for the state of Wisconsin. WTEA, UW-Stout and the DPI should develop a scheduled systematic survey to provide the most usable data and create the best possible chances of influencing, improving, and updating programs and curriculum. Yearly, or at the very least every two to three years, surveys would provide a significant

database from which initiatives, legislation, and truly effective change could result.

3. Areas of focus that should be included in future studies of this kind include addressing safety and liability concerns, developing more specific questions regarding funding, and requesting more specific information regarding course content.

References

Bonser, F. and Mossman, L. (1923). *Industrial arts for elementary schools*. New York: MacMillan.

Cardon, Phillip. (2001). Technology education curriculum designs in Michigan secondary education. *Journal of Technology Studies*, 12(3).

Dewey, J. (1916). *Democracy and education*. New York: Macmillan Co.

Dillman, D. A. (2000). *Mail and internet surveys: The tailored design method*. New York: John Wiley & Sons, Inc.

Dugger, W.W., Miller, C.D., Bame, E.A., Pinder, C.A., Giles, M.B., Young, L.H., and Dixon, J.D. (1980). *Standards for industrial arts programs project: Report of the survey data*. Blacksburg, VA: Virginia Polytechnic Institute and State University.

Dugger, W.E., Jr. (2000). Standards-based reform for technology education. Essay 22 in *Technology Education for the 21st Century a Collection of Essays*, 133-139. Council on Technology Education 49th Yearbook. Martin, G. E., ed. Peoria, IL: Glencoe/McGraw Hill.

Foster, P. N. (1994). Technology education: Aka industrial arts. *Journal of Technology Education*, 5(2).

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

International Technology Education Association. (2000). *Standards for technological literacy: Content for the study of technology*. Reston, VA: Author.

Lewis, T. (1995). From manual training to technology education: The continuing struggle to establish a school subject in the USA. *Journal of Curriculum Studies*, 27(6), 621-645.

Lewis, T. (1999). Content or process as approaches to technology education: Does it matter come monday morning. *Journal of Technology Education*, 11(1).

Maisel, R. and Persell, C. H. (1996). *How sampling works*. Thousand Oaks, CA: Pine Forge Press.

Markert, L. R. (2000). A curriculum at risk? The identity crisis continues. Essay 27 in *Technology Education for the 21st Century a Collection of Essays*. Council on Technology Education 49th Yearbook. Martin, G. E., ed. Peoria, IL: Glencoe/McGraw Hill.

McCormick, R. (1992). Evolution of current practice in technology education: Part I. *Journal of Technology Studies*, 18(2).

Neuendorf, K. A. (2002). *The content analysis guidebook*. Thousand Oaks, CA: Sage Publications, Inc.

Petrina, S. (1998). The politics of research in technology education: A critical content and discourse analysis of the Journal of Technology Education, volumes 1-8. *Journal of Technology Education*, 10(1).

Petrina, S. and Volk, K. (1995). Industrial arts movement's history, vision, and ideal: Relevant, contemporary, used but unrecognized – part II. *Journal of Technology Education*, 21(2).

Rudiger, R. (1961). *Status of industrial art in public secondary schools of Wisconsin*. Wisconsin Industrial Arts Association.

Sanders, M. E. (1999). *Technology education/industrial arts education survey*. Virginia Tech: author.

Sanders, M. E. (2001). New paradigm or old wine? The status of technology education practice in the United States. *Journal of Technology Education*, 12(2).

Schmitt, M.L. and Pelley, A.L. (1966). *Industrial arts education: A survey of programs, teachers, students, and curriculum.* (U.S. Department of Health, Education, and Welfare, Publication No. OE 33038, Circular No. 791). Washington, DC: Office of U.S. Government Printing Office.

Scott, M. L. (2000). Technology education for some Americans. Essay 32 in *Technology Education for the 21st Century a Collection of Essays*. Council on Technology Education 49th Yearbook. Martin, G. E., ed. Peoria, IL: Glencoe/McGraw Hill.

Streichler, J. (2000). The past defines the paths to be taken. Introductory essay in *Technology Education for the 21st Century a Collection of Essays*. Council on Technology Education 49th Yearbook. Martin, G. E., ed. Peoria, IL: Glencoe/McGraw Hill.

