AMERICAN COUNCIL ON INDUSTRIAL ARTS TEACHER EDUCATION

TENTH YEARBOOK 1961

GRADUATE STUDY in Industrial Arts

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A Division of the American Industrial Arts Association
and the National Education Association

Lithographed in U.S.A.

Yearbooks of the American Council on Industrial Arts Teacher Education are produced and distributed by the McKnight & McKnight Publishing Company, Bloomington, Illinois. Orders and requests for information about yearbooks should be addressed to the company. Requests to quote portions of yearbooks should be addressed to the council.

The spirit underlying this tenth Yearbook is that of Heber Allen Sotzin. A pioneer in industrial arts education for over three decades, Heber Sotzin was internationally known and respected for his leadership, vitality, uncompromising integrity, and faith in a great future for industrial arts education, through the graduate level.

His imagination and wisdom are reflected in the chapters of this Yearbook, which he, as its editor, initially planned. The colleagues who took over his unfinished task have attempted to carry through with his original outline and to reflect his educational philosophy.

It is doubly fitting, then, that this tenth Yearbook be dedicated to Heber Allen Sotzin, pioneer teacher, industrial educator, and patron of the industrial arts.

John T. Wahlquist, *President*
San Jose State College

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Preface

Through the years industrial arts has made commendable progress toward achieving the goals of general education. This progress continues today as the profession engages in re-orienting the curriculums of the elementary and secondary schools to meet the needs of a changing culture. It is to be expected that the changes in these curriculums will be affected by and reflected in the graduate programs of the colleges and universities.

Yearbook X, *Graduate Study in Industrial Arts,* provides for the first time the opportunity for collective study of graduate programs in industrial arts education. The theme of this Yearbook could be proposed by the following questions: What is the challenge to industrial arts graduate education? How did the challenge develop? How is the challenge being met? What provisions should be made for the future?

In answering these questions the authors do not offer panaceas for the ills of existing programs nor specific formulae for new programs. Instead, their answers may be thought of as hypotheses – proposals to be investigated. They direct to our attention the need for research to provide new dimensions which will serve as guidelines for the future.

With each new yearbook, the American Council on Industrial Arts Teacher Education finds opportunity to again express its deepest appreciation to the McKnight and McKnight Publishing Company for its outstanding contribution to the profession in underwriting the yearbook program. This effort on the part of the publishers has provided the stimulation and opportunity for growth and increased productivity in the members of the Council. Sincere appreciation is extended to the editors and authors of this yearbook for their devoted efforts to the profession in providing it with a work of quality and lasting value. This volume is the result of scholarship, insight, and selfless effort expended toward the enrichment of the literature in the field.

The American Council on Industrial Arts Teacher Education is pleased to present Yearbook X, *Graduate Study in Industrial Arts,* to teacher educators, students of higher education, and others interested in this vital area of academic endeavor.

Don Maley

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Foreword

The policy of the American Council on Industrial Arts Teacher Education is to make a yearly presentation of a Yearbook to the profession. This, the Tenth Yearbook, is dedicated to graduate education in industrial arts.

The selections in this Yearbook reflect intersectional thinking on current problems in graduate education. The function of the editors in putting together this Yearbook was to have the various authors write on specific themes. However, no attempt was made to direct the concepts or ideas expressed, with the result that the various chapters reflect the original thinking of the individual authors.

This Yearbook will make its maximum contribution only if it prompts educators in the field of industrial arts education to critically analyze the content and thinking expressed in the various chapters. Ideas on paper are static. They can attain realization only when they lead to better theory or practice. With this intent, the editors present Yearbook Ten to the profession for their further analysis.

Contents

PART ONE

Evolution of Industrial Arts in Public Education

The study of industrial arts graduate programs necessitates the identification of the educational areas which these programs serve. For this reason, Part I of this Yearbook is devoted to a study and evaluation of industrial arts in public education.

In the analysis of the elementary, secondary and undergraduate programs of instruction, industrial arts is defined as a part of general education. The psychological and philosophical concepts which identify industrial arts as a discipline are established. A review of the objectives of industrial arts is presented and proposals for implementing these objectives into the educational program are explored.

CHAPTER I

The Scope of Industrial Arts

Heber A. Sotzin
San Jose State College

Industrial arts, originally called *manual training,* is a foreign importation. It was first introduced into this country in 1880, through the efforts of Dr. Calvin M. Woodward, who established a manual training school in St. Louis, Missouri, in connection with Washington University. This initial attempt was inaugurated under private auspices. Three years later a similar school was established in Chicago, also financed by private funds. The movement took root and spread eastward to Toledo, Baltimore, Philadelphia, Boston and other cities. After these modest beginnings and a realization of its potential, public funds were reluctantly appropriated for schools of this type. There was much opposition, on the basis that schools meant books, memorization, drill and formal recitations. Activities related to industrial materials, tools, constructional processes and a study of man's material culture were considered as being outside the realm of our schools curricula. It was thought that academic work and practical work were dichotomous, hence could not be justified.

At the outset, the practical arts activities were confined to the secondary school. Later manual activities were introduced into the elementary grades and more recently, when the need for an adequately trained teacher personnel became necessary, departments were established in colleges and universities. Today, industrial arts activities are found on all levels of education, from the kindergarten through higher education. It is estimated that 50,000 teachers are engaged in these pursuits in the United States and that more than seventy-five per cent of the pupils enrolled in our public schools will have had some experience in this educational area.

A major problem encountered by the industrial arts teacher is the lack of understanding of his fellow teachers, school administrators and lay people, concerning the meaning and significance of industrial arts activities. A brief interpretation may be helpful.

INDUSTRIAL ARTS.

What Is It?

Industrial arts is an aspect of general education concerned with satisfying man's innate desire to construct projects with tools and materials. Learning comes through behavioral changes as pupils experience industrial processes, tools and materials; and through their study of resultant conditions of life. It is a curriculum area rather than a subject or course, being comparable in this respect to the areas which comprise social studies, health activities, language arts and the fine arts.

Why Do We Have It?

The increasing complexity of our industrial economy and the increasing amount of mechanization encountered in almost every phase of our daily living makes it essential that industrial arts experiences be regarded as basic and fundamental for all youth.

Who Takes It?

As a part of general education, industrial arts is advocated for all pupils. On the elementary level it vitalizes and clarifies subject matter content. On the junior high school level it should be exploratory and extensive. On the senior high school and beyond, it is usually elective and more intensive than in previous school years. On the collegiate level it takes on a twofold purpose:

1. Avocational, for those desiring the activities offered as recreational. An excellent example is the workshop conducted on a recreational basis at Dartmouth College, which is attended by seventy-five per cent of its students and faculty each year.
2. Vocational, for those who desire to enter the teaching profession or for those who enter industry and business and desire a broad generalized industrial and technical background.

It, therefore, possesses both occupational guidance values and avocational interests.

What Grade Level Offers It?

Industrial arts has general values that apply to all levels of education—(kindergarten, elementary school, secondary school, through college and the university). It possesses the unique quality of making abstractions concrete and practical. For example, if a boy holds a chisel on a grindstone with strong pressure he may burn the tool. He has learned from this experience that friction produces heat and without proper precautions a piece of equipment may be ruined. In other words, a basic law of physics has been learned and becomes real and meaningful. It is a continuous program whose values are progressively intensive and cumulative in their effect as the pupil advances in maturity. The program varies from simple illustrative materials for young children to recreational activities and graduate research for the adult.

What are its Aims and Purposes?

