A SURVEY OF THE MAJOR EQUIPMENT IN THE INDUSTRIAL ARTS SHOPS IN THE TENNESSEE HIGH SCHOOLS IN 1952

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CHAPTER I

THE PROBLEM FORMULATED

Throughout the study for a Master's degree in any field of education the conditions, situations and facilities of school systems in general are discussed. Generalized studies are of great importance to a certain degree, but at some stage during graduate work, one should become familiar with the schools in his own particular state, especially, in the field of which he is preparing to enter upon graduation. An investigation of this kind in the form of a research study will be beneficial to the one making the study, and if the material collected is compiled into a formal report, it will be of future value as reference material.

The values received from a study of this kind, to the individual, are three fold, namely: one will receive educational value in using the several tools of research; one will receive comparative value by contrasting educational conditions in one field of study in a state with those in other states; and one will also receive selected value in that the findings of the study may warrent application elsewhere.

The Problem Stated. This problem consists of a survey which is being conducted on a state wide basis. The title of the study is A Survey of the Major Equipment in the Industrial Arts Shops in the Tennessee High Schools in 1952. The term "high school" means both junior and senior, either white or colored. The tools and equipment will be combined into one category regardless of whether they were reported in a white or a

colored school. It was first intended to separate the tools and equipment into two divisions, those found in the white schools and those found in the colored schools, but due to the few colored respondents, the information was compiled under one heading. The term industrial arts shops will include those shops located in publicly financed schools which offer industrial arts as a school subject.

This study does not include shop courses which are under the supervision of the Tennessee trade and vocational education department other than those programs that are half industrial arts and half trade and vocational education. When a teacher teaches both subjects, the vocational education course is listed as duties other than teaching industrial arts, and the tools and equipment are checked as if the teacher taught industrial arts all day.

Purpose of the Study. The purpose of this study is to determine the quantity, quality, size and unit cost of all the major equipment in the industrial arts shops of Tennessee. It will also reveal the most common brands of machines and tools used in the industrial arts shops of Tennessee. The location, size, type building, and the kind of heating system will also be considered of importance to this study. Recorded data of this kind will be of future value to individuals who may wish to study the status of industrial arts in Tennessee for the year 1952. Collected and recorded information of this type will be useful to administrators or others who may wish to determine the needs of the industrial arts shops. Furthermore, one may use collected material of this type as a basis for selecting equipment for a new shop or it could be useful material for shop planning. It is with the future need for accurately recorded data in mind, that this

material is being collected and recorded.

Methods of Research. The questionnaire method is the chief type of research used in making this study. It was selected because this method was the only one practical under the existing conditions. The questionnaire has disadvantages, however, its value in ascertaining information within certain limits cannot be denied. This study could not have been attempted had it not been for the use of the questionnaire. Most authorities on research will agree that the personal interview would have obtained more results, but due to the distance and the expense that such method would involve in making a study of the industrial arts shops of Tennessee, it was ruled impractical for this study.

The first attempt to collect information for this problem was by mail. The Tennessee directory of industrial arts was used to obtain a mailing list of the industrial arts teachers. It proved to be very inaccurate in many instances. Ten high school principals returned the questionnaire stating there had never been an industrial arts program in that school. In some cases the industrial arts teacher had changed teaching positions since the directory was prepared, making it necessary for the check-sheet to be forwarded to the correct teacher. The questionnaires in the form of check-sheets were mailed to 193 industrial arts teachers whose names were taken from the industrial arts directory. At the end of two months, only 104 check-sheets had been returned. The writer deemed it necessary to visit some of the teachers who had not responded, to obtain more information. Twenty-nine different teachers were visited, four of which completed the check-forms while the writer was present and twenty-one mailed the information requested later. When the writer started compiling the data, there

were 130 check sheets returned. Some have been returned since, but the data were not included in this study.

The data supplied by the 130 check sheets seem to represent the typical situations that might be found in the industrial arts shops of Tennessee; therefore, information furnished by these 130 check sheets will constitute the criteria on which the assumptions for this study will be based. Really, there was a greater percentage of returns than shown by this study. Lewis, who made a study of industrial arts in Tennessee in 1951, only listed 109 schools with a total of 155 teachers, but Lewis did not include the colored schools. With the colored and white schools combined, there would be approximately 135 different industrial arts shops in the Tennessee high schools.

Definitions of Significant Terms. This part of the study is prepared for the purpose of familiarizing the reader with some of the terms used in this study. Definitions will be quoted when possible and the source stated, but in some cases it will be necessary for the writer to give a personal definition. Most of these definitions will be used to define terms referring to equipment. The educational terms will be defined later in another chapter.

Shop. The term "shop" will be used to refer to the building or room which houses the equipment. It may provide space for one or more subjects.

Metalwork. "Metalwork" will be thought of as the shaping and forging of metals by turning on the lathe, forging, cold or hot, or any method other than melting and pouring into molds.

Woodworking. A term used to refer to a study of all the phases of the lumber industry and the processing of lumber into projects. It may be

machine woodworking which involves the use of power driven tools forming or shaping the wood or it may be hand woodworking in which the operations are performed with hand tools.

Mechanical Drawing. Another form of description which has been developed by which the exact shape of every detail of any structure may be defined accurately and quickly. This method consists of the making of a series of views arranged according to a definite system, with figures added to tell the size. (17, page 1)[1]

Electrical Work. Electrical work as an industrial arts subject is the study of the fundamentals of electricity. It may include the generation, transmission, and distribution of electricity, as well as the maintenance and repair of simple electrical appliances. It may also include the building of elementary appliance motors, and other electrical devices in order to teach the operating principles of more complicated electrical machines and equipment.

Variety Saw. The variety saw has only one arbor. When changing from ripping to crosscutting, therefore, the machinery must be stopped and the saw blade changed. (20, page 25)

Universal Saw. The universal saw has two arbors, so that a rip saw and a crosscut saw can be mounted at the same time, either of which can be brought into use simply by turning a handwheel. (20, page 24)

Radial Saw. The saw unit consists of a motor, the rotor of which carries the saw blade. The motor is fastened to a horizontal arm, which

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[1] Each reference will be in this form. The first figure refers to the number of the book or magazine in the bibliography, and the page on which the reference appears is indicated by the second figure.

slides back and forth in a vertical column, which in turn is bolted to an iron table. As both the column and the motor can be adjusted to various angles, crosscutting, ripping, plain and compound mitering, dadoing, and grooving can be done on this machine. (20, page 37)

The definitions have been quoted for terms that are generally confusing. As these terms are used in this thesis the foregoing definitions have been kept in mind.

Reviews of Similar Studies. As far as could be determined by searching through references in the library, no study has been made of the major equipment in the industrial arts shops of Tennessee. Lewis conducted a study of industrial arts in Tennessee in 1951, in which the total value of the equipment in the junior and senior high schools was listed, but no attempt was made to list the tools and equipment as to quantity, size and brands. The Master's degree thesis written by Lewis is entitled A Study of Industrial Arts in the Public Schools of Tennessee. (27)

A Master's degree thesis entitled A Survey of Major Equipment in the High School Shops of Oklahoma in 1949 (42), written by Rufus Donald Teague at Oklahoma Agricultural and Mechanical College, has been used repeatedly throughout the writing of this thesis. The questionnaire used to collect the data for this study is almost parallel to the one used by Teague. The major difference between this study and the one conducted by Teague is the fact that one is a study of the industrial arts shops in Oklahoma and the other one is a study of industrial arts shops in Tennessee.

An Analysis of the Plan for Presenting the Material. It is proposed to present the findings which were secured by means of a questionnaire by

employing the use of tables and giving a descriptive account of each table as it is presented. The interpretations will be based upon the information furnished by 130 teachers of Tennessee, representing 104 different high schools. The findings will be divided into three parts, namely: the teachers, the buildings, and the equipment.

CHAPTER II

HISTORICAL BACKGROUND OF INDUSTRIAL ARTS

In the early stages of man, the term "education" had not been coined to refer to, ". . . the organization of acquired habits and actions such as will fit the individual to his physical and social environment". (William James' definition of education) However, the early man had to organize crude habits and actions in some manner in order to survive. Food, clothing, and shelter were the most important problems that he had to solve. Food was plentiful; clothing consisted of animal hides; and shelter was provided by nature in the form of a cave or hollow tree. Neighbors were separated by great distances; travel was slow and crude, making the adjustment to physical and social environment of minor importance. With nature providing man with the essential substances for survival, savage learning was in the form of unconscious imitation.

Later, as the population increased, food, clothing and shelter were in greater demand, and the adjustment to physical and social environment became a problem. At this stage man had organized into barbaric classes or tribes and learning became a conscious imitation. The problem of obtaining the necessities of life became acute. To meet these needs ancient man organized teaching facilities to train the younger members of the tribe in ways and means of competing with society.

Modern education has evolved through these different phases of unconscious, conscious and organized learning. Today man competes with millions

of people to obtain food, clothing and shelter. Education is highly organized to assist man in competing with the complicated society in which he lives.

The reader may wonder how the history and development of man crept into a study of industrial arts. Mans earliest existance depended upon the use of his hands to some degree in order to obtain the necessities of life. Barbarian man required some skill and knowledge in the use of crude tools to meet his needs. When ancient man gained the power to control the fire, he passed into another stage of civilization. This phase of development resulted in the manufacture of tools, and a greater necessity for skill and knowledge in the use of tools. As man became more and more civilized, handiwork became of greater importance.

Part A

Early History

Early man was not conscious of the term industrial arts, but handiwork was an important tool in securing food, clothing and shelter. He devised crude tools from bones, wood and stones to aid in pursuing and killing game. Knives shaped from stones aided in skinning the game for clothing and preparing the meat for food. Digging equipment was devised from the same materials to enlarge openings in caves for places to live. Handiwork existed and was of pertinent value to the well-being of primitive man, but the name for this type of work was not supplied until many centuries later.

Unconscious Learning Period. Industrial arts or handiwork in its earliest form was the skill of hand used by the primitive man to provide

food, clothing and shelter for himself and his family. Skill of hand in making and using weapons for physical protection was essential for his survival. Savage education, then, consisted of learning how to obtain the necessities of life for himself and his family, and how to combat the unseen powers that were supposed to be active in nature. Unconsciously imitating the other members of the tribe, the younger group learned to manufacture tools and utensils from wood, clay, bones and hides. These characteristics of the savage distinguished him from the lower animals. Later, environmental factors became so involved that some form of conscious learning was needed. Some older members of the tribe taught the younger generation the art of making and using the crude tools; therefore, another phase of learning developed which is referred to as the conscious period.

Conscious Learning Period. Man soon gained control of fire, then he was able to cook his food, smelt metals and shape these metals into tools. With these tools he engaged in crafts that were unknown before. This development resulted in divisions of labor; some men mined the materials, others forged them into tools, and others built houses, made cloth, etc. With the advent of specialized jobs, workmen segregated into trade groups, each group or guild pursuing the same craft.

As the crafts developed, work became more specialized and the learning of a trade became more complicated for the one preparing for a particular trade. At this time trade schools were not known and whatever education they acquired came through apprenticeship training or social contact.

Apprenticeship Training. The first apprenticeship training began in the home, but as trades became of a wider variety, a father would apprentice sons to other craftsmen to learn new trades. Bennett very concisely gives the duties of the apprentice to the master and the master's obligations to the apprentice as: (3, page 21)

> The apprenticeship period usually covers seven years. During that time the master was supposed to give to his apprentice the same moral, religious and civic instruction that he gave his own son. He was to teach him all the mysteries of his craft, which included such recipes, rules and applications of science, mathematics and art as might be involved in crafts, but it would be a mistake to think of these as comparable to modern courses in the technology of a trade. The method of instruction varied with trades and masters, but there is reason to believe that apprentice instruction in tool processes and the use of materials was almost wholly imitative. In some trades the master was required by his guild to teach reading and writing to his apprentices, and a master was not to take any more apprentices than he could "keep, inform and teach".

The apprenticeship training period was the first organized occupational training. The master planned the instructions for the apprentice in a small degree. This type of training was capable of supplying the needs for educating the youth of that period, but with the invention of machinery a more organized type of training was necessary.

Seventeenth Century Organized Teaching. Society had become more complicated. The apprenticeship system of training was failing to meet the demands for trained workers. Some leaders were advocating schools to assist in training the youth to work with their hands. Many theories were advanced on the means and methods of educating the younger generation; but none had proven satisfactory until the beginning of the nineteenth century.

Pestalozzi's Contributions. In the latter part of the eighteenth century and the first quarter of the nineteenth century, the Swiss reformer, Pestalozzi, advanced a step farther than writers of the preceeding century. He put into practice his theories in the form of a school. Due to his poor managerial ability his schools were short lived, but his methods and practices had a marked influence on future education. He based his instructions on the object method and insisted upon observation and handling of objects. He also contended that the child developed mentality through impressions and experiences, not through words. Pestalozzi's teaching spread through Finland, Sweden, England and America.

The Scandinavian Influences. To this stage, education has been discussed in general terms. Manual training had not been introduced as a school subject, but at the beginning of this period, manual training was being discussed in some countries. As can be seen, the European countries preceded the United States in recognizing manual training as an educational tool. Finland was the first to propose such courses as a part of school instruction. In 1846 the Emperor of Russia appointed Uno Cygnaeus to reorganize the primary schools of Finland. He proposed courses in woodworking, metalwork, pottery and basketry.

The Russian System. This system was divided into two parts, namely, the instruction shop and the construction shop. The students were permitted to work in the construction shop only after having completed the required courses in the instruction shop. Of the final aims and the methods used to reach these ends, Bennett says: (4, page 16)

> The end sought in the new system was to teach the fundamentals of the mechanic arts: (a) in the least possible time; (b) in

> such a way as to make possible the giving of adequate instruction to a large number of students at one time; (c) by a method that would give to the study of practical shopwork the character of a sound, systematical acquirement of knowledge; and (d) so as to enable the teacher to determine the progress of each student at any time.

It seemed that this system was concerned with giving mass instruction in a short time. The theory appeared to be based upon the personal philosophy of Della Vos, its founder. He maintained that the student should start with the easy and proceed with the more complicated, and that the student should master a certain phase at a given time. Della Vos displayed some of the projects in his system at the 1876 Centennial Exposition in Philadelphia. This display created widespread interest among educational leaders, especially in America.

The Swedish Sloyd. The third contribution was made by Sweden to make handiwork a part of its educational system. Vaughn and Mays describe the Sloyd system in these words: (44, page 25)

> Sloyd at first received the attention of the Swedish government not as a means of education, but as a means of furnishing the leisure hours in the rural home with interesting occupations, of reviving the rapidly disappearing handicrafts among the people, and of checking the rapid movement of families from the country to the cities. So, in 1870, the government urged upon the rural homes that they devote some time to the various handicrafts such as carpentry, carving, stonework, basketry, etc.

The three outstanding characteristics of the educational sloyd, as this system was called, were: (1) making useful objects; (2) analysis of processes; and (3) educational method. Otto Salomon, its founder, based the course upon a series of elementary tools, exercises and elementary forms of construction. Unlike the Russian system, Salomon combined exercises with useful models. Bennett compares the aims of the Russian system and the Swedish system in this way: (4, page 67)

> In no respect was there a greater contrast between the Russian system and the Swedish system as developed by Salomon than in the aim of the work. The Russian system was definitely devised to train skillful, intelligent mechanics. The Swedish, on the contrary, was for purposes of general education; it was considered valuable for every child. Moreover, the Russian system, devised by government engineers, was put into execution like other engineering enterprises with speed in learning and the engineering result constantly in view, and with little regard for individual capacities; it was a mass-production system of special education. The Swedish system, on the other hand, was worked out by an educator whose primary interest was the enrichment of the education of all children during the elementary-school period, recognizing individual capacities and individual speeds in learning; it was an individual-production system, not a mass-production system of general education. In this latter respect, it was an important contribution to present-day ideals and practice in elementary education.

Even the statement made by Bennett, one would readily appreciate the difference between the two systems with the present-day trade and industrial program and the industrial arts program, the aims of the Russian system representing the trades and industrial and the Swedish sloyd aims suggesting those of industrial arts.

All early history of handiwork had some effect upon industrial arts in the United States, but the Russian and Swedish sloyd systems have had more distinguishable influence than any of the others. The Russian display shown at the Centennial Exposition in Philadelphia, influenced the opening of a School of Mechanical Arts as a preparatory school for entrance into the Massachusetts Institute of Technology in Boston, and the principles of the system were followed in the establishment of the St. Louis Manual Training School of Washington University. These schools provided the impulse which caused the spread of manual training throughout the United States, resulting in the movement to establish manual training high schools over the nation.

Part B

History and Development of Industrial Arts in America Prior to 1920

When Columbus landed on the mainland of America in 1492, he found it inhabited by "redmen". Columbus mistakenly thought he had discovered a new route to India, therefore he gave the "redmen" the name Indian. The Indian was savage in many respects, but he had learned to make crude tools and implements of clay, wood and stones. He was also practicing a crude type of agriculture.

The education of the Indian was of the unconscious or semiconscious type. Training was by imitation of the older members of the tribe, but some planned training was practiced. While the older women taught the younger women to cook, sew and raise crops, the older men were teaching the younger men the art of making bows and arrows, and crude tools for fishing, hunting and warring purposes.

It is reported that Columbus went back to Spain and told of the rich country just across the ocean. With the political, social and religious unrest in Europe, many people welcomed the opportunity to settle the new country. Before long, settlements dotted the Eastern coast of America. These settlers were of many nationalities, religions, beliefs and social standing. One can say of the early American settler, seek any character, and he can be found plodding down the muddy pioneer streets, clearing the virgin forest, or building a log cabin in early America.

Each settlement organized a school after a fashion in the old country. They were short sessioned, ill equipped, and very religious in nature. As the population grew in America, the colonial schools failed to meet the

educational needs, therefore, laws were passed to make the support of an elementary school compulsory. The period of attendance was lengthened, but as society became more involved, the elementary school still failed to meet the needs. The Latin grammar school was organized. Its narrowness in subject matter and its college preparatory aims soon rendered it useless. At this time America recognized the fact that schools should be designed to fit more people than the ones preparing for college. The academy was the outcome of these broader views of education.

The academy was certainly an improvement over the older type of secondary education, but society advocated a school of higher education for everyone regardless of race, color or creed. Heretofore, the richer classes were the chief occupants of the secondary schools. The poorer classes were privileged to attend these schools, but frequently high tuition stood between them and an education. America soon realized that if the high principles of democracy were to be upheld, schools would have to be provided for the masses. The free public school was organized to meet the wider concepts of education.

Another important phase of education in America was the introduction of handiwork. It was first used in private schools as a trade preparatory subject, but slowly it found its way into the public school curriculum. It was first introduced in the school as "manual training", but later its name was changed to "manual arts". Through the writings of Russel and Bonser, its name was later changed to "industrial arts", which is the term universally used today when referring to instruction in handiwork for general education.

Savage Education in America. During this period in America there were no organized schools; yet, the American Indians used some means to train the younger braves of the tribe to compete with the savage environment. They were taught to make bows and arrows and implements of stone and wood. At a very early age the young braves were taught the art of running in the woods, swiftness in travel, and the ability to endure. The young girls were taught to cook, sew, and care for the garden. The training of young braves was administered on the individual basis, but a motivating influence to become a full-fledged brave was an incentive for them to learn.

This very early phase of education in America does not have a very significant value other than it indicates the existing conditions at the time the first settlers landed in America.

Early Colonial Period of Education. When the first settlers came to America, they established schools on the order of the ones in the old country. These early schools were very unappealing to the students. The curriculum was composed of the three "R's", reading, writing and arithmetic. They were usually operated for the wealthier class who were the only ones who could afford to go to school.

During the colonial period, elementary education was provided in various ways, as can be shown by quoting Bent and Kronenberg: (5, page 93)

> . . . education was provided in various ways. In New England it was provided in the home, the dame school, and town schools. In Pennsylvania it was provided by parochial schools; in Virginia, by private tutors and by charity and pauper schools. Private day and night schools appear to have been common all through the eighteenth century.

It seems that no two towns had the same type or the same method of financing the elementary schools. Neither were they organized as to the

teaching content, length of time or aims. In 1647 a law was passed in Massachusetts making it compulsory for each town with fifty families to establish an elementary school. This was the beginning of compulsory education in America. This law is important to the study of education in America because it was the first state intervention in education. The early elementary school was designed for those not contemplating going to college; another type, the Latin Grammar School, had preparation for college as its purpose.

The Latin Grammar School. As was stated, the Latin Grammar School had as its purpose preparation for college, with emphasis on mental discipline and moral training. Its stated aims were not wholly accurate, for many who attended the Latin Grammar School did not attend college. The "Old Deluder Satan Act" of 1647 also made it compulsory for each town with 100 families to support a Latin Grammar School. This law is quoted in part, as given by Kandel. (25, page 120)

> . . . It is further ordained, that when any town shall increase to the number of one hundred families or householders, they shall set up a grammar school, the master therefore being able to instruct youth, so far as they may be fitted for the university; provided, that if any town neglect the performance hereof above one year, that every such town shall pay five pounds to the next school until they shall perform this order.