Ten ways to increase response rate. (1990, April). *Training and Development Journal*.

U.S. Census Bureau. (2000). *Wisconsin – place and county subdivision*. Retrieved May 25, 2003 from http://factfinder.census.gov/servlet/GCTTable?ds_name=DEC_2000_SF1_U&geo_id=04000US55&_box_head_nbr=GCT-PH1&format=ST-7.

Wisconsin Department of Public Instruction. (2002a). *2002-2003 public enrollment: By district, school, and gender*. Retrieved April 2, 2003, from http://www.dip.state.wi.us/dpi/dltcl/lbstat/xls/pedg03.xls.

Wisconsin Department of Public Instruction. (2002b). *2002-2003 public school directory*. Retrieved April 2, 2003, from http://www.dip.state.wi.us/dpi/dltcl/lbstat.html.

Woodward, C.M. (1969). *The manual training school*. New York: Arno Press.

Zuga, K. F. (1989). Technology teacher education curriculum courses. *Journal of Technology Education*, 1(1).

Appendix A

***Note*.** Margins of original three-page instrument were changed to fit this publication format

Technology Education Program Survey – 2002/2003

This survey is intended only for the High School Technology Education Department chairperson (or if no such person exists, a technology education teacher). If no such department exists, kindly indicate such and return this survey in the postage-paid envelope. Please answer the following questions regarding the 2002-2003 school calendar year unless otherwise noted. Upon completing this survey please review and sign the informed consent clause and return along with this survey in the postage-paid envelope provided. Thank you for your time and cooperation!

Part I – Program Demographics:

Answer questions 1-7 by circling the answer that most appropriately represents your Program.

1) What do you call your program?
   a) Industrial Arts
   b) Industrial Education
   c) Technology and Industrial Education
   d) Technology Education
   e) Other ______________________________

2) With which of the following is your Technology Education/Industrial Arts (TE/IA) Program most closely associated?
   a) General Education
   b) Preparation for a College Education
   c) Preparation for Vocational/Technical Education
   d) Vocational/Technical Education

3) Place a check mark next to the selections below which are represented in your program and circle the one selection which best describes your TE/IA Program facilities?
   a) ____ Unit Labs (e.g. Woods, Metals, Electronics, Drafting, Automotive, etc.)
   b) ____ System Labs (e.g. Bio-Technology, Communication, Construction, Manufacturing, Transportation)
   c) ____ General Labs (wide variety of equipment in each lab)
   d) ____ Modular Labs (i.e. Paxton-Patterson, Synergistics, etc.)

4) Regarding graduation requirements in your high school, are the areas below a required elective for students (circle all that apply and provide the respective required number of credits)?
   a) Career and Technical Education Requirement - _______ credits
   b) Technology Education/ Industrial Arts Requirement - _______ credits
   c) Vocational Education Requirement - _______ credits
   d) No requirements in the above areas

Answer questions 5-14 by circling the appropriate symbol for the statement at the left.
Scale: "-" = Decreased; "0" = Remained the Same; "+" = Increased

		Dec.	Same	Inc.
5)	Over the past five years, student enrollment in your entire school has:	-	0	+
6)	Over the past five years, student enrollment in your TE/IA Program has:	-	0	+
7)	Over the past five years, class sizes in your entire school have:	-	0	+
8)	Over the past five years, class sizes in your TE/IA Program have:	-	0	+
9)	Over the past five years, the number of course offerings in your school has:	-	0	+
10)	Over the past five years, the number of course offerings in TE/IA has:	-	0	+
11)	Over the past five years, the number of faculty in your entire school has:	-	0	+
12)	Over the past five years, the number of faculty in your TE/IA Program has:	-	0	+
13)	Over the past five years, funding for your TE/IA Program has:	-	0	+
14)	Over the past five years, the number of times faculty in your TE/IA Program have attended professional conferences has:	-	0	+

Answer questions 15-26 by writing a numeric value in the blank to the left of the question.