Industrial arts does not attempt to develop skills needed in earning a livelihood or to train a pupil for a specific occupation. That function belongs to another field of education known as vocational education. Through the industrial arts program the pupil should:[1]

1. Gain knowledge of industry and industrial processes through which man changes materials to improve his daily living, his health, and increase his wealth, comfort and enjoyment.
2. Grow in appreciation of the influence of industrial products and industrialization upon social and economic life. The pupil grows in appreciation of good design and good workmanship in construction of industrial products.
3. Increase his ability in using tools, machines, and materials to construct objects which enrich personal and group living.
4. Develop attitudes and appreciations which lead to sound safety practices in the school, in the home, and in everyday living.

THE PAST

In order to understand the present and to plan intelligently for the future, it is necessary to know what has transpired in the past. It may be trite to repeat that "the most interesting thing to man is man himself." Nevertheless, numerous years ago there appeared on earth a creature known today as "man." This primitive creature was without food, clothing and shelter. The surprising fact is that he survived at all.

[1] U. S. Office of Education, Bulletin No. 34, *Industrial Arts - Its Interpretation in American Schools.* Washington, D. C.: U. S. Government Printing Office, 1937, p. 1.

The earliest humans to inhabit the earth probably lived much like wild animals. The latter transmit genetically certain traits to their off-spring which lead to survival. Man must have followed the same pattern for his survival. The only means early man had for his protection, as he roamed the earth, was what he picked off the ground—a stone, a stick, a bone, a branch of a tree or a tusk from an animal. His only shelter was a bush, a tree, a cave or over-hanging ledge. His food consisted of dead carcasses, nuts, roots, berries and other edible substances found in nature. He was in competition with wild animals, at least, for his food. He lacked all the essentials considered necessary today for survival. It is difficult to comprehend early man's ordeal and his resistance to the elements of nature. The answer lies in the fact that man is endowed with an intellect and can profit by his experiences and see the relationships between cause and effect. This reasoning power of man and his opposable thumb and binocular vision led to the development of tools. Furthermore, man is not only a tool using animal, but the only animal who has ever invented a tool. The real inception of civilization is characterized by tools and began approximately a half million years ago. The progress of civilization and man's culture is characterized by technological advancement. It is for this reason that great historical changes are termed, The Stone Age, The Copper Age, The Bronze Age, The Iron Age, The Atomic Age, The Space Age, etc.

The progress of the human race is closely allied to man's effective work habits. Through manual activities man not only satisfies his wants but increases his social and economic status. As man developed manipulative skills he passed them on to a son or some member of the tribe. The transmission of skill and knowledge in a primitive society was done in an informal manner.

The formulation of the Babylonian Code by King Hammurabi in 2100 B.C. marks the first legal and organized formal training program for apprentices and craft work. From this early endeavor have grown the extensive technical education activities found in our educational programs today. These activities include the industrial arts courses, whose function is general education, and the technical vocational courses, whose purpose is specific occupational training.

As previously stated industrial arts is a foreign importation. After the decline of Greece and Rome and the passage of the period known as the Dark Ages in Western civilization, when civilization hung on the brink of chaos, there occurred in Europe a transition, during the fourteenth and fifteenth centuries, known as the Renaissance and the

Revival of Learning. The latter was an attempt to revive at least, in part, the educational programs of the Greeks and Romans, which all but perished during the Dark Ages. These efforts culminated into a movement known as Humanism. The curriculum was based upon Greek and Latin, and abstract subject matter; whose purpose was cultural education, rather than any practical or functional goal. The educational program was intended for a small or elite class of nobles and gentlemen, who would not be required to soil their hands with manual labor.

As social and economic conditions improved, during the sixteenth and seventeenth centuries, educational reforms developed. This movement became known as Realism. It was an attempt to introduce a new and better psychology into school programs; to include the applications of science, the practical arts; to relate everyday experiences to education; to improve teaching methods; and to provide schools for both sexes. The men foremost in this endeavor were Comenius, the father of modern pedagogy, Luther, Rabelais, Rousseau and others. These men were theorists and did not actually establish schools. Their biggest contribution was the influence their educational theories exerted upon their followers. Among these were Francke, who was the first to introduce manual activities into his school's curriculum; Hecker, the founder of the German secondary school; Pestalozzi, the father of industrial arts; Fellenburg, the father of vocational education and others. The educational philosophy of these men was based upon "sense impressions." It was a type of educational expression to develop the creative thinking of the student. The belief was held that by training "the head, the hand, the heart" coupled with the proper social environment, society could be improved. This educational concept was based upon "learning by doing."

Finland was the first country to organize hand work on a national scale. From here the movement spread to Russia and Sweden. While a small group of American educators were casting about for practical arts activities for our school program, there appeared at the Philadelphia Centennial Exhibition, in 1876, a sequential order of tool exercises, displayed by the Imperial Technical School of Moscow, Russia. This gave men like Dr. Woodward of Washington University in St. Louis, Missouri, and Dr. Runkle, President of the Massachusetts Institute of Technology, an inspiration which culminated in the establishment of a manual training program in American schools.

Dr. Woodward was very emphatic that the work should be a part of general education. He believed, "That it should be as broad and liberal as intellectual" and stated furthermore, "We do not wish or propose to neglect or underrate literary and scientific culture, we strive to include all the elements in just proportion" ... "I advocate manual training for all children as an element in general education. I care little what tools are used, so long as proper habits (moral) are formed, and provided the windows of the mind are kept open toward the world of things and forces, physical as well as spiritual."[2]

Needless to say when manual training had its inception there was no trained teaching personnel. Teachers were recruited usually from craftsmen in industry. The education and training of industrial arts teachers with college degrees is relatively new. Currently more than two hundred colleges and universities offer undergraduate work and more than one hundred institutions have granted degrees beyond the bachelors.[3]

THE PRESENT.

Today, society is characterized by anxiety, fear and social disorganization. A bitter struggle has developed for the minds of men—a struggle for world domination between two idealogies; Democracy and Communism. All of which is producing value conflicts, difficult social, economic, technical and educational problems. Some of these vexing problems are new, while others have been developing slowly. Some critics lay the blame on the complacency of this country and its desire to maintain the status quo, after being generally conceded to be the most dominant nation in the world, following World War II.

Whatever complacency and national pride existed, received a terrific blow in the Fall of 1957, when Russia launched its first Sputnik into orbit. This was followed by an outcry that our schools were lagging behind those of Russia, as they had produced better scientists. Since scientists are born in the classroom and laboratory, science coupled with mathematics is receiving unusual attention. Our entire educational system appears to be receiving more attention today than in any previous period. Our future depends upon an intelligent citizenry and the development of the aptitudes and abilities of all of our people.

[2] C. M. Woodward, *The Manual Training Schools.* Boston: D. C. Heath and Company, 1887, pp. 202-203.

[3] R. C. Doane and H. H. London, "Doctor's and Master's Degrees with Thesis Granted in Education 1930 to 1955," *Industrial Arts and Vocational Education Magazine,* Vol. 46, No. 4, April, 1957, pp. 115-116.

Thus, there is created a demand for a better educated, a better selected, and an improved teaching personnel.

The contemporary industrial arts teacher conceives education as a behavioral change produced by new experiences. John Dewey pointed out that the significant factor in education is the meaning one reads out of his experiences and its subsequent effect upon behavior. Consequently, the industrial arts teacher has a major educational role in translating and transmitting our material culture to his students. This is brought about through the use of tools, materials, industrial processes, individual and group projects and constructional activities. To be effective, however, it must be functional and integrated with academic subject matter.

Education has been variously defined as "change," "growth," "continuous growth," "individual development," "growth conditioned by environment and training" etc. John Dewey defined education as

> that reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience.[4]

This definition implies that the purposes of education should be determined by the current socio-economic order, the environment and the nature of individuals.