This law was ahead of its time, and was difficult if not impossible to enforce. Many of the towns preferred to pay the five pounds rather than establish a school. Other laws were passed which raised the penalties for failure to establish schools; this was an indication that the public was really convinced of the value of secondary education. W. H. Small summarized early attitudes toward secondary schools in these words: (38, page 31)

> The grammar school was not a popular institution: it was conceived, supported, and perpetuated by the few; its extension was slow; its

> course in most towns was erratic; and yet, considering all the struggle of this period, it was a marvelous institution, the bed rock of future educational systems.

The Latin Grammar School was often spoken of as the single-subject school, since Latin was a required subject. Its curriculum included such other subjects as ethics, history and literature. Pupils were also expected to read the Bible, attend church and make a report on the sermons.

By 1750, new and more practical subjects were finding their way into the curriculum. Commercial subjects, such as records, business practices, accounting, English, composition and mathematics were introduced. They were included by demands of the people. Its failure to broaden its curriculum as time advanced, and its narrow aims are factors that hastened its decline.

The decline of the school, which started in the eighteenth century and was about completed by 1800, was one of the effects of the growth of democratic ideas in America with respect to universal education. Although the Latin Grammar School failed in its original purpose, it was the forerunner of the academy.

The Academy. The first academy was established by Benjamin Franklin at Philadelphia in 1751. Franklin said of its proposed curriculum: ". . teach everything useful and ornamental". These wide aims and purposes of the academy were some of the factors that rendered it so popular. The curriculum of the academy was broad, including almost all subjects which were designed to meet the economic and social needs of the times, mainly because its aims were not for college entrance requirements. It was one of the first schools in America that offered subjects for various occupational groups, such as surveyors, teachers, merchants and tradesmen. It

is said of the academy, in order to attract students, it would offer instructions in any subject for which there was a demand. Monroe says of its wide variety of subjects: (30, page 58)

> There were about 75 subjects taught in the academies of the state of New York in 1837, including various branches of mathematics, science, English, social studies, surveying, philosophy, law, ancient and modern languages, theology, business subjects, music, navagation, embroidery, painting and the principles of teaching. From 1787 to 1870, 149 new subjects appeared in the academies of New York.

It is very clearly shown that the aims and purposes of the academy were broad enough to meet the demands of society, but one of its weaknesses was the fact that it was privately operated and on a paying basis rendering it useless as an educational institution for the masses. From the beginning, the academy would accept girls who had no place in the Latin grammar school. The academy movement reached its height about 1850, and then gradually gave way to the free public high school.

The Public High School. The first high school was established in Boston, Massachusetts, in 1821. Its curriculum consisted of the best features of the Latin grammar school and the academy. The high school was first for boys exclusively and remained this way until 1840, when high schools became coeducational more for the sake of economy than from any education theory. The first high school grew very slowly because it had to compete with the academy, but after 1860 the academy began to decline, and the high school was definitely established as the predominant type of secondary education.

Thus far, education has been discussed separate and apart from handiwork. This can be justified by giving these reasons. First, general education has been considered by its leaders as one kind of education and

handicraft section. There were faulty assumptions on the part of general education leaders because its purposes should have been to train the youngsters in the ". . . preparation for the duties and responsibilities of life" (Woodward's definition of education), but many educational leaders seemed to be confused as to what its aims or purposes should be. Second, the development of industrial arts can best be shown separately. Its aim and objectives were not established during its early stages. In fact, handicraft was first started as a trade preparatory subject, with aim and purposes wholly for preparation for employment. The gradual change in its purposes from trade preparatory to exploration and guidance functions, were not directly connected with the history and development of general education; therefore, it should be discussed separately. Third, general education was the first organized training in the form of a school in America. Whether it should have been may be a debatable question. Survival of the early settlers depended more upon handicraft than it did reading the "three R's", but regardless of which should have been first, the history of education is already established. Being true, that general education was first in America and handicraft made its entrance later as a subject, the revision of the aims and purposes that resulted in its acceptance can best be shown in a separate discussion.

The Trade School. The early trade school aims and purposes were to train for industry. While these are not the aims of the industrial arts program, the trade school development had a marked influence upon the industrial arts program. Prior to 1620 most of the trained factory workers were imported from foreign countries or supplied by apprenticeship training, but during the war of 1812, and the advent of the factory system,

American educators realized some means had to be provided to meet the acute shortage of trained workers.

The General Society of Mechanics and Tradesmen of New York City organized the first trade school for the purpose of training workmen for the factories. Later, Franklin Institute in Philadelphia incorporated into its curriculum a type of trade training. These early trade schools provided the impetus that led to other cities establishing the same type schools. The trade school system grew very slowly until the War Between the States, in 1861, which expedited the extensive development of the trade schools. During this period mass production was introduced into the factories; power driven machinery that would stamp out thousands of parts was brought into operation. These changes in industry contributed more than ever to the trained labor shortage, but the burden of teaching these workmen rested upon the private trade school, financed by donations, profit from produced goods or by an endowment left by some industrialist.

Industrial Massachusetts provided the spark that led to a new era in vocational education. On May 24, 1905, Governor Douglas signed a bill creating the Commission on Industrial and Technical Education. McCarthy says of this Commission: (28, page 15)

> This Commission, known as the Douglas Commission, has a very definite place in the educational history of the Nation. It has made a definite contribution to the development of vocational education in America.

The purpose of this Commission was to make a study of the needs of vocational education in Massachusetts. Its findings and recommendations led to state aid for vocational education in Massachusetts and provided a precedent for other states in which the same type of schools were needed. Eventually a group of leaders working for a common purpose, banded together

in 1906 to organize what was known as the National Society for the Promotion of Industrial Education. This society secured the appointment of the Federal Commission on National Aid to Vocational Education which was created in 1914. In 1917 this Commission reached its final goal, the passing of the Smith-Houghs Act. At this stage, trade training received the incentive which caused it to develop into one of the great phases of American public education.

Manual Training in America. The Russian display at the 1776 Centennial Exposition at Philadelphia, caused widespread interest in manual training in America. Calvin M. Woodward of the Washington University, who had already introduced shopwork, and John D. Runkle, president of the Massachusetts Institute of Technology, both of whom attended the Exposition, were greatly influenced by the Russian display. Runkle, in referring to his experience at the Exposition, said: (4, page 320)

> At Philadelphia, in 1876, almost the first thing I saw was a small case containing three series of models . . . one of chipping and filing, one of forging, and one of machine-tool work. I saw at once that they were not parts of machines, but simply graded models for teaching the manipulations of these arts. In an instant, the problem I had been seeking to solve was clear in my mind; a plain distinction between a mechanic art and its application in some special trade became apparent.

Runkle was so enthusiastic about what he had seen that upon his return to Boston, he immediately recommended a group of instruction shops in which should be taught all the mechanic arts needed by young engineers. By August of that same year such shopwork had been organized. Later a secondary school developed, which offered shop instruction for those going into industry.

As has been stated, Woodward had already established instructional

shops for engineering students at Washington University. Woodward's experiences at the Exposition resulted in a study of the Russian tool industries. Through this study he visualized shopwork being placed on the same educational plane with other school subjects. In 1879 he transformed an old dormitory into a group of instruction shops which consisted of a blacksmith shop, machine shop and a woodworking shop. This school was called the Manual Training School of Washington University. The organization of these shops was the beginning of a new area in education, the introduction of manual training in the secondary school. Bennett, quoting from Woodward, gives the purpose of the Manual Training School at Washington University as: (4, page 347)

> Its objects shall be instruction in mathematics, drawing and English branches of a high-school course, and instruction and practice in the use of tools. The tool instruction, as at present contemplated, shall include carpentry, wood turning, patternmaking, iron chipping and filing, forge work, brazing and soldering, and the use of machine shop tools, and such other instruction of a similar character as may be deemed advisable to add to the foregoing, from time to time.
>
> The students will divide their working hours, as nearly as possible, equally between mental and manual labor.
>
> They shall be admitted, on examination, at not less than fourteen years of age, and the course shall continue three years.

This school seems to have included a wide offering in shop courses. Many schools today do not have such a wide selection from which to choose. Manual training was given the same consideration as the other subjects; half the time was devoted to academic subjects and half to shop work. By 1884, the success of the Manual Training School at Washington University created interest among other schools. A manual training school was organized in Chicago in 1884; four years later it was followed by a school in St. Paul, Minnesota. By this time manual training high schools had become

very popular. Manual training was soon introduced in the general high school as a subject in its curriculum and a few years later it became one of the offerings in the elementary schools.

The development of manual training in America was not as easy as it might seem. It was under constant attack by educational leaders who did not want to accept it in the school, but through the efforts of Woodward, Runkle, Bennett and others it proceeded to gain popularity until another name was suggested for this type of instruction.

Introduction of the Term Manual Arts. In the latter part of the nineteenth century manual arts was introduced in the field of shop instruction. Manual training was under criticism by educational leaders for its failure to accept the new philosophy of education. The advocates of the new philosophy wanted to correlate manual training with art instructions and give the student opportunity to use his imagination for creative design. The manual training school insisted on retaining the old practices of tool exercises. The practices of the old manual training school can be shown by quoting Hunt: (21, page 102)

> Early manual training courses sometimes consisted almost exclusively of the making of joints. This gave the name manual training such a poor reputation that the modern diversified types of shopwork offered in most high schools are included in the new term industrial arts.

In 1893 the new term "manual arts" was used at Teachers College, New York City, to signify a building in which art and manual training were taught. It was given the name Macy Manual Arts Building. Bawden says of the introduction of the term "manual arts": (1, page 1)

> Following the completion of the Macy Manual Arts Building, at Teachers College, New York City, in 1893, which was planned by Charles A. Bennett, the term "manual arts" achieved considerable popularity, especially in the east and middle west.

manual arts was soon accepted in New York, and from time to time the term gained in popularity throughout the nation. The idea suggested by the new term was at once accepted by educators as the goal for manual training, and the art work in the schools. The popularity of the term "manual arts" was short lived. John Dewey, G. Stanley Hall and others introduced a new philosophy of education toward the turn of the nineteenth century placing emphasis in the center of the school curriculum. This new progressive move in education, as it was called, resulted in a new term for shop instruction.

Introduction of the Term Industrial Arts. The progressive educational movement advocated using instructions in the school real, broad and rich in related content. The related content was to become the basis for the instruction. Charles R. Richards was the first among men in the manual arts field to react to this new philosophy. An editorial appearing in the 1904 Manual Training Magazine by Richards, suggested that the term "industrial arts" be substituted for the term "manual training and arts": (36, page 32)

> . . . owing to a change of viewpoint, we are rapidly leaving behind the purely disciplinary thought of manual training . . . Now we are beginning to see that the scope of this work is nothing short of the elements of the industries fundamental to modern civilization.

At this phase in the history and development of education, industrial arts was introduced to refer to shop instruction. Not only was a new name born, but a new subject and a new method. It was no longer a shop of tool processes and designs, but one that took into consideration the needs of the whole child, plus giving the tool processes and the opportunity to design. At last, shopwork had reached a point where it should contribute more fully to educational needs. To illustrate, Bonser's expressive views as to how industrial arts could justify itself in the school, the following

is quoted: (6, page 31)

> From this standpoint, it will at once appear that primary emphasis will not be placed upon the production of commodities, but rather upon intelligent and cultivated taste in their choice and use. In one single field will all of the children function as producers, but from every field worthy of study they will all function as consumers. The largest problems are those of developing an appreciative understanding of industry as it is at the present time, realizing its social problems and cultivating intelligent judgment and appreciation in the selection and use of industrial products.

Russel and Bonser, two distinguished leaders in the early development of the new term "industrial arts", formulated the methods for uniting the theories of the progressive educational movement. Through the efforts and writings of Russel and Bonser, industrial arts was accepted as a school subject.

The term "industrial arts" is not significant within itself, but the fact that this new area in shopwork broke away from formalized methods and practices of the old shop is the important phase in the history and development of shopwork. In the term "industrial arts" both industry and art are emphasized; while in manual arts, the "arts" is historically the distinctive word, and in the term "manual training", "manual" is the important word. Although industrial arts is almost universally accepted as the correct term to use when referring to shop instruction, for general education purposes, there are some schools in which the subject is still called manual training or manual arts. This is more in respect to the early programs and founders than for argumentative purposes. Shopwork that was introduced in the high school by Woodward has become an important phase of education, but the next period, 1920 - 1934, will show more significant results.

Part C

The Development of Industrial Arts Since 1920

The name "industrial arts" as suggested by Bonser in 1913 has become almost a universally accepted term, but more has been done since 1913 of historical value than merely changing its name. Industrial arts as a subject in the schools has passed through a series of evolutionary changes; these modifications in the industrial arts program are of importance in the study of its historical development, as well as the environmental changes that have taken place. Different views and practices of the leaders in the field of industrial arts as to its administration, course content, organization and objectives are considered valuable phases of the history and development of industrial arts.

Formulating the new purposes of industrial arts was a tremendous development over the old manual training belief, that the student should receive disciplinary experiences in the acquisition of manipulative skills. The new purposes to give the student experiences with and an insight in the materials, tools and the fundamental processes of industry, educate the boys and girls to live in a world that is characterized as industrial and technological. Changing industrial arts in this way, more nearly fits the needs of the students and impresses the public and the leaders in education with a fuller realization of the values of industrial arts as a phase of modern education.

The environmental factors that influenced the history and development of industrial arts are considered of pertinent value to this study. The reorganization of the high school which resulted in the junior high school and the change of attitude of the educational leaders toward industrial

arts as a school subject, are some of the environmental factors that have affected industrial arts.

Education in general has gone through drastic changes between 1920 and 1952 which resulted in a broader concept of its principles and purposes. Advocating education for all people regardless of race, color or creed has recognizable effect upon industrial arts, but the junior high school has helped elevate industrial arts to its present status in education more than any of the newer developments of education.

The Junior High School and Its Effects. Before the junior high school became a common phase of free public education, "manual training" was sometimes scheduled in the last year of the elementary school. With the advancement of the first junior high school, the course, properly called industrial arts, was unanimously included in its offering. The first junior high school according to Clifton, ". . . was established in 1909". (10, page 164) The first example of a school organized on a 6-3-3 basis which included a separately organized division for grades seven, eight and nine, was in Berkeley, California, in 1909. A year later, Columbus, Ohio, reported a reorganization of its system, and Los Angeles organized a junior high school in 1911. The success of the junior high school can best be understood from a statement made by Douglas: (12, page 5)

> Within a short time junior high schools were organized in many of the large cities through the United States. Since 1920, the movement has been more gradual, but an ever increasing tendency is evident to replace the traditional 8-4 organization with the 6-3-3 plan. The extent of the movement is shown by the number of reorganized schools, which by 1927 had affected 5,000 of the 20,000 high schools in the United States.

The 8-4 plan was the result of haphazard growth without definite planning. It was soon attacked by educational leaders which lead to a

reorganization. Many 6-6 plan schools were started, but due to unfavorable conditions and criticism from educational leaders the 6-6 plan was changed to the 6-3-3 plan. Such a marked increase has been shown in the reorganization until at the present 43.1 per cent of the schools are of the reorganized type.

In a period of over forty-three years the junior high school has developed into an efficient and accepted unit in the American program of education. Many have become enlightened as to the value of the junior high school and have accepted it as being worthwhile in the educational field. The statement made by Pringle bears this out when he says: (33, page 27)

> . . . We know that there has gradually come about extreme faith in the worthwhileness, possibilities and effectiveness of the junior high school. This confidence is possessed by all concerned; taxpayers, patrons, students of education and others immediately connected with the work.

It is true that the 6-3-3 plan has not met all expectations, but one can say that it more nearly fits the needs of society. There is no doubt but that it has made valuable contributions to the betterment of education for children in their early adolescence. On the whole, one can safely conclude from all evidence available that they have more than justified themselves.

The reorganization of secondary education to include both the junior and senior high school played an important part in the development of industrial arts and it has helped the junior high school to achieve its aims. This statement can best be proven by quoting the aims of the junior high school as given by Pringle: (33, page 27)

> To develop and train to the highest capacity the physical, mental, social, moral and aesthetic powers of the immature, maturing and matured pupils of the seventh, eighth and ninth grades.

A study of the aims and objectives of industrial arts as given by Selvidge and Leyhland, which are quoted in Chapter III of this study, will reveal the closeness of these objectives and the aims as are recommended for the junior high school. No doubt the junior high school has increased the effectiveness of the industrial arts program by increasing the various forms of knowledge and skills for which the elementary school once assumed the responsibility. Although industrial arts was found in some degree in the elementary school and in the original high school curriculums, with the advent of the junior high school it was more strongly emphasized.

The leaders in the junior high school movement seriously stressed the value and needs for numerous short exploratory courses as a means of continuing the general education of the youth. Industrial arts teachers and administrators welcomed this opportunity to provide means for meeting these exploratory aims. In later phases of the development of the junior high school, teachers were faced with the problems of meeting the needs of varied individual interests, aptitudes, and abilities. These problems were at least partially solved with the advent of the general shop.

General Shop. The general shop theory was advocated in 1925, but was not established in the schools until the early thirties. The early advocates of the general shop were hesitant in experimenting with the new theory of one teacher supervising several industrial arts subjects located in one shop. At first the leaders in industrial arts were skeptical of the new idea, but at the present time the general shop has become universally accepted in all parts of the nation.

There seems to be disagreement among the leaders as to how many industrial arts subjects one teacher will be able to supervise effectively and what subjects should be included in the general shop. Few schools

follow the same combination of activities or the same number of units. In some schools over the nation the general shop consists of unrelated offerings, while in other localities the subjects will be closely related.

The following characteristics of the general shop as stated by Kenkirk are to some degree responsible for its popularity in representing the industrial arts program: (31, page 19)

1. It is well adapted to the organization of industrial arts content in the light of the general education, exploration and guidance aims of the junior high school.
2. It permits students to be treated as individuals with due respect for their differences in interest and capacity.
3. It enables a student to discover his abilities and aptitudes through manipulation of a wide range of materials, tools and the processes that go with them.
4. It offers an economical way to gain experience in many activities.
5. It makes possible an adequate industrial arts program for the small school.
6. It stimulates the setting up of a well-planned shop and a carefully organized teaching content.
7. It increases teaching efficiency.

It is true that the general shop more nearly meets the newer concepts of education. General shop is easily adapted to meet the multiplicity of individual differences and interests if organized wisely by the instructor. If the subjects offered are selected to meet the needs of the community, the student will more nearly become a part of the complicated society in which he lives. There is no limit to the quantity of subjects that can be offered in the general shop provided there is sufficient space, tools, and equipment for effective teaching.

The general shop was heralded by many of the leaders in the field. Their enthusiasm for the new type of shop can be illustrated by quoting some of the articles on this subject. Lelit Hunt, in 1929, expressed his enthusiasm for the general shop in an article appearing in one of the

professional magazines: (24, page 178)

> The remarkable feature of this new building is the method employed of providing instruction in the general shop. The usual elementary woodworking shop and drafting room have been retained, and students are required to take one semester of work in each of these before the year of general shop. In this way they become "shop wise", and learn the use of many tools.
>
> The student then takes one year of the general shop, changing courses each six weeks, the six activities consist of: leather work, basketry, printing, sheet-metal, electricity and foundry.

This article is referring to a newly constructed high school industrial arts shop at Stillwater, Oklahoma. It very clearly expresses the prerequisites, organization and courses offered in the general shop.

Werner, another leader, comments on the reorganization of the industrial arts shop in 1930 as follows: (45, page 267)

> Many people do not realize the wide spread significance of the most recent development in industrial arts and vocational education, the general shop. The idea of the general shop is scarcely 20 years old and in its present development is less than 10 years old. Examples of this type of organization are seen in almost every form and level of school work.

It appears that the general shop had become almost a universally accepted part of industrial arts by 1930 and many of the administrators in the field had provided a general shop in some form. Newkirk, an author of a textbook on the general shop, published in 1947, gives some of the ways and means by which it will contribute to these aims and purposes: (31, page 18)

> The general shop is heralded as containing the solution of the industrial arts problem in small schools. It has proved valuable as an educative and finding course for vocational students who have no shop experience upon which to base the selection of a trade. The aims and basic teaching content of the general shop are in harmony with the best practices in the industrial arts field.

Characteristics such as solving the problems of the small school, orientating the student and exploratory functions have made the general shop a part of the curriculum in the junior high school. The relation of the general shop to the junior high school is clearly stated by Newkirk: (31, page 19)

> The general shop is well adapted to the junior high school. This is the period when pupils are making wide contact with objects and materials. The pupil needs information about the things they meet in the world; they need the experience that comes from handling and knowing these products. They need to learn how to care for the electrical and mechanical devices about the home and community. They should be trained to become efficient members of the family group, regardless of the vocation they may choose. They need training in the selection of the commodities which they will consume as members of a modern American community. Finally, the industrial arts teacher has the responsibility of giving occupational information about the trades and industry.