15) ___________ How many faculty are in your (TE/IA) Department?
16) ___________ How many of your TE/IA faculty are female?
17) ___________ How many of your TE/IA faculty are non-Caucasian?
18) ___________ How many of your TE/IA faculty are emergency licensed?

19) ___________ What is the average number of years your faculty has taught TE/IA?
20) ___________ What is the average age of your TE/IA faculty?
21) ___________ How many of your TE/IA faculty are members of professional associations?
22) ___________ What is the average class size in your TE/IA program?

23) ___________ How many total students are enrolled in TE/IA courses at your school?
24) ___________ How many female students are enrolled in your TE/IA courses?
25) ___________ How many minority (non-Caucasian) students are enrolled in your TE/IA courses?
26) ___________ How many special needs students are enrolled in your TE/IA Program?

Part II – Current Practice:

Answer questions 27-34 by circling the appropriate number for the statement at the left regarding resources used in preparing course curriculum and content.
Scale: 1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree.

	SD	D	N	A	SA
27) Self or locally prepared guides are useful:	1	2	3	4	5
28) Wisconsin State Curriculum Guides/Bulletins/Standards are useful:	1	2	3	4	5
29) ITEA/National Curriculum Guides/Bulletins/Standards are useful:	1	2	3	4	5
30) Advisory committees are useful:	1	2	3	4	5
31) Professional magazines are useful:	1	2	3	4	5
32) Textbooks are useful:	1	2	3	4	5
33) College/University courses/offerings are useful:	1	2	3	4	5
34) Department of Public Instruction information is useful:	1	2	3	4	5

Answer questions 35-44 by circling the appropriate number for the statement at the left regarding the teaching methods/instructional methods utilized within your program.
Scale: 1=Never; 2=Seldom; 3=Occaisionally; 4=Often; 5=Daily.

	Never	Seldom	Occ.	Often	Daily
35) Use of lecture/demonstration instruction (not hands-on activities):	1	2	3	4	5
36) Use of student generated problem solving activities:	1	2	3	4	5
37) Use of teacher generated problem solving activities:	1	2	3	4	5
38) Use of interdisciplinary instruction (i.e. with math/science teachers):	1	2	3	4	5
39) Use of vendor created modular instruction:	1	2	3	4	5
40) Use of teacher created work station instruction:	1	2	3	4	5
41) Use of student projects built from plans provided by teachers:	1	2	3	4	5
42) Use of computers as form of instruction (i.e. PowerPoint):	1	2	3	4	5
43) Use of computers by students to complete activities (i.e. AutoCAD):	1	2	3	4	5
44) Use of internet as form of instruction:	1	2	3	4	5

45) In the Table below please provide the names for the five most frequently-taught/popular courses within your TE/IA Program in the past five years (Number 1 being most frequent/popular):

Course Title
1)
2)
3)
4)
5)

Part III – Program Purpose and Barriers:

Answer questions 46-55 by circling the appropriate number for the significance of each statement at the left in regard to what your TE/IA Program asserts as its *PURPOSE* in the school curriculum and student education.

Scale: 1=Unimportant; 2=Somewhat Important; 3=Important; 4=Very Important; 5=Essential.

	Unimp.	SW Imp.	Imp.	Very Imp.	Ess.
46) Develop technological literacy:	1	2	3	4	5
47) Evaluate the positive/negative consequences of technological ventures:	1	2	3	4	5
48) Identify, select, and use resources to create technology:	1	2	3	4	5
49) Recognize that problems and opportunities relate to technology:	1	2	3	4	5
50) Develop design, problem-solving, and critical thinking skills:	1	2	3	4	5
51) Support the application of science and mathematics:	1	2	3	4	5
52) Develop career and post secondary educational awareness:	1	2	3	4	5
53) Provide vocational training and/or pre-vocational experiences:	1	2	3	4	5
54) Provide technical, machine, and tool knowledge/skill:	1	2	3	4	5
55) Develop worthy leisure time interests and creative talent:	1	2	3	4	5

Answer questions 56-65 by circling the appropriate number for the TE/IA Program's collective opinion on each statement at the left regarding *BARRIERS* to having an exemplary/outstanding TE/IA Program.
Scale: 1=Strongly Disagree; 2=Disagree; 3=Neutral; 4= Agree; 5=Strongly Agree.