Dewey's educational philosophy has received severe criticisms, especially since his death. Recently, an eminent Rocky Mountain Region newspaper editor stated rather facetiously that most of our current educational ills were being laid at the feet of Dewey, but that most of the critics were unable to identify the particular Dewey—whether it was the Admiral, the Governor or the Philosopher.

Another supporter of the experience concept in education was Dr. Boyd Bode, who declared,

> This reconstruction of experience, if it is to have any significance, must take the form of actual living and doing . . .shopwork, for example, is not dominated by the idea of personal profit, but becomes a medium for the expression of esthetic values and social aims.[5]

[4] John Dewey, *Democracy and Education.* New York: The Macmillan Company, 1931, pp. 89-90.

[5] W. H. Kilpatrick, editor, *The Educational Frontier.* New York: The Century Company, 1933, pp. 19-20.

These similar educational and philosophic ideas have begun to take root. Evidence is seen in many quarters such as the newer courses of study, professional association publications, current curricula and the research of graduate students. These changes are the out-growth of experiences related to basic manipulative skills, creative and reflective thinking through the use of concrete materials, exploring aptitudes, developing character traits, social and civic responsibilities, developing a health and safety consciousness, acquiring intelligent consumer knowledge and becoming acquainted with the work of the world.

The endorsement of one's work is always gratifying and stimulating. This was particularly true of the Harvard Committee Report on General Education in a Free Society, in which the statement is made,

> The lack of shop training is at present a most serious deterrent to entry into all types of technological work and to college and post graduate training in science, medicine, and engineering...Most students who expect to go to college are now offered an almost wholly verbal type of preparatory training, while hand training and the direct manipulation of objects are mainly reserved for the vocational fields. This is a serious mistake. The bookish student needs to know how to do things and make things as much as do those students who do not plan to take further intellectual training. The direct contact with materials, the manipulation of simple tools, the capacity to create by hand from a concept of the mind—all these are indispensable aspects to the general education of everyone.[6]

Other examples of progress are the appointments of a consultant in the Federal Office of Education, directors in a dozen state departments of education and in numerous county offices of education. In addition, committees of teachers and specialists throughout the nation have spent much time and effort in trying to improve their purposes and make them more realistic. While variations do exist, due to differences of philosophy, environment, type of students and physical facilities available; in general, there is agreement as to what is to be accomplished. This is illustrated by the following list of objectives developed by a national committee to improve standards in industrial arts instruction:[7]

[6]*General Education in a Free Society.* Cambridge, Massachusetts: Harvard University Press, 1945, pp. 160 and 175.

[7]*A Guide to Improving Instruction in Industrial Arts.* Washington, D. C.: American Vocational Association, 1953, p. 18.

1. *Interest in Industry.* To develop in each pupil an active interest in industrial life and in the methods and problems of production and exchange.
2. *Appreciation and Use.* To develop in each pupil the appreciation of good design and workmanship and the ability to select, care for, and use industrial products wisely.
3. *Self-realization and Initiative.* To develop in each pupil the habits of self-reliance and resourcefulness in meeting practical situations.
4. *Cooperative Attitudes.* To develop in each pupil a readiness to assist others and to join happily in group undertakings.
5. *Health and Safety.* To develop in each pupil desirable attitudes and practices with respect to health and safety.
6. *Interest in Achievement.* To develop in each pupil a feeling of pride in his ability to do useful things and to develop worth-while leisure-time interests.
7. *Orderly Performance.* To develop in each pupil the habit of an orderly, complete, and efficient performance of any task.
8. *Drawing and Design.* To develop in each pupil an understanding of drawings and the ability to express ideas by means of drawing.
9. *Shop Skills and Knowledge.* To develop in each pupil a measure of skill in the use of common tools and machines and an understanding of the problems involved in common types of construction and repair.

Impeding the realization of these objectives are the many problems which confront the industrial arts profession. Among these are:

1. The rapid development of new scientific principles, their application to industry, their implication and translation into shop and laboratory experiences.
2. The rapidly rising school population and the need for industrial arts expansion. At present, curtailment is feared by some on the basis of fewer electives and lack of funds.
3. The impact of the Conant Report, the subsidization of certain school subjects (mathematics, science and language) and federal loans for higher education.
4. The unusual stress being placed on academic subject matter at the expense of manipulative activities.
5. The return to a hierarchy of education for a small and elite group. In a democracy educational provision must be made for the masses and not for a particular class.
6. The need for providing for the "gifted." Today, the gifted student is considered by many as one who possesses an unusually high I.Q.

and acquires abstract subject matter easily. Provision must also be made for the "gifted" in such areas as art, music, home economics, industrial arts and other fields.

7. The need for research relative to improved curricula offerings and the necessary physical plants and equipment to conduct the program.
8. The need for improved methods of recruitment, in order to attract to the profession more young men with mechanical aptitude, technical interest and superior academic ability.
9. Methods for compensating the loss to the profession for those who are obliged to enter the military service or leave to enter industry and business. The latter is usually a problem of economics or a higher salary.
10. The need for a periodic review of the college undergraduate programs in industrial arts teacher education and a clarification and improvement of the graduate program.

These and other problems affecting the industrial arts program in our public schools will be raised in subsequent chapters. It is expected that much valuable information will be presented and many pertinent suggestions will be made to assist industrial arts teachers in their self-improvement and that of their profession.

CHAPTER II

Industrial Arts as a Discipline

Kenneth F. Perry
Colorado State College

One of the great philosophers in the field of education long ago pointed out that "our power to think effectively depends upon possession of a capital fund of meanings which may be applied when desired." He indicated that "...something must be already understood, the mind must be in possession of some meaning which it has mastered, or else thinking is impossible."[1]

The thing called "education" has been defined in many ways, but essentially it deals with the changes brought about in an individual. "Formal" education may be received from the experiences of the classroom, "informal" education may be produced from every life situation from childhood to the grave. The acquisition of important facts, the appreciation and understanding which develops from a direct experience, all contribute to the learner's ability to respond to a problem, to think his way out of a situation where unknowns predominate. The "capital fund of meanings" mentioned by Dewey are the stockpile upon which one draws as he seeks to work his way through the challenges of life's maze. The higher, the richer and more complete the pile of meanings, the more independent will be the learner as he attempts to bring intelligent order into his own life. In school, meanings can come from *all* areas of study, and no one subject or group of subjects has a monopoly on this contribution to the education of a pupil. There should be no competition between areas of study, no quarrel between their relative merits, for all are important. Actually, it is

[1] John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1910, pp. 118-119.

almost impossible to work in any single area without calling upon the knowledge, the skills, and the contributions of one or more related fields.

Many lifetimes would be required for a person to learn all there is to know. An equal amount of time would be necessary in order for an individual to have all possible experiences. *Time,* then, seems to be the restrictive element that leads some of the critics of our schools to prescribe what they consider to be the basic, fundamental courses of greatest value to all students. They apparently look upon the educative process as something that is completely restricted to the clock hours of the traditional school day and pattern their recommendations accordingly.

Dewey, together with many other philosophers and psychologists, attempted to point a way to the mastery of understanding; which route, from the classroom teacher's standpoint, is not always an easy one. Current critics, whose writings range from the ridiculously vitriolic to the moderately sensible, for the most part recommend as a panacea for our educational ills, the taking of a series of prescribed courses, and the receiving of a diploma, at which time the student is presumed to be in possession of the thing called an education. He is now assumed to be ready to take his place in society, competent to think clearly and possessed of the ability to arrive at a sound judgment. Scott recognizes this condition as he states,

> One of our most pressing needs is a revision of the false emphasis which the American people place on the purely formal evidence of education. We have made the receipt of a college degree an accolade of merit, not in terms of intellectual achievement but of prestige ...This dilemma is manifest in the entire educational spectrum. By insisting that "equality" as exactly similar exposure to education, regardless of the student's variations in interest and capacity, we inflict a serious form of inequality upon our young people.[2]

During his school days this student may have avoided all experiences that could be interpreted as *practical.* For him life's problems remain to be met in the far distant future.