Much progress has been made during recent years in making available a richer, more colorful, more appealing and more vital education through the organization of the general shop. Since the present trend in education is to demand of the industrial arts teacher to render a broader service than has been expected in the past, it is essential to offer a course which meets these demands. A well-planned, organized and supervised general shop program does enable a school, whether it be large or small, to offer a really effective course in industrial arts. The general shop has grown in popularity in the past because it provided varied activities for the students whereby the instructor could provide for these individual differences. It is safe to assume that the general shop will continue to be a part of the industrial arts program because the trends in education will, more than likely, be toward meeting the needs of the student.

The Laboratory of Industry. Closely related in aim and function to the general shop is the laboratory of industry. The idea for this probably

came from Bonser and has been developed by Lerner of Ohio State University, and others. Lerner gives this reason for using the term "laboratory of industry": (46, page 1)

> The term "laboratory of industry" was selected because the whole situation is to represent modern industry. The laboratory is to be a center about which the study of industry revolves.

The physical equipment for this type shop is selected and designed to take care of a large class. However, there must be a plan of organization to obtain the best educational results.

Various students are delegated by the teacher to act in the capacity of clerk, foreman, superintendent, storeroom and toolroom attendants and the like, while the teacher acts as the supervisor. There is a wide range of industries represented including drawing, printing, metalwork, woodwork, electrical, automotive, ceramics, photography and the like. These thoughts can be clarified by a statement made by Moffitt: (34, page 2)

> As the name suggests, this form of instructional organization places emphasis upon values growing out of experimentation, analysis and exploration in materials, processes and products of industry, involving manipulative work and study, much the same as is carried on in the general shop.

Even the time the industrial arts shop was reorganized to offer more than one subject in the same shop, there has been some controversy as to what this new shop should be called. Any of these terms, "general shop", "laboratory of industry", or "community shop", a term suggested by Moffitt first of Oklahoma A. and M. College, can be correctly used in referring to a shop that offers two or more subjects in the same room and under the supervision of one teacher. Regardless of the name used to refer to this type shop, it is achieving wide popularity among industrial arts leaders and the leaders of general education.

Industrial Arts Accepted as a Part of General Education. At one time educational leaders looked upon industrial arts as a part of specialized education. This conception as to its place was a hindrance to industrial arts and the educational program as a whole. Many of the fantastic ideas and practices in education can be attributed to the lack of unity and a well stated set of aims and objectives. At the beginning of this century the leaders became aware of this need and began to propose ways and means of unifying education. The curriculum was broadened, school term lengthened, and the consideration of the pupils interest, needs and aptitudes were made a part of the new program. Kilpatrick says of the need for a change of aims in education: (24, page 85)

> The school must become a place where life, real experiencing, goes on. Only on this basis can our children learn what they need.

At this stage the school curriculum made provisions to fit the needs of the student. The three "R's" in the old system of education had been placed in the background. Educators saw the need to accept the views expressed by industrial arts advocators in the early phases of its development. Dewey, an educator and psychologist, expresses his views as to the need of a subject that requires manipulation of the hands and mind through the use of tools. (11, page 228)

> Study of mental life has made evident the fundamental worth of native tendencies to explore, to manipulate tools and materials, to construct, . . . when exercises which are prompted by these instincts are a part of the regular school program, the whole pupil is engaged, the artificial gap between life in school and out is reduced . . . without something of this kind, it is not possible to secure the normal estate of effective learning.

Dewey made this statement in 1916, but it was not accepted as being a vital part until some years later. The view expressed by Dewey was not new to the leaders in industrial arts. It seems that the early men in

industrial arts had this view in mind when they organized the first course. Industrial arts has always made the claim that it was a part of general education. The fundamental significance of industrial arts in modern education is ably and concisely stated by Bonser: (4, page 105)

> Industrial arts is thus a study that enlists all of the learning and active impulses and abilities of children . . . manipulative, investigative, esthetic and social. It represents fields of real need in both child life and adult life, it uses the minds of the children quite as much as their hands. It leads on to related fields of cultural content, giving a basis for interest in an appreciation for much of history, geography, science, literature and art for which children and students otherwise would have no approach nor any adequate means of understanding. . . So fundamental are the values derived from industrial arts that little progress in education can be expected until its contents and method are recognized and included in the common education of our whole people.

From these statements one can readily assume that industrial arts is a part of general education and that in its early stages it was organized with this view in mind. Contrary to the belief and thoughts of some people, a good industrial arts program provides more for the students than merely manipulative skills.

Industrial arts work can be justified as a phase of general education not because its objectives are essentially different from the objectives of general education, but because the experiences provided in its offering are more effective and more economical as a means of reaching certain desirable ends which meet the aims of general education. Lemon says the contents of industrial arts are: ". . . to provide for complete growth of the individual, the school must give a prominent place to industrial arts experiences in the educational program". (2, page 19)

Miller definitely states that industrial arts is a phase of general education in his definition of the term industrial arts: (56, page 2)

> Industrial arts will be defined as those phases of general education which deal with industry . . . its organization, materials, occupations, processes and products . . . and with the problems resulting from the industrial and technological nature of society.

By the definition given by Wilber and the statements of other authorities in the field of industrial arts, one can safely assume that the majority in the field of industrial arts consider it as a phase of general education.

Part D

Industrial Arts in the United States Since 1949

The wide acceptance of industrial arts as a school subject in post-war years has resulted in the establishing of more industrial arts programs in the school system of the United States. One hindrance to industrial arts is the cost of equipment to start a shop. It requires more room per pupil which makes it hard to convince the administration of the need of industrial arts. It is also difficult to see the sacrificing of a large area to twenty or twenty-five students when other teachers teach thirty or more in a space half the size of the shop. Many administrators have overlooked the cost in the light of providing a shop which will give the student experiences in practical things of life. It is the publicly minded officials who have made provisions for industrial arts regardless of the cost. The change of attitudes toward the industrial arts programs can be attributed to the versatile industrial arts leaders who have made public relations a vital part of the industrial arts program, thus giving it a prominent place in general education. Through good public relations they have convinced the school administrators and the public that they are concerned with educating the whole child.

The Increased Enrollment in Industrial Arts Courses. There are at present, more students enrolled in industrial arts classes than have been heretofore. Industrial arts has shown a persistent increase during the last thirty-five years. Variations in percentage of pupils enrolled in industrial arts courses in the forty-eight states range from 3.6 per cent to 42.1 per cent. The following five states exceed the national average: Maryland, California, New Jersey, Connecticut and the District of Columbia. They are listed in order of highest percentage. In 1949 the largest enrollment in industrial arts was shown in the junior high school which amounted to 48.2 per cent of the pupils enrolled. Twenty-five per cent of all pupils in all types of secondary schools were enrolled in industrial arts in 1948. (15, page 19) This means that there were considerably fewer students enrolled in the senior high schools than there were in the junior high schools.

Between the period 1948 to 1950 in the United States there were 6,907,833 students enrolled in the public high schools. Of this number 1,749,105 students were enrolled in some type of industrial arts courses. This number was distributed among the different school levels as follows: 605,608 were enrolled in the junior high school; 724,420 were enrolled in the regular (4-year) and senior; with 419,077 in the junior and senior and undivided type of public school organization. (15, page 35) The large increase can be shown by quoting from the bulletin A Biennial Survey of Education in the United States. (15, page 19)

> . . . It is not possible to determine the percentage increase in enrollment in industrial arts subjects alone. It is estimated that the combined enrollment in industrial arts and trade and industrial education increased in the last four years of high school from 21 per cent of the total pupil enrollment in 1934 to 26.6 per cent of the total pupil enrollment in 1949. Enrollments in industrial arts have shown persistent increases during the past 35 years.

> In 1949 the enrollments in industrial arts in junior high schools counted to 46.2 per cent of the pupils enrolled.

Increased enrollment in industrial arts can be attributed to the much broader offerings, better methods and more logical practices in the program. Through these practices industrial arts has become a very popular subject in the general education curriculum. In the state of Oklahoma, industrial arts has a very prominent place in the general education system. Hunt reports that out of a total of 809 accredited high schools in the state of Oklahoma for the year 1951-52, there were 480 high schools that offered one or more units of industrial arts. (22, page 2) He makes the following comments concerning the Oklahoma junior high schools: (22, page 2)

> The definition of a standard junior high school in Oklahoma includes the statement that one year of industrial arts shall be required of all boys. A recent survey showed that industrial arts is offered in 149 junior high schools in the state. In many cases the high school teacher conducts the junior high school courses. Industrial arts is generally a required course for one year of the junior high school program. It is likely that at least 100 of these 149 junior high schools are separated from the high school so it may be conjectured that industrial arts is provided in at least 580 school buildings in the state of Oklahoma.

Broadening of Industrial Arts Offerings in the United States. To keep pace with the rapidly changing society, industrial arts must be flexible. Many attempts have been made in the past few years to provide a versatile program to meet the demands made of it by society. When "education for all" became the prevailing philosophy, many industrial arts general shop programs were installed to meet the wide diversity of individual interests. During the war, plastics became an important manufacturing enterprise. Today many industrial arts programs have included plastics in the curriculum. To illustrate the rapid acceptance of new subjects in the industrial arts program, the following is quoted from a Biennial Survey of Education

in the United States: (15, page 19)

> Industrial arts subjects appearing for the first time among the commonly offered subjects are: photography, reported in the science category by school in 5 states in 1934 and in 30 states in 1949; home mechanics, reported as science in 13 states in 1934 and in 32 states in 1949; and handicrafts, in 36 states in 1949. In 1934, handicrafts was not reported as a subject, but leathercraft was reported in 7 states and a few similar crafts were occasionally reported. Almost half the enrollment in handicrafts and photography are in one-semester courses.

As can be seen, photography was included in the industrial arts curriculum in 25 states during the 15 years and handicrafts, which was introduced between 1934 and 1949, was included in the industrial arts curriculum in 36 states. It is further shown that plastics and transportation were reported for the first time in 1949. The general shop, which came into being in 1925, has grown until there were 3,369 general shops in the United States in 1949. There are many more today.

A Greater Demand for Teachers. As has been shown, the demand for industrial arts teachers has increased. In Oklahoma alone in 1952 there were 969 teachers or supervisors engaged in teaching or supervising some form of shop work. Hunt lists these 969 teachers and supervisors as follows: (22, page 2)

College teachers and administrators of shopwork courses		136
In industrial arts teachers education	40	
other teachers and administrators of shopwork	96	
Teachers in penal institutions		11
Teachers in Indian schools (secondary)		22
Teachers and administrators of vocational industrial courses		151
Teachers of industrial arts courses in high schools and junior colleges		647
	Total	969

This report represents the growth of industrial arts teaching in Oklahoma for a period of 50 years, when industrial arts was first

introduced in the Oklahoma schools. Of the 969 teachers engaged in teaching shop courses, Hunt suggests that over 700 of the number are industrial arts teachers. If the 700 teachers are engaged in teaching 21.4 per cent of the total secondary school population of Oklahoma, some of the other states which have a larger percentage enrollment in industrial arts would need more than 700 industrial arts teachers. According to a bulletin prepared in the United States Office of Education, there were 1,749,105 students enrolled in industrial arts. If one teacher averages teaching fifty-five students a day, then there would be approximately thirty-four thousand teachers engaged in teaching some type of industrial arts in the United States.

Part E

Industrial Arts in Tennessee Since 1949

According to a report prepared in the United States Office of Education, Tennessee ranks eleventh from the bottom in the per cent of total school population enrolled in some type of industrial arts. This can be attributed to the financial conditions of the state. Tennessee ranks near the bottom in wealth, but during the last few years manufactories have moved into Tennessee, thus furnishing employment for thousands of people who had depended upon agriculture for a living heretofore. The Tennessee Valley Authority, the Arnold Engineering Development Center, and the Oak Ridge Atomic Bomb Plant have increased employment and brightened the educational future for Tennessee.

Variety of Offerings in Industrial Arts in Tennessee. Most of the commonly accepted subjects in industrial arts are found in the Tennessee

curriculum. Woodworking seems to be the leading offering which holds to the old industrial arts tradition. There were 4,316 students enrolled in woodworking in 1950. It is doubtful if this number has increased any since that time. More than likely there are fewer enrolled in woodworking now due to the trend to provide more modern offerings. According to a survey conducted by the United States Office of Education, Tennessee has included many subjects that were listed in the survey as uncommon. In the survey there were 99 students reported enrolled in plastics and 13 enrolled in industrial arts aviation which were listed as some of the uncommon subjects. Here are some figures taken from the United States Office of Education bulletin: (15, page 62) In 1950 there were 5,009 students enrolled in general shop; 2,363 enrolled in mechanical drawing; 665 in metal work; 59 in printing; 61 in electrical work, etc. The questionnaires received so far in this study reveal an increase in enrollment in most all of the industrial arts subjects offered in the Tennessee high schools.

Number of Industrial Arts Shops in the Tennessee High Schools. There are 69 accredited junior high schools in Tennessee; 26 of this number are offering some type of industrial arts. There are 37 teachers teaching industrial arts in the 69 junior high schools. Some of these 26 junior high schools that offer industrial arts courses employ two or more industrial arts teachers. This is not a good average as compared with some of the other states. Lewis reports that there were 185 industrial arts classes being taught in the junior high schools in Tennessee in 1951. The enrollment for each class ranged from 10 to 39 students. (27, page 71) He further showed that only 16 junior high schools required industrial arts as a school subject and 10 included it as an elective. (27, page 76)

There are 122 teachers reported teaching either part or full time industrial arts in the 101 senior high schools in Tennessee. The classes range from 9 to 40 students per class. Lewis reports that there were 570 classes offering industrial arts in Tennessee in 1951. (27, page 85) These figures indicate that there should be more industrial arts subjects offered in the junior and senior high schools in Tennessee.

Teacher Education in Tennessee. The slow advancement of education in Tennessee is not caused by a lack of higher educational facilities because there are thirty four-year colleges, ten junior colleges and four hundred seventeen public high schools and numerous private schools in Tennessee. Lewis reports that 8.8 per cent of the rural population and 17 per cent of the urban population of Tennessee were illiterate in 1940, but the rate had decreased from 8.8 to 6.8 per cent between 1940 and 1950. (27, page 65) Lewis further indicates that 62 per cent of the teachers teaching industrial arts in the junior high schools of Tennessee have Master's degrees and 30 per cent have Bachelor's degrees. (27, page 73)

This is well over the average teacher qualifications in the United States. Out of 122 teachers teaching industrial arts in the senior high schools of Tennessee, Lewis lists 76 teachers with Bachelor's degrees, 41 with Master's degrees and five with less than a Bachelor's degree. It is clearly shown that the industrial arts teachers in the senior high schools of Tennessee are above the average in scholastic qualifications.

As can be seen, school administrators have come a long way in providing a well-rounded education for the youth of Tennessee, but with the speed of daily living, the industrial arts programs have failed to be advanced accordingly. It is the task of the school officials to supply the type of

instructions necessary so that the youth of today will have the opportunity to meet the common life situations resulting from the developments of the modern age. It is evident that past officials have done some planning to elevate the industrial arts programs of Tennessee to their present status, but the time has come for educators to supply more industrial arts subjects to the curriculum in order for the educational system of Tennessee to grow in the future as it has in the past.

CHAPTER III

PHILOSOPHICAL VIEWS PAST AND PRESENT

Before one can understand and appreciate industrial arts, the influential elements, powers, causes and laws that explain the facts of its existence must be studied. Part A of this chapter will be concerned with the early American and European philosophies of education. Only the most important theories and practices will be given.

Part B of this chapter will be devoted to quoting and discussing definitions, purposes and objectives that are of pertinent value to a current study of industrial arts. There are numerous definitions and objectives that could have been chosen, but those quoted and discussed in this part of the study represent the writer's concepts and beliefs to a marked degree.

Part A

Early Philosophies

This part of the study of early philosophies could begin with the philosophical views of the early man when he had to learn only three things: how to hunt, how to fight and how to cultivate the soil; but it is not necessary as chapter two of this study shows the influences of the early period. The writers of the sixteenth, seventeenth and eighteenth centuries show strong evidence of advocating some of the prevailing philosophies of industrial arts today. Some of the writers of this period who had an influence on handwork are Comenius, John Locke, Pestalozzi, Hellenburg, Reusinger and Herbert.

Europeen Philosophies. Comenius, an educational writer of the seventeenth century, advocated the association of learning with things. He also contended that the subject taught should not be too difficult for the child to comprehend, and the instructional method should be according to nature. Bennett gives Comenius' four orders of nature as: (3, page 30)

> Educate (1) the senses, the (2) the memory, then (3) the intellect, and last of all, (4) the critical faculty.

Comenius suggested that the student perceives through senses, and that everything in the intellect must come through the senses. Another aim was to make instructions interesting to the learner. Most of these early philosophies are as sound today as they were in the seventeenth century. He further advocated handiwork as a means of accomplishing these aims. His idea was to teach for life, not for school, so that one could be fitted for the duties of life.

Two hundred and fifty years ago Locke suggested handiwork as a means of providing worthy use of leisure time. "Locke became the chief exponent of the idea that education should fit a boy for practical life, whether it be in a trade or a profession." (3, page 41) Here we have one of the important objectives of industrial arts suggested two hundred and fifty years before it was accepted as one of the aims of education. No wonder industrial arts has grown so slowly, taking three centuries to convince the public that it has something in its curriculum for the one going out into industry, as well as the professional man.

Consumers' knowledges as an aim was suggested by Petty in a school he called a "literary work-house". This school was to offer along with other subjects a study of ". . . more perfect manufacture . . ." and then gave a variety of reasons for teaching manufactory. One reason was "They will be

less liable to be cheated by artificers". (3, page 46)

Rousseau, an educational reformer about the middle of the eighteenth century, wrote extensively about realism in education. His writings later had some influence on the development of industrial arts. He would have had every boy learn a trade, not merely for the sake of knowing how to use it, but that ". . . he may overcome the prejudices usually concerned against it". (3, page 97) One of the basic principles of industrial arts today is concerned with developing an appreciation of one's fellow men.

Of all the educational writers, those who made the greatest contributions to industrial arts up to the first quarter of the nineteenth century were Pestalozzi and Fellenburg. These two men worked together at times to make work experience pay the children's way to school. Pestalozzi felt that academic work and manual work were closely associated. It was Fellenburg and Pestalozzi who put into practice the theory of "education for all".

The development of handy man abilities is not a product of modern educational thought. Nicholas, in the year 1799, wrote about this objective of industrial arts. Bennett says of Nicholas's visions: (3, page 159)

> Above all, it is well that the young should become familiar with the ordinary tools of a household, of which, moreover, one has such constant need for example, the saw, axe, gimlet, hammer, etc. To have these things carelessly out of the children's reach is the most certain way to reduce to helplessness, and, in time of need, to make them more liable to injury.

Through a study of the early philosophies of education, one can see that many of the objectives, aims and purposes of industrial arts were suggested many years before they were put into practice. It shows that educators are slow to accept new philosophies. This has been one of the handicaps that has confronted educators. More logical and better theories

had been advocated years before educational leaders began to devise means and methods of putting them into practice. Most of the present day philosophies of industrial arts are not new, but merely theories of years ago, revised by the "trial and error" method and put to work.

Philosophies of Industrial Arts in America. In the decade from 1870 to 1880, there were many changes in the philosophy of industrial arts. Heretofore practically all manual instruction had as its sole purpose teaching the boy how to earn a living. This was not necessarily a change because "vocation" is still one of the aims of industrial arts, but merely one of many. Industrial arts philosophers began to include aims of general educational value such as use of leisure time, worthy home membership, consumer appreciation, etc., which had been emphasized by Comenius, Petty, Pestalozzi and others.

The influence of the Russian system on manual training has already been shown. At this time methods in "manual training" began to undergo a change. Wendt summarizes the philosophical trends during this period as: (48, page 52)

1. By furnishing an outlet for constructive impulses, it supplied what so far had been lacking in general education.
2. It made school training more purposeful. People could recognize a more definite relationship between the school and industry.
3. The cultivating of habits of industry was felt to be important.
4. Manual training in the schools was expected to develop a respect for manual labor and to raise the status of the working class.

It is not very difficult to see in this statement of aims many of the objectives which now are recognized as guiding principles in industrial arts. As could be expected, the promoters of manual training did not avoid all the pitfalls into which other educators had fallen. The prevalent

philosophy of education at that time was the disciplinary theory. This theory constituted a pitfall for manual training leaders, which later resulted in the term "manual training" being changed to manual arts. The manual training teacher could not look far enough ahead to see the value of the project method of teaching. Most of the teaching was done by exercises, participating in woodwork which was organized around the making of a series of joints.