	SD	D	N	A	SA
56) The quality and consistency of our TE/IA Program faculty:	1	2	3	4	5
57) The quality of students enrolling in TE/IA Program courses:	1	2	3	4	5
58) Lack of financial support:	1	2	3	4	5
59) Lack of administrative support:	1	2	3	4	5
60) Lack of in-service/advanced training opportunities:	1	2	3	4	5
61) Lack of appropriate curriculum/instructional resources:	1	2	3	4	5
62) Problems with perceptions of our Program by others within our school:	1	2	3	4	5
63) Problems with identity/status of the Program in our community:	1	2	3	4	5
64) Problems with identity/status of TE/IA in society:	1	2	3	4	5
65) Impact of increasing academic requirements:	1	2	3	4	5

Appendix B

May 2, 2003

Dear Technology Education Department Chairperson,

I am writing to congratulate you on being chosen to participate in an historic research study of Technology Education Programs in the State of Wisconsin. In cooperation with the Wisconsin Department of Public Instruction (Mr. Ken Starkman, Technology Education Consultant), the Wisconsin Technology Education Association (Steve Johnston, President), and the University of Wisconsin-Stout (Dr. Robert Hendricks, Professor), I am asking for your cooperation in this significant research regarding the status of TE Program demographics, curriculum content, current practice, purpose, and barriers to effectiveness.

You and your school have been chosen to participate in this study through a randomly selected sample of only 175 Wisconsin public high schools. It is a great honor to you and the profession to be part of this research. The information contributed by you will provide data that can be compared to the 1961 state benchmark as well as national benchmark studies of 1963 and 1999. Because the research provides fact-based evidence concerning the current condition and respective trends of Technology Education Programs, it may be important to a wide range of professionals including the DPI, legislators, UW-Stout, and local school districts and educators for developing initiatives, securing funding, evaluating programs, and implementing curricula.

Shortly you will be receiving a three-page, 65-question survey soliciting your complete honesty and candidness regarding your program and our profession. As we are all well aware of the obstacles that stand in our way at this time of the year, rest assured that I would certainly not hassle you with things of mere insignificance. I greatly appreciate your time and attentiveness in advance.

Sincerely,

Travis G. Severson
Technology Education Instructor

Appendix C

May 7, 2003

Dear Technology Education Chairperson,

A short time ago, you received an introductory letter regarding your participation in a benchmark study being conducted in cooperation with the Wisconsin Department of Public Instruction and the Wisconsin Technology Education Association. In review, this study seeks to address issues concerning the status of Technology Education Programs in our state. You and your public secondary school were randomly selected to participate in this study assessing program demographics, curriculum content, current practice, purpose, and barriers to effectiveness. May I also remind you of the importance and significance of this historic research – not since 1961 has such a study been conducted in this state regarding issues that may be of great importance to a wide range of professionals including the DPI, WTEA, legislators, UW-Stout, as well as local school districts and educators for developing initiatives, securing funding, evaluating programs, and implementing curricula.

Attached is the three-page Technology Education Program Survey-2002/2003. There are three parts to the instrument in which your complete honesty and candidness would be appreciated. Part I solicits information on the demographics of your school and program. Part II asks you to provide information on your program's current practice. Part III requests your opinion on the purposes of technology education and the barriers to having an outstanding program. Please answer all questions to the best of your ability and in regard to the 2002/2003 school year unless otherwise noted. Please complete the questionnaire by May 16, 2003, and return it in the postage-paid envelope provided.

To ensure your confidentiality, all results will reflect only group information and in no way will any one respondent be able to be identified in the research. If at any time you are uncomfortable with the inquiry, please feel free to withdraw from the study. To assure that this research has been reviewed and is abiding by the Human Subjects Protection Act, please read the informed consent clause on the single colored page, sign in the appropriate box prior to completing the questionnaire, and return it along with the survey.