Our immediate task in industrial arts education is to clear up some of the many misconceptions of the work, and present the case for

[2] C. Winfield Scott and others, *The Great Debate.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959, p. 153. (Quotation is from "The Pursuit of Excellence in Education," reprinted in the *Readers Digest,* November, 1958.)

the subject as it *should* be taught. Along with other important areas in the education of a child, industrial arts is a discipline. A discipline is said to be

> a school subject or organization of knowledge, the study of which is valued for real or presumed use in "strengthening" the mind or one of attributes of the mind, as reason, memory, perception or abstraction; an expression stemming from "faculty psychology" or the "mental discipline" concept of learning widely held from about 1750 to 1900.[3]

As an instructor in the field of industrial arts ask yourself, "As I work toward objectives which I have clearly formulated, am I not forced to present materials which will require that students memorize, reason, and in many situations work abstractly with ideas peculiar to the problem at hand?" The answer is obvious, of course you are. Why is it then that your subject *per se* is never listed with those that are supposed to teach students to think? It is because of the many mistaken ideas of the functions of the area, chief of which is the notion that the emphasis of instruction is on the manipulation of materials and the development of skills. The "lessons" peculiar to other subject matter fields that lead to class discussions, and the writing of reports are presumed not to exist. Industrial arts is mistakenly thought of as a type of work utterly lacking in a solid core of instructional material. Yet, at one and the same time that these strange concepts exist we see component parts of what we call industrial arts education being taught or used almost everywhere we turn—in classrooms where good teaching is in effect and wherever creative ideas are at work in the home, in business or in industry. From architecture to the heat treatment of metals, from the production lines of Detroit to the forests of the west coast, from the Golden Gate Bridge to the pyramids and the Parthenon, from the clothing on our backs to the shoes on our feet, we see the fruits of industrial arts everywhere. Try to disassociate the industrial arts from applied physics, chemistry, economics or mathematics. History, properly taught, *has* to recognize that the fundamental discoveries and inventions on which our modern civilization is based were made even before the birth of records. The history of man's development and progress is in a large measure the history of man's mastery of materials. History itself is but a record, an assemblage or compilation of what man has done.

[3]Carter V. Good, *Dictionary of Education*. New York: McGraw-Hill Book Company, 1945, p. 396.

For the confused thinking that centers around industrial arts as a subject we have only ourselves to blame.

Let's face up to the fact that we have often permitted production work to take precedence over planned lessons taken from a carefully prepared syllabus that was formulated to further the general education of the learner. Let's admit that in many of our shops the emphasis is only on activity and the development of skills, important as competence in those skills may be. And we shouldn't excuse our own shortcomings by pointing to other areas of instruction where Johnnie isn't learning to read, or to write correctly or to spell; where he is only memorizing names, dates and places in history, or translating Caesar with the aid of a "pony." But all the while, let us remember that in *every* instructional area of our schools there are now, and always have been, outstanding teachers who reach into all fields for material to make their own subject live. Every specialized area has a solid content of its own, but when instruction is held exclusively to that content, we have only embers in place of fire.

A workshop is a place where ideas take form, and where thinking is ultimately embodied in a material thing. Art itself is a process, a doing, a verb. Its components are knowledge and skill—know *how*, know *why*, together with the mastery of the medium. Thinking must precede action, and ability to think intelligently in the face of a problematic situation presupposes lessons of factual material and a discussion of the relation of those facts to the problems man faces in what is called life. That concept of our field is a far cry from the pig breadboard and tabouret construction days which many of us experienced, where every student did the same thing at the same time, and where individual differences were yet to be acknowledged. If they had only realized it, our academic critics could perhaps award to us a measure of respectability for some of the things we did in the past. In the joint making stage we developed an important area of our "faculty" mind, the faculty of "stick-to-it-iveness," the ability to stay with a nasty, disagreeable, meaningless requirement. That is a skeleton of which some of us are not too proud, but it is similar to the procedure which makes the "basic" subjects "respectable."

Continuing with other incorrect concepts of industrial arts, somewhere along the line there developed the notion that handwork is easy, that anyone can train himself to become a proficient mechanic within a short time. And current advertisements aren't helping us any as we see beautiful women in evening gowns painting living room walls, and a power machine pictured with the caption, "Work the easy way, become an expert almost at once." Comparable misleading notions are fostered in the area of music as we observe a display of chord organs with the come-on statement indicating that you need to know little or nothing about music to play the device.

In like manner, industry plays down the fact that millions are spent by creative people in experimental laboratories where products like cinch cakes and TV dinners are prepared for supermarket shelves. There is more to industrial arts than can ever be embodied in the "project" and spring exhibit, more to music than the recital, more to instruction in oil painting than the picture produced. But *we* are the ones who have emphasized the *product* to the exclusion of the basic knowledge, the learning and the thinking so essential to its development. The very method by which we teach, and a good one it is, emphasizes the laboratory part of the work and minimizes the paralleling lessons that *have* to precede planning and construction. The psychological law of readiness plays into our hands as we put students to work as soon as possible. They are *ready to work,* and to have to listen to a teacher lecture in a work situation is annoying. However, the work that the student anticipates is only the laboratory part of the lessons that should also start at once. Chemistry, physics, botany and zoology reverse this procedure as they *begin* with the book and then turn to the *laboratory* in order to *set* their lessons. Physics traditionally has used a workbook or manual with a series of required "experiments" to bring to life the function of the lever, the magnet and the conductor of heat or electricity. It was a happy day in our high school botany class when we were permitted to go out into the neighborhood surrounding the school to gather leaves. But our joy didn't stem as much from our interest in trees and leaves as it did from the fact that we were released from the confinement of the classroom for an hour. Botany was a "solid" subject that had to be passed successfully as we studied our way to a diploma, but those of us who went on into the teaching of industrial arts really learned the basic lessons of botany when we first encountered the medullary ray in quarter sawed oak, and discovered that the real difference between hard and soft woods was *not* in the denseness of the material being processed. However, botany was a respectable, solid subject so we should presume that it must have contributed to our ability to think.

Additional incorrect notions of industrial arts include:

1. Recommending the work for boys alone, while the girls of the school engage in something more ladylike.
2. If you fail in academic areas, go to the shop, it's an easy subject where you use your hands rather than your head.
3. The shop is a production department rather than one of the centers contributing to the general education of all.
4. Slow learners will do good work in the shop.
5. Expert ability with tools and materials can be acquired in a very short time.
6. The making of a "project" is the sole function of the department.

Add others of your own.

There is no such thing as a difference between an academic and a "practical" area of study as far as the posing of problematic situations is concerned. Each has its simple basic skills which can remain at that primary level or be extended almost without limit by those of ability. The simple skills of the arithmetic class can be projected to the intricate formulas of the atomic scientist. The geometric forms of elementary drafting can expand to the architecture of a cathedral. All subjects are practical, or *should* be. Literature should be *useful* to us in the enjoyment it brings to our leisure hours. History is practical as it conditions our understanding and interpretation of world problems and influences our vote at election time. Mathematics serves us from the grocery bill to our tax report, from the selection of an investment to the mortgage problem on our newly purchased home. Other "practical" applications in all areas of study are obvious. What we are trying to point out is that the so-called theoretical subjects are all practical for someone, and to glorify them for their academic status alone is like buying a mink coat when it is only warmth one actually needs.

The concept that the practical or applied is inferior to the theoretical or basic, spills over into the area of science.