The manual training school at St. Paul, Minnesota, under the direction of Charles A. Bennett, represented what was the first notable deviation from the rigid exercise system. Bennett says of this school: (4, page 361)

> . . . some progress was made toward flexibility in the organization of shop and drawing courses to meet the needs of pupils varying interests and abilities. This led to the introduction of correlated useful problems and projects after a few fundamental tool exercises.

This was one of the first progressive attempts to provide for individual differences in the school shop. It was later made a part of the traditional academic schools, which resulted in increased popularity for manual arts, and a growing tendency to enrich its course of instruction. This tendency to enrich its offerings brought about important changes in two directions: (1) toward a complete union with the academic school, and (2) toward a richer technical curriculum.

Near the end of the last decade of the nineteenth century, the emphasis on the development of skills in shop processes began to shift to broader aspects of learning and living. This does not mean that skill was neglected but industrial arts leaders began to see other values as important as skill.

In the first decade of the twentieth century Dewey's social philosophy was introduced in education. It required problems that were real in school

life to be selected as the basis of instruction rather than those of adult life. In regard of this philosophy, Charles A. Richards states: (4, page 49)

> When we take up the problem of handwork in this spirit, we are going to recognize that a nice sequence of difficulties in the work may be of less importance than the question of motive or the significance of a project to the real interests of the particular student. Accuracy and precision have commonly been referred to as the essential qualities of all educative handwork, but accuracy is natural only when its necessity is appreciated by the worker, and this will be the case only to the degree that the need for accuracy is perceived to be an inherent condition of success in the task and not as a quality imposed from without.

Frederick G. Bonser, writing in 1913, paralleled the social philosophy theory. He influenced the leaders in industrial arts to see it not only as an end, but also as a means to an end. In 1932, Bonser made the following comment concerning industrial arts: (6, page 109)

> A study of the making of books is not primarily to produce skill or craftmanship in bookbinding -- few, if any, of the children in a given school will become bookbinders, and, if any of them do, it will probably not be hand-craft bookbinding. The purpose is rather to develop insight into an industry whereby the race has put itself on record for untold generations, improving its means and methods step by step, until the great mechanical typesetting machines are subjects of study and understanding.

As the philosophies of Russell and Bonser were applied, industrial arts emerged as a vital, living force, applying to all grades of the public school. The lower grades emphasizing it as a means to an end, with a gradual shift to an end in itself toward the end of the high school.

Many of the present day philosophies of industrial arts are revisions of the manual training and manual arts movement. Some could even be traced back to the sixteenth century when they were merely advanced thoughts of educational philosophers. They were sound theories then, but the public could not be convinced of the importance of handicraft instructions.

Part B

Present Day Interpretations

Thus far, a variety of educational terms have been used without attempting to define any of them. A term is of very little value unless its meaning is interpreted similarly by both the writer and the reader. Even a definition of an educational term alone is worthless, except when the definition is expanded into aims and objectives. Part B will be devoted to quoting authoritative definitions, stating accepted objectives, and discussing each definition and objective that is considered of pertinent value to this study.

Selected Definitions of Educational Terms. The term "philosophy" has been used repeatedly in this study. It has entered into every important discussion that has been presented concerning the development of industrial arts and it will be a determining factor when, or if, other changes occur. The following definition, which seems acceptable to this writer, is quoted from Miel: (29, page 155)

> Philosophy, a set of criticized values in life so organized as to facilitate making intelligent decisions as to policy or conduct whenever there is a choice of value.

A good philosophy is one of the most practical possessions of the industrial arts teacher, who personally influences the youth in important attitudes toward life and life values. One's philosophy should be flexible in order to adjust the industrial arts program to the ever-changing needs of society.

"Education" has been used extensively in this study. It is defined by Goetting as: (18, page 11)

> Education may be considered a disciplinary process, a process of writing impressions on the mind, establishing a set of fixed

habits, fixing associations between stimuli and responses, or assisting an individual progressively to adjust himself to his environment.

There are several conceptions of education, but when they are analyzed they are approximately the same stated in a different way. In Good's Dictionary of Educational Terms, education is defined as: (19, page 145)

> Education. The agregate of all processes by which a person develops abilities, attitudes, and other forms of behavior of positive value to a society in which he lives.

As can be seen by comparing the two definitions, each of the authors are defining the same term, but in different words and phrases. The terms "manual training", "manual arts" and "industrial arts" are terms used to refer to shop instructions. The purpose of each was to give the student experience with hand processes as well as mind exercises. Authoritative definitions of these terms are as follows:

> Manual Training is the name applied to shopwork taught in high schools beginning in the late seventies and continuing until about the second decade of the present century. The term should be discarded because it is only of historical importance. (23, page 1)

> Manual Arts is one of the earlier terms used to identify shopwork involving design and hand construction in various mediums with the purpose of developing art appreciation and manual skills. (19, page 32)

> Industrial Arts is the name applied to all forms of shopwork and industrial drawing taught in elementary schools, junior high schools, high schools and possibly in colleges where the chief purpose is general education and not specifically vocational in nature. This term was evolved during the early part of the 20th Century and is almost universally used today to refer to non-vocational shopwork and industrial courses in the public schools. (23, page 1)

> Industrial Arts is a study of the changes man makes in materials to increase their values to meet needs, of the appropriate usage of products made, and of the social advantages and problems resulting from making these changes and products. (7, page 2)

> Industrial Arts is a group of school subjects that contribute to the attainment of the goal of general education by furnishing guided experiences in the use of tools, materials and machines, and insights into those phases of industry that have become an important part of our social culture. (32, page 1)

Some people confuse the terms vocational education, trade and industrial education, vocational industrial education and industrial education with the term industrial arts. A few of these terms may include some of the practices of industrial arts, or industrial arts may be included as one of the offerings in industrial education, but each of these are distinctly different in many respects as can be shown by quoting the following definitions:

> Vocational Education is preparing individuals for and helping them in effective adjustment, to constantly changing occupational requirements. (42, page 593)

> Vocational Education in a broad sense is that part of a total experience of an individual whereby he learns successfully to carry on a gainful occupation. The narrow sense means or implies the existence of a series of controlled and organized experiences used to train any person or persons for a gainful employment. (35, page 2)

> Trade and Industrial Education is the term used to name and describe all federally subsidized courses in shopwork, industrial drawing and related courses authorized under the Smith-Hughes, George-Dean and other federal vocational education acts. (23, page 1)

> Vocational Industrial Education is designed to train workers for the skilled and semi-skilled occupations which are a part of the modern world. (31, page 15)

> Industrial Education is a generic term including all educational activities concerned with modern industry, its raw materials, products, machines, personnel and problems. It therefore includes both industrial arts, the general forerunner of or introduction to vocational industrial education, and the latter also. (16, page 7)

> Industrial Education is an old term that has been used to describe almost any kind of manual, trade, industrial, mechanical, or practical education. It is still commonly used and may include Smith-Hughes courses as well as the most professional offerings in industrial arts education. (47, page 6)

The Fundamental Concepts in Education, Vocational Education, Trade and Industrial Education and Industrial Arts. In order to formulate a better distinction between these terms, the fundamental purposes of each are given.

> Education. The purpose is to train an individual to live a useful, happy and successful life to as high a degree as is possible. (37, page 34)
>
> Vocational Education. The purpose of vocational education is to provide training, to develop skills, abilities, understandings, attitudes, working habits and appreciations, and to impart knowledge and information needed by workers to enter and make progress in gainful employment on a useful and productive basis. (14, page 1)
>
> Trade and Industrial Education. The purpose is to teach the learner a trade. The chief interest is to give the student experiences which will tend to inform the "doing" side of life. (37, page 35)
>
> Industrial Arts. It is concerned with giving the learner a wide range of experiences which will lead to interests in the industrial life. These experiences should enable the boy or girl to do effectively the things which are everyday problems regardless of the vocation. (37, page 35)

As shown by the stated purposes, trade and industrial education, industrial arts and vocational education are all a part of American education, with the representatives in each of these great fields working toward one common goal, to educate the youth of America. Vocational and trade and industrial education teachers and people are more concerned with teaching specialized type of training, while the industrial arts teacher is more interested in imparting a broad, well rounded knowledge of many crafts and trades.

The Objectives of Industrial Arts, Vocational Industrial Education, and Education. The following quoted objectives should be sufficient evidence to establish the fact that vocational industrial education and

industrial arts are two distinct phases of an educational program working toward different ends. The objectives of industrial arts as given by Wilber are as follows: (50, page 42)

1. To explore industry and American industrial civilization in terms of its organization, raw materials, processes and operations, products and occupations.
2. To develop recreational and avocational activities in the area of constructive work.
3. To increase an appreciation for good craftsmanship and design, both in the products of modern industry and in artifacts from the material cultures of the past.
4. To increase consumer knowledge to a point where students can select, buy, use and maintain the products of industry intelligently.
5. To provide information about, and -- in so far as possible -- experiences in, the basic processes of many industries, in order that students may be more competent to choose a future vocation.
6. To encourage creative expression in terms of industrial materials.
7. To develop desirable social relationships, such as cooperation, tolerance, leadership and followership, and tact.
8. To develop a certain amount of skill in a number of basic industrial processes.

There are several statements of objectives for industrial arts. Each of these very closely parallels the other. Warner developed statements of industrial arts objectives which are used rather freely by industrial arts people. They are as follows: (47, page 86)

1. Exploration
2. General guidance
3. Household mechanics
4. Avocational
5. Desirable personal and social habits
6. Consumer knowledge
7. A degree of skill
8. Correlation or integration of other interests

Selvidge and Fryklund quote twelve industrial arts objectives that were developed by a committee of teachers of the Detroit schools. They are as follows: (37, page 47)

1. To develop interests in an understanding of the place of industry, its materials and processes, in social economic life.

2. To develop consumer's knowledges which involve ability to select wisely, care for, and use properly various industrial products.
3. To foster appreciation of good workmanship and good design in industrial products.
4. To develop safe work habits and attitudes of respect for hygiene and safe work practices in the preservation of resources.
5. To further the growth of problem solving attitudes as experienced in creating industrial products.
6. To inculcate ideals and attitudes of readiness to assist and to cooperate with others in industrial shop activities.
7. To foster the growth of effective individual work habits through cheerful, orderly and methodical performance of any chosen or assigned tasks.
8. To provide experiences of value in awakening the interests and in creating intelligent understanding of industrial occupations.
9. To develop knowledge and understanding of drafting and the interpretation of working drawings and diagrams.
10. To develop wholesome leisure time interests in industrial materials and processes.
11. To provide training in occupational skills in keeping with maturity, aptitudes and interests.
12. To foster appreciation of contributions of science to industrial processes.

As can be seen, these aims represent a broad philosophy of industrial arts including the social, economic, consumer, safety, creative, guidance, vocational, and scientific principles that should be in a modern philosophy of industrial arts. Upon a close observation, one would readily recognize the resemblance of these quoted objectives of industrial arts to the seven cardinal principles of education. Lent and Fronenberg quote the seven cardinal principles which were formulated by a committee of the National Education Association as: (5, page 56)

1. Health
2. Command of fundamental processes
3. Vocation
4. Worthy home membership
5. Citizenship
6. Worthy use of leisure
7. Ethical character

It is no reflection upon either industrial arts or education that they have objectives resembling each other. Both should be working toward the same end, that is to teach the youth the best ways and means to serve society as a useful citizen.

These selected definitions, purposes and objectives that have been quoted are only a few of the ones available. They are definitions and objectives that were stated by authorities in the different phases of education, but on paper they are worthless. There is need, however, for one to have usable definitions and objectives, to be able to formulate results, outcomes, and final attainments in the field of education. The previously stated philosophies, definitions and objectives will be used as controlling criteria in preparing the remaining parts of this study.

CHAPTER IV

THE INVESTIGATION REPORTED

After selecting the topic for a thesis, the next thing to determine is the scope of the study. When each item of information and the degree in which each phase will be discussed is determined, the best and most practical method of securing this information can be selected. For this particular study, a questionnaire in the form of a check-sheet was used. With many helpful suggestions from several industrial arts education staff members, the writer compiled a rough draft of the questionnaire. Several revisions of the check-sheet were made before it was developed into a final acceptable form. During the revisions, many items of information, which were considered unnecessary, were deleted and a few pertinent items added. Two hundred and twenty-five copies of the revised form were reproduced by the multilith process. One hundred and ninety-three of these were mailed at the first mailing and the remaining thirty-two were sent with the follow-up letter. For illustrative purposes, a copy of the four page check-sheet, letter of introduction, and the follow-up letter are shown in Appendix C.

Chapter IV will be divided into three parts. Part A will be devoted to the different subjects taught, the number enrolled, and the grades represented in each subject. Another phase of the subject to be discussed will be the number of industrial arts classes taught by the teachers and the duties of teachers other than teaching industrial arts. Part B will be concerned with the buildings which house the industrial arts classes;

the types of construction used to build the industrial arts shops in Tennessee; whether the industrial arts shop is a part of the main building or separate from it; the distance from the main building; types of heating used; as well as the year in which the shop was built and the number built during that year. The size of the industrial arts shops in Tennessee, the range of ceiling heights, and the location of the shop or industrial arts rooms will be pertinent to this part of the study. The size, condition, brand and the quality of each machine or item of equipment will be shown by tables in Part C. A discussion will follow the tables to help the reader and writer to understand them. The following will be the order in which the information will be presented in Part C of this chapter: woodworking machinery and equipment, metalworking machinery and equipment, drawing equipment, tools and equipment used in teaching electricity, and the arts and crafts.

Part A

Subjects Taught, Grades Represented in Each Subject, and the Duties and Responsibilities of the Teachers of Industrial Arts in the High Schools of Tennessee

Data of this kind will be of value to one who is planning to enter the teaching profession in the Tennessee high schools. It will be invaluable as a means of selecting a curriculum to be followed in college, in order to qualify and be successful in teaching industrial arts in Tennessee. Information given in Part A could be used by industrial arts administrators who plan the curriculum for a program of industrial arts teacher education and as a criterion for selecting the courses to offer to students, especially those who are anticipating teaching in the Tennessee schools.

Subjects Taught in the Tennessee High Schools. Table 1 shows the wide variety of industrial arts subjects taught in the Tennessee schools. Most of the commonly accepted industrial arts subjects are included in the curriculum. There are 26 different industrial arts subjects taught in the high schools of Tennessee by 130 teachers. Woodworking is the leading subject taught. There are 196 woodworking classes reported by 82 high school teachers. Students in all grades from the seventh through the twelfth are reported enrolled in some type of woodworking.

Table No. 1. NAMES, NUMBERS AND GRADES OF INDUSTRIAL ARTS SUBJECTS TAUGHT BY 130 TENNESSEE TEACHERS

Name of Subject Taught	Number Reported in Each Grade						Number of Classes in Each Subject	Teachers Teaching Subject
	7	8	9	10	11	12		
Arts, General			1	2	1	1	2	1
Arts, Industrial	18	15	16	2	1	2	24	12
Arts, Manual			2	1	1		4	1
Aviation					1	1	1	1
Crafts		1					1	1
Drafting	5		9	9	8	10	26	9
Drawing, Architectural					1	2	2	1
Drawing, Mechanical	26	9	60	38	72	75	121	57
Electricity			2	3	1	1	4	4
Manual Training	1	1					1	1
Mechanics, Auto			2	6	6	6	4	2
Mechanics, Home			12	7	8	8	20	8
Metals			6	9	9	9	10	3
Metals, General			1	1	1	1	1	1
Metals, Sheet		2	5	4	3	3	10	2
Machine Shop			5	5	5	4	5	1
Welding			3	3	3	3	3	1
Plastics	5	4	6	3	2	2	13	4
Printing			2		3	3	4	2
Printing, Production					1	1	1	1
Shop	3	3	18	15	12	10	43	11
Shop, General	11	20	25	8	6	4	49	22
Woodworking	14	17	99	88	108	96	164	67
Woodworking, General			3	2	1	2	6	3
Woodworking, Machine			2	2	3	3	4	1
Cabinet Making			2	16	12	7	22	11

Drawing, which is divided into drafting, architectural, and mechanical, is the next most commonly offered subject reported by the respondents.

There are 149 different drawing classes reported in this study. Of the 67 teachers employed to teach 149 drawing classes in the Tennessee high schools, 26 classes are listed as drafting, two architectural and 121 mechanical drawing. All grades are represented in drafting and mechanical drawings, while only students in the eleventh and twelfth grades are enrolled in architectural drawing.

The relatively new general shop program was listed as being offered in 49 different classes by 22 teachers. There were six schools in which no industrial arts subjects were offered other than general shop. General shop was reported offered more times in the seventh, eighth and ninth grades than in the higher grades. The lower three grades were represented 56 times while the upper three grades appeared only 18 times. These figures will uphold the theory that the general shop is better suited for exploratory functions. General arts was listed twice by one teacher. The writer considered listing it as general shop, but not knowing the nature of general arts, it was listed separately.

Rank of Each Industrial Arts Subject. Table 2 shows the order in rank of each industrial arts subject taught in the Tennessee high schools. From observing Table 2, one would readily recognize some of the reasons why woodworking is listed as the most common subject. Woodwork is one of the older industrial arts subjects. It is difficult to break with tradition; furthermore, some of the woodworking machines were left from the period when woodworking was very popular. The school administrators had to be convinced of the need to break an old tradition which is hard to do when more money is involved to purchase different machines and equipment.

From a review of Table 2, one who recognizes the trends in industrial arts would predict that some of the lower ranking subjects such as plastics, printing, electricity, general shop, etc., are to gain prestige in the high schools of Tennessee.

Table No. 2. NUMBER AND ORDER IN RANK OF THE CLASSES IN INDUSTRIAL ARTS SUBJECTS IN TENNESSEE

Name of Subject	Number of Classes in Each Subject
Woodworking	196
Drawing	149
General Shop	49
Shop	43
Industrial Arts	24
Home Mechanics	20
Plastics	13
Sheet Metal	10
Metals	10
Machine Shop	5
Printing	5
Auto Mechanics	4
Electricity	4
Manual Arts	4
Welding	3
General Arts	2
Aviation	1
Manual Training	1
General Metals	1
Crafts	1

The Number of Students Per Class and the Number of Classes Taught Per Day by Tennessee Industrial Arts Teachers. The mode in Table 3 represents the ideal class size as agreed by most industrial arts authorities. Of course, the subject being taught is a major factor in determining the number of students that can be taught effectively in one class. Most authorities agree that the minimum number of students in an industrial arts class should be from 16 to 20 and the maximum number from 25 to 30.

Seventy-eight per cent of the classes reported had 16 to 30 pupils to the class, while 16 per cent had over 30 students to the class.

Table No. 3. THE SIZE AND NUMBER OF INDUSTRIAL ARTS CLASSES IN THE TENNESSEE HIGH SCHOOLS

Size of Class	Per Cent of Total Number of Classes	Number of Classes
Less than 10	.37	2
11 to 15	5.31	30
16 to 20	32.11	175
21 to 25	33.02	180
26 to 30	13.15	75
31 to 35	11.00	55
36 to 40	5.04	28
Total	100.00	545

In the Tennessee high schools, six class periods is the most common schedule arrangement, with some schools reporting seven. Table No. 4 will show more clearly the number of industrial arts classes taught each day by 130 teachers. Industrial arts teachers meet from one to seven classes per

Table No. 4. TEACHER LOAD FOR VARIOUS NUMBERS OF PERIODS OF INDUSTRIAL ARTS CLASSES IN THE HIGH SCHOOLS OF TENNESSEE

Number of Classes Per Day in Industrial Arts	Per Cent of Total Number of Teachers	Number of Teachers
One	1.54	2
Two	6.12	8
Three	13.54	18
Four	14.51	19
Five	33.50	43
Six	23.93	31
Seven	3.85	5
Failed to Answer	3.01	4
Total	100.00	130

day. The largest percentage reported was five periods per day. Of the 130 teachers reporting, 42 have one vacant period, one has two, and one reported three, which means that 33 per cent of the industrial arts teachers

in Tennessee have at least one vacant period during the school day.

Duties of Industrial Arts Teachers Other Than Teaching Industrial Arts. The industrial arts teachers of Tennessee reported a varied number of duties other than teaching industrial arts subjects. Fifty-four teachers reported other duties and responsibilities while 76 devoted full time to teaching industrial arts subjects. As can be seen in Table No. 5,

Table No. 5. OTHER SCHEDULED SUBJECTS TAUGHT BY 130 INDUSTRIAL ARTS TEACHERS OF THE TENNESSEE HIGH SCHOOLS

Name of Duties or Courses Taught	Number of Periods	Number of Teachers
Agriculture	7	2
American History	3	1
Arithmetic	1	1
Biology	2	1
Civics	3	2
Coaching	7	5
Diversified Occupations	3	1
Economics	1	1
English	2	2
General Building Trades	15	5
General Business	1	1
General Science	2	2
Geography	1	1
Geometry	2	1
Health	6	3
History	2	2
Home Room	3	3
Mathematics	5	5
Physical Education	4	2
Printing	3	1
Spelling	1	1
Study Hall	11	11
Free Periods		44

the most common duty is keeping the study hall. Eleven teachers reported study hall duty. The next highest was part-time teachers, teaching a half-day of industrial arts and a half-day trade and industrial education. Five of these teachers teach general building trades, one printing, and

one is a diversified occupations coordinator. Five teachers teach mathematics. Two teachers were reported as teaching vocational agriculture which is a very unusual teaching combination. There are 20 different duties listed other than teaching industrial arts, with a total of 85 class periods devoted to these duties.