If you have any questions or concerns regarding your participation and/or nature of this study, feel free to contact one of the following people: Researcher – Travis G. Severson at (715) 261-3140, tseverso@wausau.k12.wi.us; Research Advisor – Dr. Robert Hendricks at UW-Stout, (715) 232-1299, hendricksr@uwstout.edu; UW-Stout Human Protections Administrator – Sue Foxwell at (715) 232-1126, foxwells@uwstout.edu.

Thank you for your time and assistance,

Travis G. Severson
Technology Education Instructor

Appendix D

Technology Education Program Survey – 2002/2003
Informed Consent Form

Informed Consent Statement

I understand that by signing in the box below, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that only minimal identifiers are necessary and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

Please include your e-mail address below if you wish to receive a summary of the findings from this study.

____

Please return this signed consent form along with the completed survey in the postage-paid envelope provided.

Survey No.

____

Appendix E

May 27, 2003

Dear Technology Education Chairperson/Instructor,

Three weeks ago, an introductory letter was sent to you regarding your participation in a benchmark study being conducted in cooperation with the Wisconsin Department of Public Instruction and the Wisconsin Technology Education Association. Shortly thereafter, a survey was mailed seeking input on issues concerning the status of Technology Education Programs in our state. At this time, a completed survey from your school has not yet been received. Enclosed you will find an additional copy of the questionnaire and postage paid return envelope – please consider taking approximately ten minutes of your time to fill it out and return by June 4, 2003.

May I also remind you of the importance and significance of this historic research. By participating, you will be contributing valuable information that can be compared to the 1961 Wisconsin benchmark as well as national benchmark studies of 1963 and 1999. Because the research provides fact-based evidence concerning the current condition and respective trends of Technology Education Programs, it will be important to a wide range of stakeholders within our profession as well as those beyond who work toward developing initiatives, securing funding, evaluating programs, advancing our profession, and implementing curricula.

To ensure your confidentiality, all results will reflect only group information and in no way will any one respondent be able to be identified in the research. If at any time you are uncomfortable with the inquiry, please feel free to withdraw from the study. To assure that this research has been reviewed and is abiding by the Human Subjects Protection Act, please read the informed consent clause on the single colored page, sign in the appropriate box prior to completing the questionnaire, and return it along with the survey.

If you have any questions or concerns regarding your participation and/or nature of this study, feel free to contact one of the following people: Researcher – Travis G. Severson at (715) 261-3140, tseverso@wausau.k12.wi.us; Research Advisor – Dr. Robert Hendricks at UW-Stout, (715) 232-1299, hendricksr@uwstout.edu; UW-Stout Human Protections Administrator – Sue Foxwell at (715) 232-1126, foxwells@uwstout.edu.

If our correspondence has crossed in the mail, I am grateful for your input and please disregard this request. If you have not had the chance to complete this survey, please take a few moments of your time to answer the questions and return by June 4, 2003.

I sincerely thank you for your time and assistance at this chaotic time of year!

Travis G. Severson
Technology Education Instructor

Appendix F

SURVEY SUPPLEMENT (Researcher Use Only)	
Survey No.	____________
School Classification	_____________________
Community Classification	_____________________
Total School Enrollment	_____________
Total District Enrollment	_____________
Total School Male Student Enrollment	_____________
Total School Female Student Enrollment	_____________

Appendix G

Course Category Groupings

General TE Category	**Course Category**
General Technology	General Technology Education
	Technological Design/R & D/Problem Solving
	Modular Technology
	Computer Technology
	Engineering/Engineering Design
	Adaptive Technology Education
Bio-Technology	Bio-Technology
Communication Technology	Communications
	Graphic Communications
	Visual Communications
	Broadcast Communications
	Drafting/CADD
	Architectural/Mechanical Design
	Electricity/Electronics
Construction Technology	Construction
	Building Construction/Trades
	Home Maintenance
Manufacturing Technology	Manufacturing
	Wood Technology
	Metal Technology
	Plastics Technology
	Materials & Processes
	Enterprise/Entrepreneur

General TE Category	Course Category
Power & Energy	Power & Energy
	Small Engines
Transportation Technology	Transportation Systems
	Auto Technology
	Auto-Mechanics
	Consumer Automotive
	Aviation