> What is basic research? Charles E. Wilson, the former Secretary of Defense, defined it as what you do "when you don't know what you're doing," a sarcasm presumably intended to justify the inadequacy of financial support for basic research. More commonly, *basic research is thought of as the opposite of "practical" research,* the kind that can be immediately applied. This suggests its disassociation from man's everyday problems. The development of weapons, television sets or vaccines is obviously practical. Studies of the inner temperature of distant stars, of the habits of infinitely small living beings, of the laws

> governing the inheritable coloration of flowers, all seemed eminently impractical—at least when first undertaken. They were viewed as sophisticated pastimes, pursued by intelligent but somewhat eccentric, maladjusted people, whose otherwise excellent minds had been sidetracked by a queer interest in the farfetched and useless.
> ...Some insist that basic research must proceed in the same spirit as "art for art's sake," and should not be appraised by its practical applicability. Yet, in defending this view they usually argue that even *the most abstruse research may eventually* yield practical results. It is odd that the study of the impractical should have to be justified by its potential usefulness.
> ...*Pure art—a great painting, a piece of music—is useful, since it lifts us beyond the preoccupations of everyday life,* bringing us peace and serenity. Bearing these facts in mind, I am inclined to define basic research as the study of natural laws for their own sake, irrespective of immediate practical applicability—with emphasis on the qualification "immediate."[4]

Industrial arts education dealing as it does with materials, tools and things receives the connotation of being a practical rather than theoretical area of study. Ideas and thinking, and the need for them, are assumed to be absent. Now, the Sputnik is a thing, constructed of materials, and fashioned by hands. The same may be said of the atomic submarine, or the device that will tomorrow carry man to the moon and back. Each is the product of creative thinking on the part of individuals who implemented their ideas with their knowledge of many materials, their potentiality and their limitations. There was a constant interaction of ideas and the transfer of that thinking into material things on the laboratory table top. The "thinkers" were possessed of the capital fund of meanings referred to in the initial sentence of this chapter, and those meanings were embodied in all sorts of background, from mathematical formulae to the strain the surface material under consideration can be expected to stand. In many instances the creative scientist, the technician and the machinist are one and the same person as ideas take form.

Booker T. Washington, many decades ago, experienced this mind-hand dualism, which caused him to write

> When I saw and realized that all this was a creation of my own hands, my whole nature began to change. I felt a self-respect, an encouragement, and a satisfaction that I had never before enjoyed or thought

[4]Richard Thruelsen and John Kobler, editors, *Adventures of the Mind.* New York: Alfred A. Knopf Company, 1959, pp. 136-138.

> possible. Above all else, I had acquired *a new confidence in my ability actually to do things and to do them well.* And more than this, I found myself, through this experience, getting rid of the idea which had gradually become a part of me, that the head meant everything and the hands little in working endeavor, and that only *to labour with the mind was honourable while to toil with the hands was unworthy and even disgraceful... I soon learned that there was a great difference between studying about things and studying the things themselves, between book instruction and the illumination of practical experience.*[5]

To the well informed teacher of industrial arts the reiteration of all this material must seem unnecessary, but perhaps it is good occasionally to have to be stimulated to count our blessings and restate the contribution to education we are charged with making. Evidences of the value of our work are all around us if we will but take the time to look. As has been said, science often turns to facets of our work as the lessons of that area of instruction are brought to life.

> If a teacher is sympathetic and uses initiative, he can so direct the children that they can work out for themselves science projects which illustrate fundamental ideas of science for more important to them than any textbook lesson.
> Science projects often come as a response to need in the minds of children. They reach a stage in the development of a unit of work where they feel an urge to express some phase of the unit. For young children, an intimate appeal is possible and important. Whatever they can see, hear, or touch fascinates them. Everything is new to them. At the right time, the making and using of visual-sensory projects will aid in clarifying their ideas and give them a desirable opportunity for self-expression. And for sheer enjoyment, there is nothing to equal the fun boys and girls have in creating their own models... The first thing to do in constructing such a habitat group is to have the children plan very carefully what they wish to represent and draw a sketch to show how the accessories and forms of animal life are to be arranged in the the group... The *construction* of a habitat group to show the interdependence of plant and animal life is a project *that will require much careful thought and planning* by your more advanced pupils, but when completed they will surely vote it a most worthwhile activity.[6]

Notice the significant items in that brief statement:

1. Science projects come as response to need.
2. *The urge to express.*

[5]Booker T. Washington, *Working With the Hands.* New York: Doubleday, Page and Company, 1904, pp. 9 and 12.

[6]Grace Fisher Ramsey, *Project Making in Elementary Science.* New York: American Museum of Natural History, 1934, pp. 3, 6 and 7.

3. The appeal of the material thing.
4. The opportunity for self-expression.
5. The need for planning.
6. The ability to draw.
7. The fact that *careful thinking* is a prime requisite.

The total project would cause the students to dip into the lessons normally included in several areas of study and only a foolish person, in an effort to split academic hairs, would be concerned about that fact. As some stones found in nature are conglomerate, so do we in the project cited above find a "subject matter assemblage" welded into a natural educational whole.

Each area of instruction once in a while has the need to organize "projects" of its own where the fruits of learning of many fields are brought into play. "History Comes to Life" was a recent feature in the magazine section of a large city newspaper and described a variety of things the students made to illustrate their lessons; the annual Fiesta of the Spanish class always looks to the home economics department and the dance class for assistance; the many outside requirements of the Science Fair are obvious as students bring showmanship into play; the assembly presented by the Latin class usually requires a generous application of plebian arts and crafts together with the public speaking skills of the narrator, and the historical research ability of the student attempting to learn how a toga was made and how to produce laurel branches out of season for Caesar's headdress. Each of those activities or "projects" of a class is comparable to the required laboratory period in chemistry and physics and serves the same purpose—it *sets* the lessons studied. Here ideas leave their nebulous state and manifest themselves in the realities of what is called life.

Industrial arts offers a unique opportunity for the development of skills and techniques and the acquisition of knowledge basic to creative thinking—and "creativity" today is big business. One has only to examine the most recent books and reports emanating from seminars and conferences called by colleges and industry to sense the bigness and the importance of studying what lies behind original thinking.[7]

[7]Harold H. Anderson, editor, *Creativity and Its Cultivation.* New York: Harper and Brothers Publishers, 1959.

Paul Smith, editor, *Creativity, An Examination of the Creative Process.* New York: Hastings House, 1959.

Serge Boutourline, Jr., and others, *Individual Creativity and the Corporation.* Boston: Institute of Contemporary Art, 1959.

Original thinkers are needed in every profession and industry, from the basic research laboratories of science to the studios of advertising art, from the halls of politics and diplomacy to the drafting tables of city planners.

The "Harvard Report" also lends support to this idea as it states:

> In the final section of this chapter we shall say something about the importance of shop training in general education. For those who intend to go into the scientific or technological work, it has special relevance. The manipulation of objects, the use of tools, and the construction of simple apparatus all are required for entry into the world of experimentation. Even the pure mathematician is greatly aided by shop experience; the forms, contours, and interrelations of three-dimensional objects provide a stimulus and satisfaction not to be achieved altogether within the limits of plane diagrams. The lack of shop training is at present a most serious deterrent to entry into all types of technological work and to college and postgraduate training in science, medicine, and engineering. What students should learn in secondary school specifically is the use of simple hand tools and the execution of simple basic operations such as soldering and elementary glass blowing and joining. If the student can be taught to operate a drill press, a wood lathe and a machine lathe, so much the better. Obviously, the equipment for work with power-driven tools is not ordinarily available except in larger schools.[8]

Long ago Dewey pointed to the fact that "In the mechanical arts, the sciences become methods of managing things so as to utilize their energies for recognized aims!"[9] Brameld also supports the relationship of science to the arts and emphasizes the *thinking* that lies back of *doing* as he writes

> We should expect that the pragmatic philosophy would regard science and art, not as separate, but as complementary achievements of man. Notwithstanding the strong emphasis placed upon the consummatory or intrinsic phase of creative experience, art also demands full utilization of the reflective, or more explicitly instrumental, phase. Such utiliza- is perhaps more apparent in some arts than in others; the so-called "applied arts" (weaving, metalwork, dozens of others) are in obvious need of a great range of practical and technological skills, processes,

[8]*General Education in a Free Society.* Cambridge, Massachusetts: Harvard University Press, 1958, p. 160.