Table No. 5 can be used very effectively by prospective teachers in selecting a college curriculum. Administrators of teacher education can use material such as Table No. 5 as a means of selecting courses to offer the prospective teachers. Some of the courses are commonly included in the requirements for an undergraduate degree in industrial arts, while some are very uncommon for an industrial arts major.

Part B

The Buildings Which House the Industrial Arts Shops or Rooms in the Tennessee High Schools

A study of the industrial arts program would not be complete without investigating the kind of construction and the age, size and ceiling height of the buildings utilized in housing the industrial arts shops or rooms. It is also advantageous to know the number of shops or rooms that are located in the main building, as well as the shops that are built separately.

Types of Construction. The 130 respondents listed five different types of construction used in building the 39 separately located industrial arts shops in Tennessee. Thirteen of these were built of brick and 11 were constructed of a combination of concrete block and brick; seven were built of block alone, while two were constructed of stone and

wood. Six of the teachers reporting separate shop buildings did not specify the kind of construction. This information is given in Table No. 6. It is surprising that only one shop was listed as being constructed of wood when Tennessee has such an abundance of timber.

Table No. 6. TYPES OF CONSTRUCTION USED IN 39 SHOP BUILDINGS BUILT SEPARATELY FROM THE MAIN HIGH SCHOOL BUILDING

Types of Construction	Number of Shops
Brick	13
Concrete Block	7
Concrete Block and Brick	11
Stone	1
Wood	1
Not Specified	6
Total	39

Dates of Construction. Table No. 7 shows the dates the shop buildings or rooms were built. Column one of Table No. 7 gives the years; column two the number of separately located buildings; column three the number of shops in the main building; and column four gives the total number of shop buildings or rooms built during that period.

Table No. 7. YEAR OF CONSTRUCTION AND NUMBER OF BUILDINGS COMPLETED.

Year Building was Completed	Number of Separate Shops	Number of Shops in Main Building	Total Number Completed
Since 1950	7	6	13
1940-1950	12	27	39
1929-1939	11	34	45
1918-1928	2	15	17
1907-1917	2	2	4
Not Specified	5	7	12
Total	39	91	130

The information in Table No. 7 may be misleading in that 130 schools are listed. It is likely that the same shop or room is listed twice in some cases where more than one teacher teaches in the same school, but the

writer did not have any way of separating the shops or rooms that were listed more than one time.

The oldest industrial arts shop was reported built in 1907, making it 46 years of age. Thirteen of the Tennessee high school shops or rooms were built between the years 1951 and 1952. The largest number completed in one period was between the years 1929 and 1939. Thirty-four of the 45 shops or rooms built between 1929 and 1939 were located in the main school plant, while 11 were separately located shops. The next largest number completed in one period was between 1940 and 1950. Twenty-seven of these were shops or rooms located in the main building; twelve were listed as separate shop buildings located some distance from the main school plant. The newest industrial arts building was under construction at the time of reporting (Fall, 1952).

The Distance from the Main School Plant to the Separately Located Industrial Arts Shop or Room. There are many disadvantages to having an industrial arts shop separate from the main school plant. If the shop is some distance from the main building, the students will have a tendency to waste time in getting to the shop. If the passage from the shop to the main building is not sheltered, a problem will arise during bad weather of getting to and from the shop. A separately located shop will tend to cause a feeling that the industrial arts department is not a part of the main school system. Without some means of communication between the shop and the main building, the industrial arts teacher and students will miss some special announcements and programs. In some schools it may be more desirable to have a separately located shop, but in most instances the high school industrial arts department should be located in the main building.

The distance that separates the shop from the main building is an important problem to be considered in planning a school shop. Just how far it should be separated from the main building or whether it should be in a different building from the main school plant are some of the decisions that must be made by one who is planning a school shop. To be able to reach a conclusion from Table No. 8 is impossible with the information it supplies. For Table No. 8 to be a basis for establishing the most satisfactory distance, it would require comments from each of the teachers as to the advantages and disadvantages of each distance represented. Without this data a generalized discussion will be given. The most commonly reported distances in Table No. 8 are 20 and 100 feet. The reasons for these being the most common are not known. Some of the distances reported were accounted for by statements made by some of the teachers, such as the shop was located in an old building or in the basement of the gymnasium.

Table No. 8. THE DISTANCE FROM THE MAIN BUILDING OF 39 SEPARATELY LOCATED INDUSTRIAL ARTS SHOPS AND THE NUMBER REPORTED

Distance in Feet From the Main Building	Number Reported
20	6
30	4
40	3
50	3
75	3
100	6
150	3
200	2
300	3
Not Specified	6
Total	39

Location of the Shop or Room in the Main Building. The location of the industrial arts shop or room in the main school plant is of importance to a study of industrial arts in Tennessee schools. Twenty-four and six-

tenths per cent of the shops reported in this study located in the main school building are in the basement. An old trend in planning a school shop was to have it in the basement, but the modern school architects do not include a basement in school plans, therefore, the shops are placed on the ground floor or in a separate wing attached to the main building. Each of these may have advantages depending upon the location, the opinion of the teacher, and the type shop. If the shop is in a separate wing the noise created by the machines will be less disturbing, but with modern means of sound proofing, the noise factor becomes less noticeable. Some

Table No. 9. LOCATION OF THE INDUSTRIAL ARTS SHOPS IN THE MAIN BUILDING AND THE NUMBER REPORTING.

Shop Location	Number of Shops	Per Cent of Total
Basement	30	24.6
Ground Floor	51	41.9
Second Floor	2	1.6
Separate Building	39	31.9
Total	122	100.0

industrial arts shops or rooms can be located above the ground floor depending on the subject taught. Plastics, electricity, drawing, printing, etc., are some of the shops that can very satisfactorily be located on the second, third, or even high floors. The weight of the machines used in a shop will, to some degree, affect its location. In most cases the architect will be the one who locates the school shop, but it is well for an industrial arts teacher to have some knowledge about locating a school shop.

Thirty of the industrial arts shops or rooms in the Tennessee high schools are located in the basement; 51 are on the ground floor; and two are on the second floor. The writer used the number of teachers reporting

rather than the number of schools since it was impossible to interpret the location of the rooms reported by teachers in the same schools.

Size of Rooms and Range of Ceiling Height. This part of the study should have been divided into the size of room utilized for each subject, but the information furnished on the check-lists was not sufficient to warrant such a division.

Table No. 10. AREAS OF INDUSTRIAL ARTS SHOPS, RANGE OF CEILING HEIGHT AND NUMBER OF SHOPS REPORTED

Size of Shops in Areas	Range of Ceiling Height				Number of Shops
	8 to 12	13 to 15	16 to 18	19 to 20	
Under 1000	13		1		14
1001 - 1500	14	4	2		20
1501 - 2000	15	8			23
2001 - 3000	24	10	6	2	42
3001 - 4000	5	5		3	13
4001 - 6000	11	1	2		14
Over 6000	3				3
Not Specified					5
Total	85	28	11	5	134

In Table No. 10, column one gives the size of the industrial arts shops or rooms in square feet; column two through five give the range of ceiling heights; and column six lists the total number of teachers reporting a given size shop or room. The most common size shop reported was between 2001 and 3000 square feet. To be able to say whether this was sufficient space, one would have to know the subject taught and the number of students that occupy the area, also the number and size machines used in teaching the subject.

Three teachers reported shops with over 6000 square feet of floor area with a ceiling height of eight to twelve feet. The lowest floor area reported was 480 square feet. As can be seen in Table No. 10, the

lowest ceiling height reported was eight feet, and the highest was twenty feet. Fourteen teachers reported a shop area of less than 1000 square feet; twenty shops were reported with between 1001 and 1500 feet; while a larger percentage reported shops with greater areas.

Table No. 11 shows some of the recommended sizes for different shops. The kind of shop is shown in column one; column two gives the size in square feet per pupil as recommended by DeWitt Hunt; and column three lists the recommended sizes as given by Weaver, Conner and Panitz. (48, page 86)

Table No. 11. THE FLOOR AREA PER PUPIL RECOMMENDED BY HUNT AND WEAVER, CONNER AND PANITZ FOR THE DIFFERENT SHOP SUBJECTS

Subject Taught	Area in Square Feet Per Pupil Recommended By	
	Hunt	Weaver, Conner and Panitz
General Shop	50 to 75	
Metal and Machine Shop	50 to 75	70 to 80
Automobile Mechanics	90 to 120	50 to 130
Electrical Shop	50 to 75	70 to 80
Mechanical Drawing	50	35 to 40
Print Shop	50 to 60	30 to 75
Woodworking	70 to 90	

As can be seen in Table No. 11, the subject taught in a shop or room will determine to some degree the dimensions of the shop. To use Table No. 11 for determining the size for a given subject, the recommended area per pupil can be multiplied by the number of students expected in each class. It would be well to increase the dimensions some to compensate for growth. The amount to increase the calculated area will depend upon the community, the space available, and the money to spend on building a shop. Newkirk makes the following suggestions concerning the space and size of a general shop. (31, page 83)

> The general shop should provide from 70 to 100 square feet of floor space per student and have the relative proportion of

1 to 2. Thirty by seventy-five feet makes a suitable sized general shop to accommodate a class of twenty to twenty-five students. Students must have room to move about and work in a general shop, and shops which are too small lessen efficiency of instruction, increase accidents and encourage discipline problems.

The advantages given by Newkirk for having sufficient space for the students to work would be applicable to areas provided for other shop subjects. The information quoted on recommended sizes for shops is not the only information available on shop planning. There are other good sources of information which will be helpful in planning a high school shop.

Types of Heating Used in the Industrial Arts Shops of Tennessee. The types of heating systems used is not important as long as the room is kept at a comfortable temperature. The temperature for a woodworking

Table No. 12. TYPES AND NUMBER OF HEATING SYSTEMS REPORTED BY 130 INDUSTRIAL ARTS TEACHERS

Types of Heating	Number Reported
Ceiling Steam Heat with Fans	53
Coal Stoves	6
Gas	13
Hot Air	9
Steam Radiators on Floor	43
Steam Radiators on Walls	2
Not Specified	4
Total	130

shop is more critical, especially when finishing and gluing are to be done in the shop. A temperature of approximately 70 degrees Fahrenheit is very essential for either gluing or finishing. Six methods of heating are in common use in the industrial arts shops of Tennessee. The greatest number of teachers listed ceiling steam heat with fans. This is one of the more recent types of heating. This type heating was listed 53 times.

In Tennessee the most common type fuel is coal because it is mined in abundance in the state.

A more recent type of fuel in Tennessee is natural gas. In the last few years gas lines have been run to many of the cities. Fuel oil furnaces are used in some of the more recently constructed school buildings in Tennessee in areas where natural gas has not been provided. The old coal stove is still the means of heating in some areas. Some teachers reported the coal stove as the only method of heating. The information given in Table No. 12 does not have the future value that some of the tables may have. It only shows the trends in heating systems in the state of Tennessee. No doubt, one who is planning a shop for a certain locality would select the type heat most prevelent in that particular area.

In this part of the study the industrial arts buildings in Tennessee have been discussed very briefly. A separate study would be required to determine all the phases and factors that might involve the buildings, but with these thoughts perhaps some reader will be led to make a more comprehensive study of the buildings which have industrial arts shops. A study of this kind would be of more interest if similar studies of other states were available for comparison with the findings of this study. Then one could rank the industrial arts departments of the Tennessee high schools with those of other states.

Part C

The Machines and Equipment in the Industrial Arts Shops of Tennessee

In this part of Chapter IV information concerning the machines and equipment in the industrial arts shops of Tennessee will be listed in

tables. In some tables the information on several machines will be listed. In others, only the information on one machine will be given. The writer anticipated arranging these tables under the subjects in which they were used, but the information given would not warrant such segregation. All the woodworking machines are listed under woodworking regardless of whether they were used in general shop or in some other subject.

The metalworking machines and equipment information will be given under three headings: metal, sheet metal, and welding. Other machines and equipment were very easily placed in a particular category except the soldering iron. It was checked under electricity by some teachers who taught a varied number of industrial arts subjects; therefore, the soldering irons will be listed with the electrical tools and equipment, regardless of the subject under which they were checked. The major aim in Part C is to present the quality, size and the brands of machines and equipment used in the industrial arts shops of Tennessee.

Variety and Universal Saws. It seems that it would be very difficult to teach any kind of machine woodworking without some kind of circular saw. The table and bench circular saws are the most common types used in the industrial arts shops, while in some cases a special type saw may be desirable. To give the student a more complete insight into the tools and processes of industry, an industrial arts shop should have as many special tools and machines as financial conditions will permit, especially in the senior high school. Some industrial arts people question the use of any power driven machine in teaching junior high school students. In most cases the junior high school industrial arts shop is equipped with power driven machines, but they are operated only under the close supervision of the teacher or by special permission.

As far as it is known by the writer, there is no set rule as to the correct size of circular saw to use in the industrial arts shop. The eight and ten inch saws are the type most commonly reported by the industrial arts teachers in Tennessee. It is reasonable to think the smaller diameter and lower powered circular saw would be more suitable for the junior high school.

Table No. 13 gives the reported information on the variety and universal saws in the Tennessee high schools. The different sizes of saws reported are in column one; columns two, three, four, five, six and seven show the number of each size of variety and universal saws in the city senior, city junior, and county high schools of Tennessee; and the last column gives the number of each size reported. The smallest diameter saw reported was six inches. It is the opinion of the writer that a six inch

Table No. 13. SIZES AND NUMBERS OF VARIETY AND UNIVERSAL SAWS IN THE COUNTY, CITY JUNIOR, AND CITY SENIOR HIGH SCHOOL INDUSTRIAL ARTS SHOPS IN TENNESSEE

Size of Saws	Number of Saws in Schools						Total Number Reported
	City Senior		City Junior		County		
	Variety	Universal	Variety	Universal	Variety	Universal	
6 inch	3	0	2	1	2	1	9
8 inch	2	0	0	2	6	3	13
10 inch	1	2	1	4	11	6	25
12 inch	2	1	2	2	2	0	9
14 inch	3	0	2	0	2	1	8
16 inch	0	2	0	0	0	1	3
							18*
Total	11	5	7	9	23	12	85

*Size not reported

saw is too small for most teaching situations where a circular saw is required. The purchase of a small diameter saw in most cases could be traced to limited finances. Due to the life of a smaller saw, the larger and better saw will prove cheaper over a period of years. There were

only three teachers who reported sixteen inch universal saws; eight reported fourteen inch saws, seven of which were variety saws. Three of the eight were in the city senior high schools, two in city junior high schools, and two were in the county high schools. One of the fourteen inch saws was of the universal type and was in a county high school.

As shown in Table No. 13, the number of variety and universal saws were distributed over the state as follows: the city senior high schools had eleven variety and five universal saws; the junior high schools reported seven variety and nine universal saws; and the county schools were listed as having the largest number of each kind with twenty-three variety saws and twelve universal saws. Comparing the number of saws reported in the industrial arts shops in the city system with those reported in the county schools shows the following: the city system has a total of thirty-two variety and universal saws combined, while the county system reported a total of thirty-five saws of both types.

Brands of Saws. In this section the brands of band, jig, portable, radial arm, and the two types of bench or table saws will be discussed. The number of each kind of saw reported is shown in Table No. 14 under the manufacturing company or brand. There seem to be more Delta band, jig, and the two types of table or bench saws than any other brand. There are thirty-three band, thirty-four jig, one radial arm, nine universal, and sixteen variety saws of the Delta brand. Walker Turner was the next largest number of brands reported. Of this brand, there were sixteen band, ten jig, five universal, and eight variety saws. Craftsman, a Sears Roebuck brand, was the third highest in number.

Some of the most common brands reported can be classified as: small and less expensive, medium size and medium in price, and the larger and more expensive groups. Atlas, Craftsman, Duro and Power Craft can be classified under the small and less expensive brands. The medium sized

Table No. 14. BRANDS OF THE DIFFERENT KINDS OF SAWS AND THE NUMBER OF EACH IN THE INDUSTRIAL ARTS SHOPS OF TENNESSEE

	Kinds of Saws					
Brand of Saws	Band	Jig	Portable	Radial	Universal	Variety
American						2
Atlas		1				
Boice Crane	3	3			3	3
Craftsman	7	8	3	1	5	3
Crescent	6					3
Delta	33	34		1	9	16
De Walt				8		
Driver	1	3				
Duro	1					
Fay Egan	1					
Lectro			1			
Oliver	7			1	3	7
Power Craft	1					
Stanley			1			
Union	1					
Walker Turner	6	10			5	8
Wallace	1				2	4
Yates American	5	3			2	
Not Specified	2	2			4	6
Total	75	64	5	11	33	52

and priced saws are Boice Crane, Crescent, Delta, Fay Egan, Walker Turner and Yates American. While the following brands are of the larger size and more expensive brands: Oliver, American, De Walt, and Stanley. As can be expected the larger percentage of the saws reported in Table No. 14 are of medium size and in the medium price range. Most of the brands listed in Table No. 14 are good brands of machines to purchase for an industrial arts shop. Each one will have an advantage over the other, depending on the expected use, size of classes, and financial circumstances of the school.

Sizes of Band, Radial Arm, and Portable Circular Saws. To assist in understanding of the sizes given in Table No. 15, the following explanations are made. The size of a circular saw is determined by the diameter of the saw. This will apply to all the saws mentioned in this study that require circular saw blades for cutting. A band saw size indicates the diameter of the wheels. Two respondents gave the length of the blade for the band saw size. These two were checked under the not stated column.

Table No. 15. THE KINDS OF SAWS AND THE SIZE IN INCHES

Kind of Saws	Size in Inches											Not Stated
	6	7	10	12	14	16	18	20	24	30	36	
Band			6	7	23	10	4	10	6	2	1	6
Radial Arm			2	2	1	1						5
Portable Circular	1	2										2

There were nine different sizes of band saws reported by seventy-five industrial arts teachers in the Tennessee high schools. The most common size listed was fourteen inches. One teacher reported a thirty-six inch band saw. The smallest size listed was ten inches. Table No. 15 shows the number of each size reported in the industrial arts shops of Tennessee. Column one of Table No. 15 lists the kind of saws. Columns two through eleven give the sizes and the number of each size reported. The largest percentage of the smaller size saws listed in Table No. 15 were of the less expensive variety. The thirty-six inch band saw was reported as being very old, but in good condition.

A radial arm saw is a very useful machine to have in a woodworking shop, but in most cases limited funds for purchasing equipment will not warrant buying one. The De Walt radial arm saw is a very versatile machine. It can be used for ripping, cut-off, mitering, routing and many

other operations. The De Walt saw has disadvantages as well as advantages. In the first place it is a very expensive saw for the average industrial arts shop; second, special attachments are required to convert the saw into a router, drill press, etc.; third, some of the operations are very dangerous to perform, especially for high school industrial arts students. Eight De Walt saws were reported in the Tennessee industrial arts shops, while three reported a cheaper brand. Two of the eleven radial saws were ten inch; two were twelve inch; one fourteen inch; and one sixteen inch.

Portable circular saws would be considered more of a special kind of saw for an industrial arts shop. The portable circular saw is more commonly used in the building trades. A portable circular saw is very dangerous to use. Some of these saws are small and very powerful. A strong grip is necessary to hold one of these saws. When a portable saw is used, be sure the saw frame is grounded. This can be done by attaching the third wire which protrudes from the plug cap to a good ground. Five teachers reported portable circular saws. Three of these were small sizes, while two did not state the size.

Surfacers in the Tennessee High Schools. There were forty-one surfacers reported by the 130 respondents. The size ranged from four to thirty inches. The four inch surfacer must have been reported by mistake. It is a very small size, while the thirty inch is relatively large and very rare in high school industrial arts shops. The size of a surfacer is determined by the length of the blades or the width of board that it will surface. Eleven twenty-four inch surfacers were the most of one size reported. The sizes reported are as follows: one, four inch; seven, twelve inch; one, fourteen inch; five, sixteen inch; seven, eighteen inch; three,

twenty inch; eleven, twenty-four inch; and one, thirty inch.

The size and number of each size are shown in Table No. 16. The sizes are given in column one and the number of each size is shown in column two.

Table No. 16. SIZE OF SURFACERS AND THE NUMBER OF EACH SIZE

Size in Inches	Number of Each Size
4	1
12	7
14	1
16	5
18	7
20	3
24	11
30	1
Not Specified	5
Total	41

The Size of Jointers Reported in the Tennessee Industrial Arts Shops. The size of a jointer is determined by the length of the knives; a six

Table No. 17. SIZE OF JOINTERS AND THE NUMBER OF EACH SIZE

Size in Inches	Number of Each Size
4	3
6	49
8	17
10	2
12	8
18	1
Not Specified	8
Total	88

inch jointer will surface a six inch board. As could be expected, the largest percentage of the sizes reported were of the smaller variety. The smallest size reported was four inches and the largest eighteen inches. The greatest number in Table No. 17 favors the six inch jointer, while the

next highest number reported was the eight inch size. Two ten inch jointers were reported; eight, twelve inch; and eight of the respondents did not specify the size. This information is shown in Table No. 17 which can be interpreted by finding the size in column one and then locating the number of each size in column two. The total number of jointers reported in the Tennessee industrial arts shops is shown at the bottom of column two of Table No. 17.

The Brands of Jointers, Routers, Surfacers and Shapers Reported in the Tennessee High Schools. The brand of machine to purchase for an industrial arts shop is hard to determine in some cases. There are several factors that must be considered. The first question to ask is what is the machine expected to do? Determine the answer to this question and then study the characteristics of the different brands. It will help to visit shops in which different brands are used and see the machine and talk to the teacher about the advantages and disadvantages of each make of machine.

The size should be considered in selecting a brand, although most of the better manufacturers make different sizes of the same machine. The price is an important factor to be considered in the purchase of a machine. The old adage, "You get what you pay for" can be applied to purchasing equipment for a school shop, but in some instances the finances available will not permit the purchaser to apply the commonly accepted rule.

Table No. 18 does not furnish any information that will be helpful in selecting a certain brand, other than it shows the most common brands used in the Tennessee high schools. Information of this kind has its limitations. In some cases it could be biased by personal opinion, political reasons, and in some cases favoritism to a local representative. The

writer feels that none of these influences were present, to a great degree, in making the choice of brands represented in Table No. 18 because the largest percentage of machines is of the commonly accepted better brands.

Table No. 18. BRANDS OF JOINTERS, ROUTERS, SHAPERS, AND SURFACERS AND THE NUMBER OF EACH BRAND

Brands of Machines	Kinds of Machines			
	Jointers	Routers	Shapers	Surfacers
American	2			
Black and Decker				1
Boice Crane	8		4	2
Craftsman	10		6	1
Crescent	1			8
Delta	30	1	22	
De Walt	1			
Fay Egan	2			2
Mohawk			1	
Oliver	11		1	6
Parks				5
Powermatic				5
Salem Machine				1
Sidney	1			
Stanley		28	1	
Union	1			
Walker Turner	6		4	4
Wallace	1			
Yates American	11		4	4
Not Specified	3	2	2	2
Total	88	31	45	41

A few of the most obvious results in Table No. 18 are: there are more Delta jointers in the Tennessee high school shops than any other brands; the Stanley router is almost the unanimous choice of portable routers; Delta leads in the number of shapers reported; and the Crescent brand surfacer is the most common brand reported in Table No. 18 by a slight majority. The nineteen different brands as reported by 130 industrial arts teachers in Tennessee are shown in column one of Table No. 18. The figures shown in columns two, three, four and five, respectively, represent the number of jointers, routers, shapers, and surfacers of each brand reported in the Tennessee high schools.

Wood Turning Lathes. There were 133 wood turning lathes reported in the Tennessee high schools. One turning lathe per school was listed by thirty-one teachers; twenty-five schools had two; ten, three lathes; three, four lathes; and two had five lathes in the shop. The writer questions the advisability of a high school industrial arts shop having more than two wood turning lathes. In most cases one would be considered sufficient.

Table No. 19. THE NUMBER OF WOOD TURNING LATHES IN EACH INDUSTRIAL ARTS SHOP OF THE TENNESSEE HIGH SCHOOLS

Number of Wood Turning Lathes per School	Total
1	31
2	25
3	10
4	3
5	2
Total	133

Most of the wood turning in industry is done by automatic lathes. It is well for the industrial arts teacher to teach some wood turning; too, it is well to have a lathe in the industrial arts shop for reproducing some period furniture. Just how far to stress wood turning is a matter of opinion. Modern furniture design has straight lines with very few curved surfaces, but some people still prefer the antique designs. As one would conclude by observing the number of lathes reported in Table No. 19, wood turning is not stressed to a great degree in Tennessee. These statements made by the writer do not indicate that wood turning should not be taught at all. To form such a conclusion would defeat one of the purposes of industrial arts.

The Age and Condition of the Different Woodworking Machines. Most of the woodworking machines and equipment in the Tennessee industrial arts

shops are fairly new. The greatest number of old equipment consisted of woodworking benches. Twenty-four of the 677 woodworking benches were purchased between 1935 and 1945. It would seem logical that there would be more old woodworking benches reported than machines, because they do not have any moving parts to wear, except the vise. The vise can be replaced or repaired. With the proper use and care, woodworking benches will last almost indefinitely.

One interesting thing to note in line seven of Tables No. 20 and No. 21 is the listing of three dry kilns, which are very desirable to have in a woodworking shop, especially in a lumbering area. The cost of kilns limits their use in high school and even in college industrial arts shops.

There are twenty-nine different machines or items of equipment listed by the industrial arts teachers of Tennessee. The average shop would not have over seven to ten items that would be considered as major equipment. A high school industrial arts woodworking shop would be recognized as a well equipped shop if it had the following major equipment: one table or bench saw, one band saw, one surfacer, one jointer, one drill press, one jig saw, one lathe, one sander of some type, and enough benches for the students.

Selecting and purchasing tools and equipment for a general shop presents a different problem. There are more subjects which involve a wide variety of tools and equipment. To be able to determine the tools and equipment, one must first know the subjects that are to be taught. A minimum number of tools and equipment will be needed to teach effectively the fundamental things a student should know about each subject. The minimum number should not be lower than the minimum required for teaching the basic processes in a unit shop. For instance, the same tools and

equipment would be required to teach hand woodworking in a general shop as the ones used to teach the basic operations in a unit woodworking shop.

Table No. 20. PURCHASE DATE AND NUMBER OF WOODWORKING MACHINES BOUGHT DURING SPECIFIED PERIODS IN THE TENNESSEE HIGH SCHOOL INDUSTRIAL ARTS SHOPS

Name of Equipment	Year Purchased				Date Not Given	Total
	Before 1926	1926-36 Inclusive	1937-47 Inclusive	Since 1947		
Air Compresser		2	7	6	5	20
Band Saw Brazers			1	3	2	6
Benches	74	58	211	221	413	977
Drill Press		8	25	24	20	77
Glue Pot		7	9	14	16	46
Jointers	4	11	22	31	20	88
Kiln		1		1	1	3
Miter Box		8	14	20	16	58
Mortiser, Vertical		2	7	8	6	23
Portable Router		5	5	11	10	31
Power Grinder	8	7	19	21	20	75
Sanders, Belt		3	6	13	10	32
" , Disc		2	3	3	5	13
" , Drum			1	2	1	4
" , Oscillating			1		1	2
" , Portable		4	10	30	11	55
" , Spindle		2				2
Saws, Band	7	8	24	32	4	75
" , Jig		8	20	26	10	64
" , Portable Circular				4	1	5
" , Radial		1	3	2	5	11
" , Universal	6	3	7	13	4	33
" , Variety	7	9	13	17	5	51
Saw Filing Machine				1	1	2
Shaper	5	8	12	10	10	45
Spray Gun		3	4	8	10	25
Surfacer	1	8	13	10	9	41
Tenoner		1		1	1	3
Wood Turning Lathe	10	17	42	28	36	133

Table No. 20 can be interpreted as follows: the names of equipment are listed under column one; columns two through five give the quantity of equipment purchased during a certain period. Listed under column six are

the machines for which a purchasing date was not given. The last column, number seven, is the total of the number given in columns two through five.

Table No. 21. REPORTED CONDITIONS OF WOODWORKING MACHINES IN THE INDUSTRIAL ARTS SHOPS OF TENNESSEE

Name of Equipment	Condition of Equipment					Not Given	Total
	Good	Excellent	Fair	Poor	New		
Air Compressor	7		6	3		4	20
Band Saw Brazers	4		1			1	6
Benches	238	24	275	31	79	330	977
Drill Press	50	3	8	4	3	9	77
Glue Pot	16		11	7		12	46
Jointers	55	5		10	3	15	88
Kiln	1			1		1	3
Miter Box	26	5	7	4	2	14	58
Mortiser	12	1	3	1	1	5	23
Portable Router	14	2	5	2	2	6	31
Power Grinder	39	2	15	4	1	14	75
Sanders, Belt	16		4	4	1	7	32
" , Disc						13	13
" , Drum	1		1		1	1	4
" , Oscillating	1					1	2
" , Portable	24	3	11	1	3	13	55
" , Spindle	1					1	2
Saw, Band	42	3	15	10		5	75
" , Jig	32	4	17	5	3	3	64
" , Portable Circular	4		1				5
" , Radial	8		1	1		1	11
" , Universal	10	9	5	2	4	3	33
" , Variety	20	11	10	5	4	1	51
Saw Filing Machine	2						2
Shaper	32	1	4	3	1	4	45
Spray Gun	7			2		16	25
Surfacer	23	1	5	4		8	41
Tenoner	1		1	1			3
Wood Turning Lathe	67	10	24	11	1	20	133
Total	753	84	430	116	109	508	2,000

For example: reading Table No. 20 from top to bottom and from left to right, the first item of equipment listed is the air compressor; column one is blank, indicating that there were no air compressors reported

purchased during this period. The figure two under column two, line one, shows that there were two air compressors reported purchased between 1926 and 1936. Columns four and five are read in the same manner as columns one and two. Table No. 21 is read in the same way. For example: column one, line one, indicates that seven air compressors were reported to be in good condition.

The reported condition of the woodworking equipment in the Tennessee industrial arts shops ranges from poor to good. Of the 2,000 woodworking machines and equipment reported by the industrial arts teachers of Tennessee, only 116 items were listed as being in poor condition. The writer presumed that these items were in a usable condition. There were 508 varied items that did not have the condition specified. Some of these could have been in need of repair. Table No. 21 shows the reported condition of the woodworking machines and equipment in the Tennessee high school shops. It is read in the same manner as Table No. 20. The name of the machine or equipment is listed in column one. Column two through six give the number reported in each condition. Column seven gives the number that did not specify the condition, while column eight lists the total of each woodworking machine or piece of equipment reported.

Woodworking Benches. The 130 industrial arts teachers of Tennessee reported 977 woodworking benches. Of this number, 436 were in the county school system; 294 were in the city junior high school system; and 247 of the 977 were in the city senior high school system. These totals are shown in Table No. 22, as well as the brands and the number of each brand.

There were more shop-made benches reported than manufactured ones. The writer had an opportunity to visit some of the shops that had shop-made

benches. A close inspection was required to detect that they were not manufactured benches. Over half of the teachers did not specify the brand. The fact that some of these were old and the metal identification tags had been removed will account for several of the 552 benches with brands not specified.

Table No. 22. BRANDS AND QUANTITY OF EACH BRAND OF BENCH IN THE INDUSTRIAL ARTS SHOPS OF TENNESSEE

Make of Benches	Number of Benches			
	County	City Junior	City Senior	Total
Columbia		4	6	10
Oliver		24		24
Richard Wilcox	5		24	29
Sheldon	30	35	25	90
Shop-made	167	53	40	260
Stanley	12			12
Not Specified	222	178	152	552
Total	436	294	247	977

Under column one, the six different brands reported are listed, with the number of each brand in the county, city junior high schools and city senior high schools given in columns two, three and four respectively. Column five is the total of each brand reported. Line four of Table No. 22 shows that there were ninety Sheldon brands reported. This was the largest number of any one of the five manufactured brands reported. The Richard Wilcox brand was the next highest with twenty-nine reported. The third highest was twenty-four Oliver, Stanley with twelve, and Columbia with ten.

The Different Sizes of Woodworking Benches Reported in the Tennessee High School Shops. The size of woodworking benches is very important information to have when planning an industrial arts shop. It is likely that the size of manufactured benches are more nearly standardized than

Table No. 23 shows. The fact that 260 of these benches shown in Table No. 23 are shop made will contribute to some of the odd sizes, and in some

Table No. 23. SIZE OF BENCHES AND NUMBER REPORTED IN THE DIFFERENT INDUSTRIAL ARTS SHOPS IN THE TENNESSEE HIGH SCHOOLS

Size in Inches	Number of Benches			Total in Sizes
	County	Junior City	Senior City	
18 x 96		10		10
22 x 42	15			15
24 x 28		35		35
24 x 40	10		24	34
24 x 48	44			44
24 x 50	15			15
24 x 54	30		22	52
24 x 58		36		36
24 x 60		20	24	44
25 x 54	9			9
30 x 60	20			20
30 x 72	8			8
32 x 72	24	9	6	39
36 x 52		6		6
36 x 53	4	11		15
36 x 60	37	10		47
36 x 72	10			10
36 x 84	3			3
48 x 60	6			6
48 x 72	4		6	10
48 x 96			6	6
60 x 96	3			3
67 x 42		10		10
Not Specified	194	147	159	500
Total	436	294	247	977

of the cases the size could have been approximations. In most cases of shop planning, one would profit by referring to a more reliable source.

The E. H. Sheldon Company of Muskegon, Michigan, a manufacturer of woodworking benches, lists the following sizes:

One Student Bench	52 inches by 22 inches
Two Student Bench	52 inches by 36 inches
Two Student Bench	42 inches by 30 inches
Four Student Bench	54 inches by 54 inches
Four Student Bench	60 inches by 60 inches

These sizes were also given in the Broadhead Garrett Company catalogue, but in the School Shop Planning Manual, published by Walker Turner Division of Kearney and Trecker Corporation, Plainfield, New Jersey, different sizes from the ones shown above were given. This reveals the fact that the size of woodworking benches is not standardized. The School Shop Planning Manual, published by Walker Turner, is a good source of material for shop planning. It has drawings of the tools used in different subjects drawn to scale. These drawings may be cut from the manual and used on scaled shop layouts.

Estimated Cost of Hand Tools. The writer believes that the estimated cost of hand tools in Table No. 24 is too high. It is possible that some of the respondents interpreted the question on the check sheet to mean the

Table No. 24. VALUE OF HAND TOOLS IN THE TENNESSEE HIGH SCHOOL INDUSTRIAL ARTS SHOPS

Cost of Hand Tools	Number Reported
Less than $ 250.00	20
$ 251.00-$ 500.00	30
501.00- 700.00	13
701.00- 800.00	10
801.00- 1,000.00	12
1,001.00- 1,500.00	17
1,501.00- 2,000.00	7
2,001.00- 3,000.00	4
3,001.00- 4,000.00	3
4,001.00- 6,000.00	5
Not Specified	9
Total	130

approximate cost of all machines and hand tools in the shop, and no doubt, some teachers listed the same tools twice, nevertheless, these are some of the errors that may result from information which is collected by questionnaire.

There are several factors that could enter into establishing a certain value for hand tools. The subjects taught would certainly be an important thing to consider. The size, number of pupils, and manner in which the tools are distributed to the class will raise or lower the amount of money to spend for hand tools. These factors are not known to this study, therefore, Table No. 24 will have to be interpreted from another viewpoint. For almost any subject, size of class, or regardless of the method used for distributing the tools, one would conclude that a shop with less than $500.00 worth of hand tools would be ill equipped. Fifty of the shops in Table No. 24 are in this category. Even for some subjects, $1,000.00 would be considered a small amount to spend for hand tools. If one wishes to accept the foregoing conclusion, thirty-six of the 130 respondents reported a sufficient amount of hand tools. Table No. 24 would have been of more value if it had been possible to list the reported values of hand tools under each subject, but the information on the check list was not complete enough for such division.

There are more woodworking shops in the Tennessee high schools than any other kind of shop. They seem to be the best equipped shops reported in the study. No doubt it being one of the oldest industrial arts subjects is one of the causes for it being the most common and the best equipped.

The administrators are rather lenient on shop records in Tennessee. Very few teachers could give the original cost of the machines in the shops. Most of the dates of purchase were approximate. It seems that industrial arts teachers should have the most accurate and the most complete records of any teachers. The industrial arts teachers now teaching

are not altogether responsible. It is possible that no records were left on file, but it is the duty and responsibility of the present teachers to formulate records as accurately as possible from the information available and leave the future teachers some means of reading the past.

Metalworking Machines and Equipment. The following metalworking machines and equipment were reported by eight teachers who were teaching twenty-nine classes in metalworking. These classes were listed as metals, general metals, sheet metal, machine shop and welding. It is likely that some of the more general subject terms such as industrial arts, shop, etc., included metalwork of some type. A few of the teachers who did not specify subjects, listed items which are included in this part of the study. In some tables more teachers are listed reporting a certain item of metalworking equipment than were teaching a metalworking subject.

Metalworking Machines and Equipment Other than Sheet Metal. To be able to form a conclusion as to whether the metalworking shops in Tennessee are well equipped or not, one would need more information than was given in the questionnaire used in this study. It seems that most of the common metalworking machines are found in the Tennessee high school shops. Some of the teachers reported better equipped shops than others. Teachers in the unit metal shops reported the most equipment while teachers in some of the general shops listed only a few machines. Teachers of all the unit metal shops reported a vise, anvil, metal lathe, drill press and forge. More shops were equipped with a shaper than a milling machine.

Many factors must be taken into consideration when selecting the varieties of machines and equipment for a metalworking shop. Some of these are: the community in which the shop is located; the size of the class

and the age of the students; the money available for purchasing; and the objectives or final outcome expected from the class. Basic metalworking tools should be purchased before the special types.

Table No. 25 consists of a list of the metalworking tools and equipment in the Tennessee high schools. It shows the number of machines reported in the state and the number of schools with that type of tool. As

Table No. 25. TYPES OF METALWORKING MACHINES AND EQUIPMENT AND THE NUMBER OF EACH TYPE REPORTED IN 130 INDUSTRIAL ARTS SHOPS OF TENNESSEE

Types of Metalworking Machines and Equipment	Total Number of Equipment	Total Number of Teachers Reporting
Anvil	29	15
Band Saw, Metal Cutting	3	3
Forge	10	8
Gas Furnace	8	3
Melting Furnace	4	3
Drill Press	17	15
Lathe	40	17
Shaper	7	6
Milling Machines	4	3
Power Hack Saw	2	2
Stock and Die, Pipe	14	11
Tap and Die Sets, Bolt	18	13
Vise, Machinists	140	19
Vise, Pipe	14	13
Welding, Electric	9	8
Welding, Gas	15	12

can be seen, some teachers reported more than one of a certain type. It is possible that some machines and equipment are listed twice by two teachers in the same school system.

Metalwork is an important phase of our modern civilization. It should be one of the important industrial arts subjects. In most cases it ranks below woodworking, which is less important in the present age. It is very likely that the great cost of metalworking equipment and machines plays an

important part in its being in the minority as a school subject. It is unfortunate that school equipment is neglected because of finances, when the future happiness and well-being of youth is at stake.

Welding Machines and Equipment. Today leaders in the productive world realize the importance of welding, but from observing our educational world one would wonder if welding is considered a vital subject for the national welfare. During World War II, welding was a valuable asset to mass production. It is here to stay and should be one of the important subjects in industrial arts.

Table No. 26. TYPES OF WELDING EQUIPMENT AND NUMBER OF SETS REPORTED IN THE TENNESSEE INDUSTRIAL ARTS SHOPS

Type of Welding Equipment	Number of Schools Reporting One Set	Number of Schools Reporting Two Sets	Total Number Reported
Gas	9	3	15
Electric	7	1	9
Total	16	4	24

In Tennessee, one teacher reported teaching three classes in welding, but from observing Table No. 26, one would conclude that there were more than three welding classes. There were fifteen sets of gas welding equipment and nine electric welding machines reported in this study. Twelve different teachers reported gas welding equipment, while eight teachers reported electric welding machines. It is possible that there are twelve different welding classes in the Tennessee high schools with eleven of these being taught in a general shop or under one of the generalized subject terms.

Sheet Metal Equipment in Tennessee. There were seven different items of sheet metal equipment reported in the Tennessee high school shops. These

were the ones considered major equipment. Of course, many of the sheet metal tools are of the hand variety which were not listed in this report. Many were reported in the general shop. Only two teachers reported teaching classes in sheet metal work, but from studying Table No. 27, one could conclude that there are from ten to twelve schools in which sheet metal work is being taught. Table No. 27 shows the major items of sheet metal

Table No. 27. NUMBER AND KIND OF SHEET METAL EQUIPMENT REPORTED IN THE INDUSTRIAL ARTS SHOPS OF TENNESSEE

Name of Equipment	Quantity	Number of Schools
Bar Folder	12	11
Brake	12	11
Hollow Mandrel	5	4
Slip Roll Former	8	8
Soldering Furnace	10	5
Squaring Shears	10	9
Stake Plate	13	8

equipment reported in this study. Column one gives the name of the equipment; column two gives the total number of each piece of equipment; and column three gives the number of schools reported having a certain item.