[9]John Dewey, *Democracy and Education.* New York: The Macmillan Company, 1922, p. 384.

> knowledge. But even the so-called "fine arts" (Dewey is skeptical of any forced separation between them and "applied arts") have similar needs. Music, for example, depends upon mathematically stated tempos; painting, upon spatial principles.
> Indeed, any notion that art requires any less exacting or active intelligence, strictly defined, than does science is completely spurious. The difference again is one of emphasis, not of kind. Both utilize essentially the same experiences of nature; both try to bring these into more meaningful relation with man, and man with them. Also, the artist faces problems, tries to think them through and to *do* something about them. [10]

Every living person has constant need to solve problems, to respond creatively to thought provoking situations, and the nature of the challenges range from the simple to the complex. It is not uncommon to hear someone say, "I was having trouble for a while, but I figured out an answer." And the thing called an "education" is the stuff upon which we draw as we *think* our way toward those answers. Children in school rooms constantly ask questions, and knowing teachers constantly respond with, "Stop and think a minute, son, and recall what we discussed yesterday and the day before. *Now* do you see where that material helps you with this present problem?" And in any good industrial arts workshop, lesson follows lesson, and each is usually paralleled with actual experience as material is processed. Problems involving the principles of design, strength of materials, cost computation and suitability to purpose are constantly posed. Those lessons require the memorization of salient facts and the facts may be directly or indirectly related to all other areas of instruction, from mathematics to economics. The skeptic need only check any good anthropology book and note the space devoted to the history of man's tools and the part they played in elevating him from a primitive state to today's complex industrial society. Man's progress has required the constant interaction of discovery and invention, and the inventor—primitive or modern—has been called upon to apply thinking of the highest order. Now these ideas aren't new, for half a century ago a curator in the department of ethnology of the Smithsonian Institution wrote

> Again, the term invention involves three sets of phenomens—*the mental acts of inventing, of thinking* out how; the things invented, usually called inventions; and the rewards bestowed on the inventor, nowadays called patents, but granted in some form during all the ages. In this

[10] Theodore Brameld, *Patterns of Educational Philosophy.* New York: World Book Company, 1950, pp. 124-125.

> work frequent allusion will be made to the growing intricacy of thought developed and demanded by this process through all history, terminating in the laboratories of invention with their cooperating experts, learned in every branch of science and mechanics; but commencing with the relief of discomfort through a happy thought by means of some slight modification or new use of a natural object"[11]

For a moment now let us refer back to the definition of a discipline, as presented in the first part of this chapter, in order to determine whether industrial arts can find a place alongside other accepted areas of study. A discipline was said to be a school subject or organization of knowledge presumed to strengthen the mind or one of the attributes of the mind such as reason, memory and the like. The problematic situations and the facts deserving of memory are without limit in the industrial arts, and as the instructor proceeds with planned lessons taught from a well organized course of study he at once is required to present material that overlaps other areas. And here an unthinking critic might say, "But *that* isn't industrial arts, that is economics and mathematics and English." And the critic would be *right,* because as student proceeds with problems involving materials to meet life's needs he *does* become involved with problems that *require* a generous amount of what is now the subject matter of several organized areas of study commonly referred to as disciplines. That is why the industrial arts instructor has to be one of the best prepared teachers in the school. Little did original man dream, as he worked with skin and stone in his cave, or clay on the bank of a nearby stream that what he was doing in order to *live* would, in the twentieth century, be regarded as a non-essential. Yet the only difference between the problems of that original man and the ones we face today is in degree of complexity. Our forefathers progressed from stone to bows and arrows just as we have rather recently progressed from the muzzle loader to the atomic weapon. He too faced the problem of housing, and through discovery and invention worked his way from the simple cave to the apartments of the cliff dwelling. He somehow found out that drying meat and corn would preserve it for a time of need. What's so different between that and our invention of the deep freeze—except one of complexity over centuries of time. That forefather of ours was thinking every step of the way as he discovered that permanent records of the hunt could be made by applying pigment to a wall, and when another

[11]Otis T. Mason, *The Origins of Invention.* New York: Charles Scribners & Sons, 1910, p. 15

crude form of record keeping was invented through the application of a stylus to clay, a form of recorded *history* was born. Mathematics found a place in the knots tied in thongs and notches cut in sticks. Somewhere along the line man felt the need for a more advanced means of computation and invented a device that employed wooden buttons on a strip of bamboo. In the hands of an expert, that instrument can be made to work as fast as some of today's modern computing machines.

As schooling progressed, the bits of knowledge that developed as man worked out his problems were brought together and "subjects" came into being. These subjects were in themselves but a classification of knowledge, knowledge that was born of *need,* knowledge that grew from the interaction of discovery and invention as man progressed through the ages. And our great museums today dramatically present ever living testimony of the history of materials and the part they have played and continue to play in effective living.

Contrary to what many may think, leisure time together with its opportunities for personal expression, was also in existence in the days when men lived in caves. Leisure did not suddenly descend upon us with modern industrialization and the short work week. As original man developed security in living, as he had food for his stomach and clothing for his back, he apparently found the leisure time in which to decorate his weapons, his utensils and the walls of his shelter.

That original artist didn't have words like form, harmony, domiance, rhythm and the like. He had never taken an "art" lesson. Yet in his drawings and designs, he showed command of the principles that are today indicated by words with full meaning. Was he thinking? He must have been, for the do-it-yourself kits with their patterns and directions were yet to be invented.

An artist who is master of his medium is possessed of the skills of processing that material. Those skills, together with a great accumulation of knowledge directly related to the subject under study are basic to any creative or original effort in the field. A student doesn't come into a shop, studio or laboratory and start at once to create.

He first has to develop the basic skills essential to the work and start to learn the fundamental lessons as outlined in the course of study. The teacher of English composition faces an identical problem as he lays the groundwork for the required "themes." We recall that our own high school geometry class had the standard theorems preceding the "originals." All subject matter areas that expect to pose problems for students to solve are charged with first establishing a solid groundwork upon which to build, and good teachers need never apologize for the time it takes to set the "fundamentals."

Among other things, it is mandatory that the industrial arts teach

1. Fundamental skills with tools and machines in order that a medium may be properly processed, and
2. Fundamental skills in drawing and design, as one of the bases of planning.

These lessons *have* to be accompanied by assignments that require the acquisition of factual material necessary to achieve the aims of the course. A single period is all too brief a time in which to accomplish all that needs to be done, which forces a double period (one for class, one for laboratory) or the development of a study guide to be used to direct "homework." Homework is not added in order to dignify industrial arts as an area that actually requires a student to read and write something, but rather as an essential technique to supplement the usual single period allowed in the school day. The construction work in the shop itself is in essence only the outcome of lessons basic to the experience, and instructors today are in many instances doing only half a job because of the shortage of teaching time. However, the addition of necessary homework may help gain academic respectability for industrial arts because outside study seems to be recognized as a requisite for a basic or "solid" subject.