Drafting Tools and Equipment. Drawing is the language of modern industry. It is one of the basic activities in all industrial arts subjects. A large per cent of industrial arts students are taught drawing of some kind. It may be drawing in the simplest form, without instruments, but it is valuable to the student for making progress in other industrial arts subjects. The next paragraph of the study will be devoted to the machines and equipment used in teaching drawing in the Tennessee high schools.

The Drafting Tables in the Tennessee High Schools. The 130 teachers, who made this study possible, reported 1,043 drafting tables. There were sixteen different sizes reported. The sizes are graduated according to the width and length of the top. The height of the table was not given.

Table No. 28. NUMBER AND SIZE OF DRAFTING TABLES IN THE TENNESSEE HIGH SCHOOLS

Size of Drafting Tables	Number of Drafting Tables
18 by 24	24
18 by 36	2
24 by 30	76
24 by 36	88
24 by 40	15
24 by 42	30
26 by 36	24
26 by 38	18
26 by 46	20
28 by 28	26
28 by 36	39
30 by 36	30
30 by 42	20
30 by 72	6
36 by 72	5
48 by 96	3
Not Specified	617
Total	1,043

Many of the teachers reported shop-made drafting tables which may account for the large variety of sizes. Two of the schools visited by the writer were using the tables in the home economics room for drafting tables. Three teachers reported the woodworking benches were used for drafting tables. Good drafting tables are desirable but not necessary for effective teaching of drawing.

The different reported sizes of drafting tables are shown in Table No. 28, and the number of each size is also given. One could not determine the best size drafting table by studying Table No. 28. The size of the

drawing room, the type of industrial drawing being taught, and the number of tables to be used in the drawing room would influence the tables more than the most common size selected by another school.

Drafting Stools. The most important information in Table No. 29 is the total number of stools reported. The date purchased and the condition of the stools in the Tennessee high schools does not have very much value, but a sufficient number of teachers reported these data and the results were compiled in Table No. 29 along with the number of stools. It is

Table No. 29. NUMBER, CONDITION AND YEAR THE DRAFTING STOOLS WERE PURCHASED IN THE TENNESSEE HIGH SCHOOLS

Year Stools Were Purchased	Condition				Total Number of Stools
	New	Good	Fair	Poor	
1925		30			30
1930		36			36
1936		6		30	36
1947		42			42
1949		56			56
1950	26	18	20		64
1951		36			36
1952	10	30			40
Year Not Specified					265
Condition Not Specified					106
Year or Condition Not Specified					335
Total					1,046

interesting to note that thirty stools were purchased in 1925 and are still in use. The newest stools were purchased in 1952. Some of the teachers who listed other drawing equipment did not report any stools. A few teachers gave the brand and size of stools, but these were not enough to include in the study.

Drafting Sets. Most of the teachers that gave the size of the drafting sets, listed small sets from two to four pieces to the set. There

were 759 drafting sets reported. Ten teachers reported that the students furnished the drawing instruments. There were not enough respondents to include the brands of drawing instruments in the Tennessee high schools. Post was the most common brand named by the few that gave a brand. Table No. 30 shows the condition and the number of sets of drafting instruments in the Tennessee high schools. It shows that there were 759 sets reported in this study.

Table No. 30. CONDITION AND NUMBER OF DRAFTING SETS

Conditions of Drafting Sets	Number of Drafting Sets
New	10
Good	396
Fair	62
Poor	100
Not Specified	181
Furnished by Students (Schools)	10
Total	759

T-Squares and Drafting Boards. T-squares and drafting boards are very inexpensive to be considered as major equipment, but without them the teaching of drafting would be impossible. Table No. 31 shows the number and size of T-squares reported in the Tennessee high schools. It also gives the number of each size reported. The size of T-square needed will depend upon the size of drawing that is to be made. There were 1,819 T-squares reported in this study. Whether this was a sufficient number for each student to have one was not shown in the questionnaire.

In Table No. 32 the size and number of each size of drawing boards are shown. There were 1,843 drawing boards reported. The information in Tables No. 31 and No. 32 is given for the purpose of evaluating the industrial arts shops of Tennessee.

Table No. 31. NUMBER AND SIZE OF T-SQUARES IN THE TENNESSEE HIGH SCHOOL DRAFTING ROOMS

Size in Inches	Number of T-Squares
16	25
18	20
20	44
24	918
26	48
27	3
28	24
30	76
34	40
Furnished by Students (Schools)	4
Not Specified	621
Total	1,819

Other Drafting Equipment. There are other items of drafting equipment that are very desirable to have, but they are not necessary for teaching drawing. Some of these are: lettering guides, drafting machines,

Table No. 32. NUMBER AND SIZE OF DRAFTING BOARDS IN 49 TENNESSEE HIGH SCHOOLS

Size in Inches of Width and Length	Number of Drafting Boards
12 by 70	50
16 by 22	28
18 by 22	24
18 by 24	846
18 by 30	36
20 by 24	120
23 by 31	163
24 by 24	3
24 by 30	54
24 by 36	24
Furnished by Students (Schools)	2
Not Specified	595
Total	1,843

paper cutters, blue print machines, etc. Only one teacher reported having a LeRoy lettering set and one reported a drafting machine. Five of the teachers had blue print machines which is shown in Table No. 33. The

information given on these machines is all shown in this table. Three teachers reported having paper cutters which are useful in a drawing class but not a necessity. From the information furnished on the drawing equipment in the Tennessee high schools, one would conclude that drafting rooms

Table No. 33. SIZE OF BLUE PRINT MACHINES, YEAR MADE, CONDITION AND NUMBER

Size of Blue Print Machines	Year Made		Condition			Number of Blue Print Machines
	1949	1952	New	Good	Fair	
18 by 24	1				1	1
18 by 24		1	1			1
36 by 36	1				1	1
Not Specified by Year	2			1	1	2

are fairly well equipped. This could be attributed to the small expense required to furnish a drawing room as compared to the cost of equipment for other industrial arts subjects.

The Equipment in the Electrical Shops of Tennessee. The electrical industry is the largest single industry in the world. With this being true, electrical subjects should be more prominent as an offering in industrial arts. There were four electrical classes reported in this study; no doubt, some electrical work is taught in the general shops of Tennessee.

Table No. 34 shows all the electrical tools and equipment reported in this study. This does not represent all the tools and equipment that would be necessary to teach an electrical class. The tools and equipment listed in Table No. 34 were the ones considered by the writer as being the major tools and equipment that would likely be found in an electrical shop. There are many more items that could be included to teach electricity. Numerous boards for wiring the different electrical circuits to illustrate the most common electrical principles could be included. The only items

of equipment in Table No. 34 considered essential are the soldering irons, but the other tools and equipment would be desirable to have. The amount

Table No. 34. KINDS, QUANTITY, AND THE NUMBER OF SCHOOLS REPORTING EACH KIND OF ELECTRICAL TOOL AND EQUIPMENT

Types of Equipment in High Schools	Quantity of Equipment	Number of Schools Reporting
A.C. Ammeter	1	1
Blow Torch	23	13
Gasoline Coil Fire Pot	1	1
P.A. System	2	2
Radio Sets	5	2
Soldering Copper, Electric	59	16
Soldering Guns	2	2
Soldering Irons	12	1
Tube Checker	1	1
Volt-ohm-mil-ammeter	10	5
V.T. Volt Meter	2	2

and kind of equipment needed for teaching an electrical class would depend upon the amount of theory taught and the electrical fields to be covered. Some of the electrical fields that could be studied are generating, transportation, communication, maintenance and repair. Many different tools and equipment would be required for each of the electrical fields. Which of these fields to teach and how extensive an industrial arts class should go into the different fields constitutes a debatable question. The community in which the class is taught and the qualifications of the teacher are two factors that should be considered along with others too numerous to mention.

Automobile Mechanics. Certainly, automobile mechanics is a very important subject in industrial arts. With millions of automobile owners, automobile mechanics should be one of the challenging fields for an industrial arts student. What could be the reason for industrial arts lagging

in offering automobile mechanics? Where can the industrial arts teacher create more interest than in an automobile mechanics class? Industrial arts is overshadowed by the woodworking tradition that started with the manual training movement. Needless to say, industrial arts is like many other phases of education in that once a subject is established, it is difficult to change to another, although another subject may more nearly fit the modern times. Again, problems of finances to purchase machines

Table No. 35. KIND, QUANTITY, AND THE NUMBER OF SCHOOLS REPORTING EACH KIND OF TOOL AND EQUIPMENT

Name of Equipment	Quantity of Equipment	Number of Schools
Battery Charger	4	3
Body Metal Spray	1	1
Buffing Machine	4	1
Chain Hoist	7	5
Grinder, Cylinder	1	1
Grinder, Electric (Body)	1	1
Grinder, Valve	1	1
Portable Metal Cutters	3	1
Test Engines	3	1
Testing Equipment	3	3
Tools, Body	2	2
Tools, Vibro	3	1
Total	33	19

and equipment confront the industrial arts leaders. There were only four classes in automobile mechanics reported in this study. The writer wonders if this is enough for a state the size of Tennessee, when there are 196 woodworking classes reported in this study. There is no known bias against woodworking, but it is time for people in education, especially industrial arts, to awaken to the needs of a modern society. There were twelve different items of tools and equipment reported in the automobile mechanics shops of Tennessee. A total of thirty-three tools or items of equipment, considered belonging to automobile mechanics, were reported.

Some of these were reported by teachers teaching other subjects. This accounts for more automobile mechanics tools and equipment being listed in Table No. 35 than there were classes in the subject.

Tools and Equipment in the Crafts Shops of Tennessee. There was only one crafts shop reported in this study. Therefore some of the tools and equipment listed in Table No. 36 were reported by teachers teaching other subjects. The writer visited some schools in Tennessee that had craft shops, but they were not connected with the industrial arts department in the school. Crafts are very common in Tennessee, especially in the eastern part of the state. Many small articles that would be considered crafts are made in Tennessee and sold to tourists. It was surprising that only one industrial arts shop was reported teaching crafts.

Table No. 36. KIND, QUANTITY, AND NUMBER OF EACH KIND OF TOOL AND EQUIPMENT USED IN TEACHING CRAFTS IN THE INDUSTRIAL ARTS SHOPS IN TENNESSEE

Name of Equipment	Quantity of Equipment	Number of Schools
Block Printing Equipment	1 Set	1
Book Binding Equipment	1 Set	1
Glass Etching Equipment	1 Set	1
Metal Etching Equipment	1 Set	1
Silk Screen Equipment	16	1
Leather Tools	8 Sets	7
Weaving Loom	3	2
Wood Carving	11	5

As in other industrial arts subjects, many of the tools and equipment used in teaching crafts are of the hand variety which were not included in this study, while in some instances ordinary woodworking and metalworking tools can be used for teaching crafts.

Table No. 36 shows the tools and equipment that were checked under

crafts. Just what tools and equipment would be necessary to teach crafts is very difficult to say without knowing the kind of crafts taught. The kind of tools and equipment vary with the different crafts.

Printing Equipment. Printing is the sixth largest industry in the world. Tennessee reported only four industrial arts printing classes. One teacher taught one-half day industrial arts printing and a half day trade and industrial printing. The printing equipment reported in this study is all shown in Table No. 37. Column one lists the different kinds of equipment; column two the quantity of each kind; and column three gives the total number reported. One school reported four linotype machines

Table No. 37. KIND, QUANTITY, AND THE NUMBER OF EACH KIND OF PRINTING TOOL AND EQUIPMENT IN THE INDUSTRIAL ARTS SHOPS OF TENNESSEE

Name of Equipment	Quantity of Equipment	Number of Schools
Cases of Type	500	4
Composing Stand	8	4
Cutters, Paper (hand)	3	3
Cutters, Power	1	1
Folder	1	1
Linotype Machine	4	1
Perforator	1	1
Press, Cylinder	2	2
Press, Platen	8	4
Press, Proof	5	4
Metal Saw	2	2
Stitching Machine	1	1
Strip Caster	1	1
Type Cabinets	30	4

which is very unusual for an industrial arts shop. This same school listed four presses: two platen, one cylinder and one proof, with printing equipment totaling $80,000.00 in value. It is not necessary to have that much equipment for an industrial arts printing department. A few hundred dollars will buy enough equipment to give students a chance to explore the printing

industry which is the aim of an industrial arts shop.

The tools and equipment listed and discussed in this part of the study do not represent all the tools and equipment in the Tennessee industrial arts shops, but they are samples from each of the three main divisions of Tennessee. There were enough respondents that one can determine how well the industrial arts shops of Tennessee are equipped. In this study only the major tools and equipment were listed, but an estimated value of the hand tools was presented in Table No. 24. It seems, from observing the information supplied by 130 respondents, that most of the industrial arts shops of Tennessee are very well equipped.

When a study has been made and the data compiled, helpful suggestions and recommendations should result from the study. In many cases the solutions to problems such as a study of this kind would reveal, are already known, but financial conditions of the state, county, and the school system will not justify the correction. Nevertheless, the concluding chapter will deal with solutions that were suggested by the information collected and compiled for this study.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The writer realizes that much significant information has been omitted from this study, but one could not expect to include all the eventualities that should have been investigated and reported. It is felt, however, that much good has been accomplished toward determining the status of industrial arts equipment in the Tennessee high schools.

Part A

An Abstract of the Findings

As developed in the course of this study, it is evident that industrial arts should have an important place in the high schools of Tennessee. It should be encouraged to the fullest extent until some type of industrial arts is taught in each of the 417 high schools of Tennessee.

The following statements are brief summaries of findings which were revealed in this study.

1. Shop Buildings. All the shop buildings in the Tennessee high schools are constructed of brick or concrete block except one.

2. Age of Buildings. The largest percentage of shop buildings have been built since 1939.

3. Location. Of the 130 shop installations reported in this study, thirty-nine are in separate buildings, while ninety-one are located in the main school plant. Most of the separately located buildings are within 150 feet of the main school plant. Fifty-one of the shops which are

located in the main building are located on the first floor and thirty are located in the basement.

4. Shop Sizes. The floor area of shops in the Tennessee high schools would evidently rank with the average of the nation. The smallest floor area reported was one thousand square feet. More teachers reported shops with floor areas from two to three thousand square feet than any other size.

5. Subjects Taught. There were twenty-eight different industrial arts subjects reported in this study. It was encouraging that some of the newer industrial arts subjects were offered.

6. Rank of Offerings. Woodworking was the leading subject with 196 classes; mechanical drawing was next; and general shop was the third most commonly offered subject.

7. Size of Classes. Seventy-eight per cent of the 130 teachers reporting taught classes with less than twenty-five pupils. Sixteen per cent reported classes with over thirty pupils.

8. Teacher Load. The largest per cent of teachers reported one free period per day. Most teachers were required to teach subjects other than industrial arts. Two teachers taught only one industrial arts subject per day, while thirty-six devoted full time to teaching industrial arts.

9. Equipment. The shops in Tennessee rank from poor to well equipped. The better equipped shops are found in the larger city schools. Woodworking shops were the best equipped of any of the shops which were reported in this study.

10. Duties Other than Teaching Industrial Arts. Industrial arts teachers in Tennessee have a varied number of duties other than teaching

industrial arts. Some teachers teach academic subjects, others coach, while some are engaged in part-time industrial arts and part-time trade and industrial teaching.

These statements that have just been given do not represent all the facts which were revealed in this study. If the reader would like to obtain more information concerning each of these topics, tables with comments are provided in Chapter IV.

Part B

Recommendations

There are countless ways and means for improving industrial arts, especially the major equipment in the industrial arts shops, but will recommendations based upon findings from one study be sufficient evidence to warrant very drastic changes? Needless to say, many of the solutions to the problem in the Tennessee high schools are already known and waiting for some means to meet these needs. In a large percentage of cases the problem is very easily detected, but providing the money is the most difficult task. The following pages of Part B will be devoted to the easiest report, that of discussing the needs.

1. Shop Buildings. An industrial arts building or room should be the best designed in the school plant. With all the free aids on shop planning, there are no reasons for poorly designed shops, especially shops built in the last few years. First, an industrial arts shop should be built large enough for the present and a few extra feet of floor space added for future expansion. One of the more recent means for providing more space is the use of removable partitions. These partitions can be added and removed as the need arises without damaging the ceiling, floor,

or walls of the building. An industrial arts building should be constructed of material that will last for many years to come. Most of the more recent buildings are built of brick or concrete block. Either of these two materials is well adapted to the construction of industrial arts buildings.

2. Location. In the past, many industrial arts buildings were built seperate from the main school plant, but in more recent school architecture the shop has been added to the main building. At one time the industrial arts rooms were located in the basement, but modern school architects have eliminated the basement. Today, the industrial arts shops are more commonly located on the first floor.

3. Location of Tools and Equipment. A wise shop planner today will arrange the tools and equipment in the shop before it is built. With miniature scale models of machines and equipment, it is possible to have each item pre-planned. Several of the leading tool manufacturers will supply these miniature models free or at very little cost. Some machine manufacturers will pre-plan a shop free of charge, or in some cases they will supply a specialist to assist in planning. An important point to remember is that time and money spent in pre-planning will pay large dividends in the future.

4. Per-Pupil Space. The minimum space recommended per pupil for any industrial arts shop is fifty square feet. Most authorities give fifty square feet as the minimum, but recommend more where possible. Another important phase to be considered in establishing per-pupil space is the type shop to be used. More space is required for automobile mechanics than mechanical drawing. The following space per pupil in square feet is recommended for the industrial arts shops of Tennessee.

General Shop	50 to 75 square feet
Sheet Metal Shop	50 to 65 square feet
Machine Shop	50 to 75 square feet
Automobile Mechanics	85 to 130 square feet
Electrical Shop	60 to 75 square feet
Mechanical Drawing	50 square feet
Printing Shop	50 to 75 square feet
Woodworking Shop	65 to 90 square feet

5. Teaching Combination. A large percentage of industrial arts teachers are required to teach subjects other than industrial arts. The best teaching combination would depend upon the qualifications of the teacher. The writer recommends any combination as long as one duty does not interfere with the other.

6. Teaching Combination in the General Shop. The writer recommends the inclusion of from six to ten subjects in a general shop. This does not necessarily mean that in order to teach a subject in a general shop the teacher must have college credits in the subject. Many general shop subjects can be taught very effectively by a teacher who has not had previous training in these subjects. The following recommendations concern the general shops in Tennessee.

(1) The college officials in Tennessee need to offer more general courses in teacher education.

(2) The number of general shops in the high schools at present need to be increased.

(3) The number of different subjects offered in the present general shop should be increased to at least ten different subjects.

(4) Officials should be encouraged to install general shop in the small high schools.

7. More Industrial Arts Programs Recommended. If it were possible, each high school in Tennessee should have some type of industrial arts.

The minimum number of industrial arts programs should not be less than 250. The following suggestions are recommended for the future expansion of industrial arts in Tennessee.

(1) The general shop plan of organization is recommended for schools that have only one industrial arts teacher.

(2) Two or more general shops are recommended for schools that have two or more shops with two or more teachers.

(3) The industrial arts people should conduct continuously some type of public relations so that each person in Tennessee will have some knowledge of industrial arts.

(4) The offerings in industrial arts education in the colleges of Tennessee should be increased and a large variety of vocational shop subjects offered.

8. State Advisory Committee for Industrial Arts. A committee of this kind is very helpful to an industrial arts program in any state. An active advisory committee for industrial arts composed of members from the colleges and teachers in the field, would be a valuable asset to the industrial arts programs of Tennessee. Many solutions to problems confronting the industrial arts teachers could be solved by this committee, as well as establishing policies and standards for the unification of the industrial arts programs of Tennessee. It is convincing to note that all the states which have an advisory committee for industrial arts have advanced furthermost in the field.

9. State Supervisor of Industrial Arts. The need for a state supervisor of industrial arts has been apparent for many years. At present each county employs a "regular" supervisor, but they are of very little assistance to the industrial arts teacher. A full time state industrial

arts supervisor is needed to assist the county superintendent, school principal and the industrial arts teacher in organizing, promoting and supervising the industrial arts programs. A formal inspection tour of each industrial arts shop in the state would tend to unify and strengthen the industrial arts programs in operation, as well as to suggest ways and means for expansion.

10. Combination Trade and Industrial Education and Industrial Arts. It seems to be a trend in the smaller high schools in Tennessee to organize a combination of trade and industrial education and industrial arts programs. The teacher is required to teach a half day trade and industrial education and a half day of industrial arts. In some schools the industrial arts program has been discontinued for trade and industrial education. This is not justifiable; neither is it fair to the student. Many students cannot schedule trade and industrial education because three consecutive hours of time are required, whereas an industrial arts class is usually one hour in length. The writer suggests that both trade and industrial education and industrial arts have a place in the programs of the Tennessee high schools, but at no time should one be sacrificed for the other.

11. Tools and Equipment. From observing the data in this study, one would readily recognize the need for more tools and equipment. Although a complete set of power driven machines is not an essential for teaching industrial arts, every industrial arts teacher would wholeheartedly agree that the subject can be taught more effectively with the necessary tools and equipment. The kind of tools and equipment needed in the industrial arts shops in Tennessee would vary from school to school. Some

schools have sufficient tools while others need the fundamental tools and equipment to teach the basic operations of the subject. The tool shortage situation can be greatly improved in Tennessee by observing and putting into practice the following suggestions.

(1) Do a good job of teaching. School administrators are more generous toward a program that is making progress.

(2) Talk industrial arts to friends. After all, a well advertised program will attract attention.

(3) Invite the public in to visit. Let them see an efficient program in operation.

(4) Provide project displays in the school and in store windows in town. Taxpayers like to see the fruits of their money; also school administrators welcome the opportunity to advertise the results of their supervision.

(5) Teach adult classes after school or at night. A little extra work may result in a well equipped shop. The school officials can very easily reject a request for more tools and equipment from the industrial arts teacher, but if the voting citizens in the community make the request, it is more difficult to ignore. This would be good practice even though obtaining tools and equipment were not the motive.

These recommendations made by the writer are only a few of the ways and means that industrial arts can be improved in Tennessee. Some of these recommendations concern the program on a state wide basis, while others only affect particular localities within the state. A number of these suggested recommendations could very easily be adapted to the needs

of other states. The writer has made these recommendations with good faith without trying to cast a reflection upon the good administrators in Tennessee or on any industrial arts teacher. After all, the industrial arts programs in Tennessee rank among the average of the nation, but the people of Tennessee should not be satisfied with the present status. They should strive to elevate industrial arts in the Tennessee high schools to the highest degree of attainment in the United States.

APPENDICES

A. A Selected Bibliography

B. Directory of Respondents

C. Letter of Transmittal and Check-List Form

D. Follow-Up Letter

Appendix A

A Selected Bibliography

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Appendix B

Directory of Respondents

School Year 1951-52

City Schools.

Alcoa		
Carroll R. Campbell	Industrial Arts	Alcoa High School
Lewis N. Crawford (C)	General Shop	Chas. M. Hall High School
Bristol		
Rupert M. Smith	General Shop and Mechanical Drawing	Tennessee High School
Chattanooga		
Evan M. Jones	Mechanical Drawing and General Woodworking	Brainerd Junior High School
C. J. Woodson	General Woodworking	Dickson Junior High School
A. J. Verble	General Woodworking	East Side High School
Frank Copeland	General Woodworking	Hardy Junior High School
Thomas M. Rhue (C)	General Woodworking	Second District Junior High School
Dyersburg		
N. O. White	Woodworking and Mechanical Drawing	Dyersburg High School
Elizabethton		
Glenn Murray	Woodworking, General Shop and Mechanical Drawing	Junior High School
John Bolden (C)	Woodworking, General Shop and Mechanical Drawing	Douglas School
Etowah		
Paul M. Levengood	Shop	Etowah Junior High School
Johnson City		
Terrell Ponder	Mechanical Drawing and Woodworking	Science Hill High School
John G. Hillenbrand	Drawing	Junior High School
Halton W. Williams	Drawing and Woodworking	Langston High School
Kingsport		
Victor Simpson	Automobile Mechanics and Home Mechanics	Dobyns-Bennett High School
Gordon B. Wasinger	Woodworking	Dobyns-Bennett High School
Rollin Kennerly	Mechanical Drawing	Dobyns-Bennett High School
Robert Jordon	General Shop and Home Mechanics	Kingsport Junior High School

Knoxville		
Paul Brewer	Industrial Arts	East High School
Hugh D. Powers	Industrial Arts	West High School
John Bosse	Metals	West High School
Harold S. White	Industrial Arts	Rule Junior-Senior High School
Donovan B. Stringham	Shop	Christenberry Junior High School
James Reasonover	Industrial Arts	Christenberry Junior High School
Lauton Edwards	Industrial Arts	Park Junior High School
E. H. Aslinger	Industrial Arts	South Knoxville Junior High School
Allen Wickersham	Industrial Arts	Tyson Junior High School
Edward Hughes	Industrial Arts	Tyson Junior High School
W. E. Camphor (C)	Industrial Arts	Beardsley Junior High School
Nelson R. Nance	Metal Work	Beardsley Junior High School
C. W. Peavey	Industrial Arts	Vine Junior High School
Maryville		
Ben Green	Woodworking	Maryville High School
Memphis		
W. S. Hiltpold	Drafting	Humes High School
E. H. Smith	Printing	Tech High School
J. R. Ralston	Industrial Arts	Messick High School
Paul J. Williams	Woodworking and Electricity	Messick High School
Charles R. Fite, Jr.	Industrial Arts	Messick High School
Dayton B. Smith	Woodshop	Southside High School
Raymond McElroy	Woodshop	Southside High School
Ralph Evans	Electricity and Metals	Southside High School
Winfred H. Sharp	Industrial Arts	Treadwell High School
Harold Fredricks	Industrial Arts	Treadwell High School
Joseph Mitchell	Industrial Arts	Fairview Junior High School
John H. Spray	General Shop	Hollywood Junior High School
S. M. Wyatt (C)	Drafting	Manassas High School
Nashville		
Joseph C. Wells	Woodworking and Drawing	Cohn High School
S. S. Ervin	Woodworking and Drawing	Cohn High School
A. E. Smedley	Woodworking and Drawing	North Nashville High School
Thomas Hall	Woodworking and Drawing	North Nashville High School
J. T. Appleton	Woodworking and Drawing	Howard High School
D. J. Ayers	Woodworking and Drawing	East Nashville Senior High School
Hillary Martin	Woodworking and Drawing	East Nashville Senior High School
Haskell Newman	Woodworking and Drawing	East Nashville Junior High School
John D. Thomas	Woodworking and Drawing	East Nashville Junior High School

Claude Hall	Woodworking and Drawing	East Nashville Junior High School
Paul Mortimer	Woodworking and Drawing	West End High School
Robert L. Howell, Jr.	Woodworking and Drawing	Bailey Junior High School
George D. Shreeve	Woodworking and Drawing	Cavert Junior High School
Jesse Buchanan	Woodworking and Drawing	Highland Heights Junior High School
Charles E. Adwell	Woodworking and Drawing	Waverly-Belmont Junior High School
J. A. Smith (C)	Woodworking and Drawing	Cameron Junior High School
Q. L. Gray (C)	Woodworking and Drawing	Meigs Junior High School
	Oak Ridge	
Frank J. Heck	Industrial Arts	Jefferson Junior High School
Willis Adams	Industrial Arts	Jefferson Junior High School
A. B. Harper	Industrial Arts	Jefferson Junior High School
Charles C. Carnes	Industrial Arts	Oak Ridge High School
Charles Nave	Industrial Arts	Oak Ridge High School
	Tullahoma	
Charles Thomas	Industrial Arts	Tullahoma High School

County Schools.

	Anderson County	
Robert Weems	Woodworking	Norris High School Norris, Tennessee
	Bedford County	
Stone Wiseman	Manual Arts	Central High School Shelbyville, Tennessee
Weck H. Howse	Manual Arts	Wartrace High School Wartrace, Tennessee
	Blount County	
Milburn Waller	General Shop and Mechanical Drawing	Everett High School Maryville, Tennessee
	Bradley County	
Frank Whitaker	Woodwork	Bradley County High School
Daniel Weekley	Mechanical Drawing	Bradley County High School
	Cannon County	
Clark Turney	General Woodworking	Woodbury High School Woodbury, Tennessee
	Carter County	
A. H. Hyder	Woodworking, General Shop and Mechanical Drawing	Hampton High School Hampton, Tennessee
Thomas Morgan	Woodworking, General Shop and Mechanical Drawing	Elizabethton High School Elizabethton, Tennessee

	Coffee County	
Roy McDuffee	General Shop	Central High School Manchester, Tennessee
	Davidson County	
Ralph E. Partee	Woodworking and Mechanical Drawing	Central High School Tennessee
Joe N. Hunt	Woodworking and Mechanical Drawing	Central High School Tennessee
Sam Kerr	Woodworking and Mechanical Drawing	Cumberland High School Tennessee
Gordon Lovell	Woodworking and Mechanical Drawing	Isaac Litton High School Tennessee
Doyle Smith	Woodworking and Mechanical Drawing	DuPont High School Old Hickory, Tennessee
William B. Pendleton	Mechanical Drawing	Antioch High School Antioch, Tennessee
Woodrow Arnold	Mechanical Drawing	Bellevue High School Bellevue, Tennessee
Howard Hayes	Woodworking and Mechanical Drawing	Donelson High School Donelson, Tennessee
Randall Eaves	Woodworking	Joelton High School Joelton, Tennessee
Annie R. Stroud	Crafts	Joelton High School Joelton, Tennessee
Robert Drummond (C)	Woodworking	Haynes High School Nashville, Tennessee
	Fentress County	
William Leavitt	General Shop and Mechanical Drawing	Alvin C. York Agriculture Institute Jamestown, Tennessee
	Franklin County	
Rudy Wm. White, Jr.	General Shop and Mechanical Drawing	Huntland High School Huntland, Tennessee
Horace D. Jared, Jr.	Industrial Arts	Franklin County High School Winchester, Tennessee
Edward Clay	Industrial Arts	Franklin County High School Winchester, Tennessee
Alvin Campbell	General Shop and Mechanical Drawing	Townsend Training School Winchester, Tennessee
	Giles County	
Owen Bass	Manual Arts and Mechanical Drawing	Beech Hill High School Pulaski, Tennessee
Hillard Kincaid	Manual Arts and Mechanical Drawing	Minor Hill High School Minor Hill, Tennessee
Urban Smith	Manual Arts and Mechanical Drawing	Giles County High School Pulaski, Tennessee
	Hamilton County	
Archie Bibbey	Mechanical Drawing	Central High School Chattanooga, Tennessee

J. M. Seaton	Mechanical Drawing	Central High School Chattanooga, Tennessee
R. S. Wharton	Mechanical Drawing	Central High School Chattanooga, Tennessee
J. J. Fletcher	Automobile Mechanics	Central High School Chattanooga, Tennessee
Oliver E. Scott	Printing	Central High School Chattanooga, Tennessee
James I. Calfee	Mechanical Drawing	Red Bank High School Chattanooga, Tennessee
Lawrence Cuba	Drafting and Woodwork	Red Bank High School Chattanooga, Tennessee
Joe L. Maddox	General Shop and Mechanical Drawing	Tyner High School Tyner, Tennessee
	Hawkins County	
Harold Pope	General Shop	Rogersville High School Rogersville, Tennessee
	Humphreys County	
Harold Orgain	Industrial Arts and General Shop	Waverly Central High School Waverly, Tennessee
	Jackson County	
Clifford Gentry	Woodworking	Jackson County Central High School Gainesboro, Tennessee
	Knox County	
James R. Large	General Shop	Central High School Fountain City, Tennessee
B. O. Petree	Mechanical Drawing	Central High School Fountain City, Tennessee
William I. Denton	General Shop and Mechanical Drawing	Young High School Knoxville, Tennessee
William Davidson	General Shop	Bearden Station High School Bearden Station, Tennessee
	Lawrence County	
Seth Springer	Mechanical Drawing and Woodworking	Summertown High School Summertown, Tennessee
Robert Henson	Woodworking and Mechanical Drawing	Lawrence County High School Lawrenceburg, Tennessee
	Lincoln County	
Leonard Mansfield	Drafting and Woodworking	Central High School Fayetteville, Tennessee
	Marion County	
Pink A. Foutch	General Woodworking	South Pittsburg High School South Pittsburg, Tennessee

	Madison County	
Kirby McKnight	General Shop	J. B. Young High School Bemis, Tennessee
John T. Bryan	General Shop	Northside High School Jackson, Tennessee
	Marshall County	
Roy Derryberry	General Woodworking and Mechanical Drawing	Marshall County High School Lewisburg, Tennessee
	Maury County	
Luther D. Ralph, Jr.	Industrial Arts	Central High School Columbia, Tennessee
	Rutherford County	
Donald O'Brien	Industrial Arts	Central High School Murfreesboro, Tennessee
	Scott County	
Clarence McIntyre	Home Mechanics and Shop	Robbins High School Robbins, Tennessee
	Shelby County	
T. V. Jordan	General Shop	Whitehaven High School Whitehaven, Tennessee
Kenneth Reed	Mechanical Drawing	Whitehaven High School Whitehaven, Tennessee
Carlton Pruitt	Mechanical Drawing and Woodworking	Frayser High School Frayser, Tennessee
	Sullivan County	
Walter Reed	Mechanical Drawing and Woodworking	Sullivan High School Kingsport, Tennessee
Thomas McConnell	Mechanical Drawing and Woodworking	Bluntville High School Bluntville, Tennessee
Willard Bailey	Mechanical Drawing and Woodworking	Holston Valley High School Briston, Tennessee
Cecil Davis	Mechanical Drawing and Woodworking	Lynn View High School Kingsport, Tennessee
	Williamson County	
Leland Gore	Industrial Arts and Mechanical Drawing	Franklin High School Franklin, Tennessee

Appendix C

Letter of Transmittal and Check-List Form

28 D College Courts
Stillwater, Oklahoma
November 7, 1952

Dear Sir:

Under the direction of Dr. DeWitt Hunt, Head, School of Industrial Arts Education and Engineering Shopwork at the Oklahoma Agricultural and Mechanical College, I am making a survey of the major equipment in the industrial arts shops of the Tennessee High Schools. This material is being collected for the purpose of writing a Master's Degree thesis entitled, "A Survey of the Major Equipment in the Industrial Arts Shops in the Tennessee High Schools in 1952".

As a means of securing information for this study, check-lists are being sent to each of the 199 high schools listed in the 1952 State Directory of Industrial Arts. Your cooperation in completing the check-list and returning it in the enclosed, self-addressed and stamped return envelope will be greatly appreciated.

Respectfully yours,

Malcom Stover, Graduate Student
School of Industrial Arts Education
and Engineering Shopwork
Oklahoma A. and M. College
Stillwater, Oklahoma

Approved by:

DeWitt Hunt, Head
School of Industrial Arts Education
and Engineering Shopwork

AN INQUIRY FORM PREPARED FOR THE PURPOSE OF MAKING AN INVENTORY ANALYSIS OF THE MAJOR EQUIPMENT IN THE INDUSTRIAL ARTS SHOPS OF THE TENNESSEE HIGH SCHOOLS

Malcom Stover, Graduate Student
School of Industrial Arts Education and Engineering Shopwork
Oklahoma Agricultural and Mechanical College
Stillwater, Oklahoma
Fall 1952

irections: Please fill in the blanks as they apply to your shop. (Note: A separate nquiry form is being sent to every teacher of industrial arts in Tennessee.

ame of school_____ City_____

ame of shop or room_____ Size of shop_____

ate shop was built_____ Ceiling height_____

heck type of heating: Steam radiators on floor____; Ceiling steam heat with fan____;

ot air____; Coal stove____; Gas stove____; Other_____

s the shop a part of the main building? Yes___ No___ If your answer is no, how far is he shop from the main building (in feet) _____. If the shop is a part of the main uilding, on what floor is it located? _____. If the shop is separate, what type of uilding? _____

me of teacher making this report_____

eacher's address (street address desired)_____

ease fill in the blanks to indicate your daily teaching schedule (include all classes).

Periods	Subjects Taught	Number of pupils		Grade
		Boys	Girls	
1.				
2.				
3.				
4.				
5.				
6.				
7.				

In the following check-list (three pages) please give all the information requested r each machine or item of equipment which is located in your shop or drafting room. you have machines or major equipment other than the ones included in this form, list the spaces provided below each division. In the case of a general shop, check with red pencil the machines and equipment used. Use approximations where definite infortion is not available. As for example: date purchased and the original unit cost.

ease check as requested on page one

Name	No.	Size	Date Purchased	Original Unit Cost	Condition	Name of Manufacturer
Variety Saw						
Universal Saw						
Band Saw						
Jig Saw						
Jointer						
Drill Press						
Shaper						
Surfacer						
Belt Sander						
Drum Sander						
Portable Sander						
Oscillating Sander						
Spindle Sander						
Disc Sander						
Glue Pot						
Saw Filing Machine						
Band Saw Brazer						
Portable Router						
Wood-Turning Lathe						
Vertical Mortiser						
Horizontal Mortiser						
Tenoner						
Radial Saw						
Portable Circular Saw						
Mitre Box						
Power Grinder						
Benches						
Air Compressor						
Spray Gun						
Kiln						
Tube Checker						
Volt-Ohm-Mil-Ammeter						
Signal Generator						
Sweep Generator						
Oscilloscope						
Condenser Tester						
Soldering Copper Elec.						
Soldering Gun						
Signal Tracer						
V. T. Voltmeter						
Rider's Manuals						
Howard W. Sams Manuals						
P. V. Sets						
Radio Sets						
P. A. Systems						
Blow Torch						

lease check as requested on page one

Name	No.	Size	Date Purchased	Original Unit Cost	Condition	Name of Manufacturer
Drawing Sets						
T-Squares						
Drafting Boards						
Drafting Machines						
Leroy Lettering Guides						
Blueprint Machines						
Drafting Tables						
Stools						
Paper Cutter						
Lathe						
Shaper						
Milling Machine						
Drill Press						
Power Hack Saw						
Forge						
Anvils						
Gas Furnace						
Taps and Dies (Bolt)						
Welding (Gas)						
Welding (Electric)						
Melting Furnace						
Cupola						
Vise (Machinist's)						
Vise (Pipe)						
Stock & Die (Pipe)						
Press						
Band Saw (Metal Cut.)						
Boring Machine						
Hydraulic Lift						
Chain Hoist						
Testing Equipment						
Battery Charger						
Body Tools						
Electric Hoist						

Please check as requested on page one

Name	No.	Size	Date Purchased	Original Unit Cost	Condition	Name of Manufacturer
Platen Press						
Cylinder Press						
Rotary Press						
Proof Press						
Linotype Machine						
Monotype Machine						
Type Cabinets						
Cases of Type						
Composing Stand						
Paper Cutter (Hand)						
Paper Cutter (Power)						
Squaring Shears						
Slip Roll Former						
Bar Folder						
Brake						
Box and Pan Brake						
Hollow Mandrel						
Stake Plate						
Soldering Furnace						
Leather Tools (sets)						
Wood Carving (sets)						
Loom (Weaving)						
Potters Wheel						
Pottery Kiln						
Book Binding Equip.						
Silk Screen Equip.						

ease fill in the following blanks

at is the approximate cost of all the hand tools in your shop? $_____

w long have you been teaching at this school? _____

you consider that you have enough equipment for effective teaching? Yes___ No___

aborate _____

Appendix D

Follow-Up Letter

28 D College Courts
Stillwater, Oklahoma
December 22, 1952

Dear Sir:

On or about November 15 you received a check-sheet and a letter asking your cooperation in making a study of the major equipment in the industrial arts shops of Tennessee. At present, I have not received your reply. This study is immensely important to me, and it will be of future value as recorded data for those who may wish to use it.

If you have misplaced the other check-sheet, I will be glad to supply you with another copy. Will you please take a few minutes of your valuable time to complete the check-list and return it to me?

Respectfully yours,

Malcom Stover, Graduate Student
Oklahoma A. and M. College

MS:dw

VITA

Walter Malcom Stover
Candidate for degree of
Master of Science

Thesis: A SURVEY OF THE MAJOR EQUIPMENT IN THE INDUSTRIAL ARTS IN THE TENNESSEE HIGH SCHOOLS IN 1952

Major: Industrial Arts Education

Biographical and Other Items:

Born: January 6, 1918, at Willow Grove, Tennessee

Undergraduate Study: Tennessee Polytechnic Institute, 1946-47; 1950-52.

Graduate Study: O. A. M. C., 1952-53.

Experiences: Radio and Electrical work, 1938-43; U. S. Navy, 1943-45; Employed by Henderson County Board of Education, 1947-50.

Member of Iota Lambda Sigma, Phi Delta Kappa, Oklahoma Industrial Arts Association, American Industrial Arts Association, Oklahoma Vocational Association and American Vocational Association.

Date of Final Examination: May 12, 1953.

THESIS TITLE: A SURVEY OF THE MAJOR EQUIPMENT IN THE INDUSTRIAL ARTS SHOPS IN THE TENNESSEE HIGH SCHOOLS IN 1952

AUTHOR: Walter Malcom Stover

THESIS ADVISER: DeWitt Hunt

The content and form have been checked and approved by the author and thesis adviser. Changes or corrections in the thesis are not made by the Graduate School office or by any committee. The copies are sent to the bindery just as they are approved by the author and faculty adviser.

TYPIST: Dorothy Watkins