> If a school is organized with a sufficent number of periods in a day, there is no difficulty in having the programs of the academically talented include as many as four years of art, music, and other electives, as well as five subjects with homework in each of the four years (twenty academic subjects with homework.)[12]

Again, it must be emphasized that homework will *have* to be required of students in industrial arts classes if the full potential of the subject is to be achieved. As has been stated, this outside study is not added to command academic respectability, but rather it is mandatory if the single period in school is to be used for the laboratory part of the work. Said another way, shop instruction does not need to "go academic" in order to survive in our scientific age, but it must have much more formal instruction to parallel the laboratory part of the work if we are ever fully to *achieve our purposes*. It's as simple as that.

[12] James B. Conant, *The American High School Today*. New York: McGraw-Hill Book Company, 1959, p. 27.

Up to this point we have tried to say that industrial arts calls upon the fruits of many fields of study as instruction progresses, and several of those supplementary fields perhaps originally stemmed from what might be termed the industrial arts of original man. But, in addition to applying the laws, principles, and lessons of other areas, industrial arts is unique in much of the material it has to offer. It too has a solid core and sturdy legs upon which to stand. Where else in the school day will tomorrow's scientist and engineer have the opportunity to *experience* materials, to learn the fundamentals of good design, and to lay the groundwork for creative thinking in the graphic and plastic arts. Where else will all students learn to *sense* the magnitude and complexity of our industrialized society? Where else will they have the chance to explore for possible vocations, or sample areas of doing that can resolve into lifetime leisure interests? And only the unknowing individual would ever discount the educational potential of an avocational interest and its value in the mental health of a nation. Would that we could measure educational development and the results of mental therapy as we measure dollars spent on the multi-billion dollar business of recreation. Education is not concerned only with how to *develop* the mind, but must take note that there is also a maintenance job to be done. Let us bring every learner up to his top level of achievement, and then *also* let us teach the lessons that will keep him sailing on an even keel. Men of medicine daily prescribe an area of the arts as they prescribe drugs when they tell a patient "What you need most is an interest. Find something that captivates your mind, and your other troubles will disappear." Industry recognizes the desirability of maintaining the peace of mind and happiness of the individual as it sponsors recreational programs. Whole communities in recent years have seen the value of contributing tax dollars toward local programs for both youth and adults. The current problem of delinquency is associated with individuals who have time on their hands and who have never been disciplined to its profitable use. There is more to the education of our youth than the reading of chapters in books and the memorization of factual material in classrooms. The most efficient automobile motor has to be mounted in a sound body, supported on good tires with a suitable road to travel if it is to achieve its potential in the service of man. In like manner, the contributions of the finest minds are likely to be lost if the lives of the owners are not kept in balance.

The *title* of the class does not make mathematics, or physics, or history, or industrial arts a discipline. To achieve the discipline status, situations must be created and problems posed that challenge the thinking ability of the learner. Salient facts must be learned, and the function of principles and formulas understood. Basic knowledge must be accumulated and digested, because later creative work—the fruit of learning, the result of thinking—depends upon this sound groundwork of fundamental understanding. And so we see that a student can *take* a course, any course, and hardly be challenged to learn or think. Whether or not the student has had the benefit of a true "discipline" goes deeper than the record on a transcript. Most objective tests are poor measures of a student's power to think, and other means are needed to check on that ability. Yet today enrollment in a course scheduled as a solid, a discipline, is naively accepted as the means of developing a student's mind and few are challenging what *actually happens* in the classroom. The liberal arts are *said* to be the magical way to thinking, but we await the research that will prove the point. In like manner, the industrial arts are *said* to be for the slow learners who work best with their hands. In *all* the academic areas we can have classes that range from worse than poor to better than good. The same is true in the industrial arts, where instruction can range from the crudest of shaving making and brass bruising up to high levels of learning where technology joins hands with chemistry, physics, mathematics and design as they apply to the study and processing of materials.

A class can have all the ingredients of a discipline, as defined earlier, and still not function in stimulating pupils to think until one last element is added. That missing thing, to fire up the I.Q., is Z.Q. or "zip quotient." A master teacher with stimulating, challenging subject matter to present is stopped before he starts when he is given only the "Joe College" and the pupils who seek depth chiefly in lunch and athletics. An industrial arts teacher cannot function at his highest level when his classes are filled with castoffs from other areas or when the administration of the school thinks that the shop teacher's chief obligation is to print the school newspaper and construct new hurdles for the track team. Guidance counselors and administrators need to be brought up to date in *their* thinking too—and that responsibility is ours. It is actually a compliment to the industrial arts teacher to have sent to him the student who is dying educationally because of the lack of proper nourishment in other areas. It is an admission of laziness, lack of understanding or plain stupidity on the part of those who are acknowledging their own weakness when they fail to adjust to the level of a learner. They wouldn't expect a single horse to pull a twenty ton load in a muddy field, yet they make a similar requirement of pupils in their classes. The Creator put some youngsters together with parts less effective in their functioning power than commonly found in other boys and girls. Those children may be the slow learners who become "failures" in the "solid" subjects and are sent to the shop to be reclaimed for society. The industrial arts teacher proceeding as does a medical doctor, diagnoses the case and starts to inhibit the habits of failure. He adjusts problems to the level of the learner and produces habits of success, bringing to the student perhaps for the first time the thrill of feeling "I can." But where the medical doctor would be acclaimed for comparable achievement, the industrial arts teacher has in essence lost ground in the eyes of his liberal arts minded fellow teachers. The progress of the slow learner in his shop, a low achievement but positive, is to the critic but further evidence that "*anyone* can work with his hands." Into this scene there is also injected the low esteem in which anything "practical" or "applied" is held. Business English and shop mathematics are good examples, and are often referred to as watered-down courses. A medical doctor might be said to water-down his aspirin as he prescribes a light dose for a child–but it's still aspirin he is administering. He prescribes light exercise for a frail person and occupational therapy for a patient who needs to turn his mind away from worry by finding a captivating interest. Success in a shop, as the result of the recognition of individual differences and prescription for the same, is expected to occur automatically because "those who can't work with their heads can be expected to achieve with their hands." We often wonder if a person who thinks that way would trust the repair of an expensive automobile or a valuable violin to such a "handworker."

Credit the foregoing comments to the "plus" side of the industrial arts instructor's job, over and above the regular planned teaching of the average school day where he works with the average or above average pupils assigned to his classes. Another "plus" value can come when he accepts students from other areas of study who are working on special problems and need his help. Implications here for extending the development of a science project are at once apparent, and we can name teachers whose shop door is always open to students with such problems. Add another "plus value" as we see the development of attitudes in the workshop situation, and would that we had instruments for adequately measuring their growth.

The education of guidance counselors and administrators and the understanding of fellow teachers will improve just as fast as industrial arts instructors themselves get to them with the true story of their field. When the lessons in every shop are loaded with the stuff of education as written in a sound course of study, when every industrial arts instructor really *teaches* that material and develops instruments for measuring and reporting his achievement, then will he *command* the respect due his field. As was said in the preceding paragraph, industrial arts is not only a *discipline,* it's a discipline *plus,* if such can be imagined. And the ineffective teaching and weaknesses found in the traditional disciplines should be no excuse for our own lack of effort to improve constantly the contribution of our field for the education of all.

The "arts" in industrial arts implies the potential of creation; creation requires a background of knowledge and understanding; and thinking as it manifests itself through manipulation of a medium will give form to a new idea. Our biggest and most immediate challenge is first to sense the almost limitless possibilities of our field and then to develop techniques to present effectively that material. We are in competition with no one. To man's *oldest* field, where we have witnessed the continuing interaction of discovery and invention, we are now challenged to bring new, and better, and more effective methods of presentation. It is the *teacher,* drawing upon sources of substantial learning material, who makes the difference between a discipline and ordinary subject of study.

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CHAPTER III

Elementary School Industrial Arts

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A NEW MOVEMENT?

The recent wave of literature about elementary school industrial arts points out that there are many ideas about what it should be. This is particularly noticeable by the names it is given. Arts and crafts, handcrafts, integrated handwork, elementary industrial arts, and construction activities, are a few.

The label usually indicates the philosophy and content. The arts and crafts advocates place emphasis on materials to be used. The handcrafts people shift the emphasis from materials to skills. Others try to combine both emphases. Another school sees materials and skills as coincidental to a larger goal: the enrichment of general classroom studies.

These varying emphases are related to the orientation of the people involved. And there are many people involved. Some are industrial arts specialists (who, for the most part, are secondary school minded), some are fine arts people, some are home economics people, and still others are elementary education specialists.

Construction activities for elementary school children are looked upon by many as "something new." The current boom in the producuction of magazine articles and books in this field has caused this; so has the recent expansion of school programs. More people are reading and talking about the benefits for children, and as a result, more people are doing something about it.

Students of elementary industrial arts realize that the ideas are anything but new. What is happening is that we are "rediscovering the world." Greater and more well-known educators and philosophers talked of and did things about this field many years ago.

Early Developers.

It could be said that Rabelais (1483-1553), a French physician-social reformer, was one of the original thinkers on the subject. In his *Gargantua,* he satirized on the evils of the formalistic education of the times, and replaced them with concrete experiences aimed at reducing the remote and the abstract.

Rousseau (1712-1778), another French reformer and pedagogical stalwart, wrote *Emile.* Emile, his "dreamchild," did not learn from books; rather, his education revolved around the simple manual arts. His belief that "experience is the best teacher," was based on recognizing the nature of the child. Rousseau was really the first to place value on manual experiences as a means of training the mind.

With inspirations from Rousseau's child development theory, and a sincere love of children, especially neglected ones, Johann Heinrich Pestalozzi took up the work of teaching. His immediate concern was with helping youngsters to talk and think intelligently; reading and writing would come later. He gave up his study of law for agriculture, and used this as a basis for his experiments with children.

Pestalozzi's pity for the poor people led him to gather a group of vagrant children in Neuhof, where he conducted "school" in his home. There were few "lessons." Most of the activities centered around soil tilling, weaving, and domestic chores. There were constant conversations linked with the everyday life experiences.

Although the five-year experiment was a financial failure (due primarily to Pestalozzi's lack of administrative finesse), educationally, it was a huge success. Pestalozzi's ill-mannered, undernourished, ignorant urchins became strong, alert, useful, music-loving people. They worked successfully with their hands as well as with their minds.

Mild success at writing about his experiments *(Leonard and Gertrude)* helped the Swiss pedagogue renew his work with children. In 1798, Pestalozzi opened a home for fifty war orphans at Stanz. Although this experiment was short-lived (French soldiers took over the home for a hospital), many of the Pestalozzian methods were rooted there. Again, he coupled study with manual labor. The workshop was the classroom. His children helped him prove his theory that judging and reasoning would follow the exercise of inherent faculties.

Later, Pestalozzi received acclaim and a wide following as a result of his institute at Burgdorf. A later move to the castle at Yverdun allowed him to carry on his work. Plagued with organizational problems and business blunders, this effort, too, went the way of the rest. It dissolved in 1824.

Pestalozzi's labors were induced by his convictions that life-related education would wipe out poverty. His initial task of helping people led to an experiential understanding of the now time-tested theories of learning. Heading his list of teaching methods were the use of concrete things, and manual labor, for the instruction of basic subjects.

While a student of architecture at Frankfort-on-the-Main, Friedrich Froebel became interested in Pestalozzianism and teaching. Subsequently, he went to Yverdun and studied with Pestalozzi from 1807-1809. After considerable shifting and job-changing, Froebel opened his Blankenburg *Kindegarten* in 1837. It was here that he used his "gifts" and "occupations" as teaching tools. The gifts consisted of balls, blocks, triangles, leaves, seeds, sticks and other concrete objects. By playing and building with the objects, Froebel demonstrated to the children that although the basic forms could not be changed, it was possible to arrange the forms into many schemes. This he likened to many rigid aspects of everyday life.

The occupations included work with paper, wood, clay, paint, yarn, and cardboard. These materials could be modified, altered, transformed; they could be controlled. These creative experiences, Froebel felt, gave insight to thought, discovery, and reasoning; other important parts of everyday life.

Like Pestalozzi, Froebel connected the work of the hands with the work of the mind. Recognizing the active nature of children, Froebel believed that handwork excited all other learning. Doing preceded knowing.

Although many people were sympathetic to the manual work-mental work notion, all did not arrange the relationship in the same way.

Johann Herbart, an educational philosopher from Berne, saw value in handwork, but only as a *device* for teaching the regular school subjects. Froebel presented handwork as a subject from which other learnings evolved. Certainly both approaches bore a Pestalozzian flavor.

Oswego Movement.

While great strides were being made in Europe, there was a noticeable absence of the successful practice of Pestalozzian teaching in America. There were many attempts in this country, but for various reasons they did not seem to "catch on." In 1860, Dr. E. A. Sheldon came on the scene. The then Superintendent of the Oswego Public Schools of New York tutored his teachers in Pestalozzi's object method of teaching. He imported Pestalozzi protégés from Europe and in 1861 found himself in the Normal School business. The Normal School (now State University College of Education) included a practice school. In both departments, learning by doing was accented. In the two workshops, one for the children and one for the student-teachers, boys, girls, men, and women worked with tools and materials. Here, learning and teaching blossomed from concrete experiences.

Word of the "Oswego Movement" spread. Sheldon travelled widely to tell people about his work. Groups of visiting educators convened at the Oswego campus. Sheldon's students were in demand and took positions all over the country (some went out of the country). Kindergarten courses, styled after Sheldon's sprung up all over. Roots had been planted in the United States.

Although the hand training-mind training idea was widely accepted, there were people who saw handwork only as a means of vocational preparation. There were others who went to extremes and devised courses to emphasize the manipulative experiences. Typical of that viewpoint was the "sloyd method," which consisted of a series of woodworking exercises. Each exercise became increasingly more difficult, and was said to be based on the interests of children.

In the late 1800's John Dewey entered the educational arena. In his University Elementary School in Chicago, he used manual training and industrial occupations as teaching methods for all of the "other subjects." This very broad concept received acclaim and criticism (as it does now). In his *School and Society,* he explained his industrial occupations as those that were characteristic of the adult world as well as the school world.

The turmoil that arose did not center around the validity of handwork. All agreed that it held an important position in the education of young children. Rather, the conflict seemed to be over *how* handwork could contribute to the overall program.

About that time (1913), Frederick G. Bonser of Teachers College, Columbia University, offered, what he felt, was the great compromise. He considered industrial arts in the elementary school to be both subject and method. Production of three dimensional objects should continue but careful attention should be given to their choice.

The experiences of life, Bonser argued, are not sequential in occurrence, nor are they divorced from one another. Life's experiences are spontaneous. They involve arithmetic, science, industrial arts, spelling, and others. It follows then, that school experiences should be the same.

Although it was used in varying degrees (as it is now), the *food clothing, shelter,* approach was Bonser's. His "industrial arts" was life-related. Real problems were recognized and solved through this approach. Rigid sequences of exercises were considered artificial.

Many other educators (laymen too) expressed their opinions about elementary industrial arts. Most of them, however, were more concerned about what we now call junior and senior high school education. But it is important to note that industrial arts figured prominently in the beginnings of education. It was a vital part of *all* education. Another rather surprising and significant fact is that original thoughts and practices in industrial arts education began with young children— children of elementary school age. It is surprising that, with this rich background, current practices in elementary industrial arts seem less understood than secondary school industrial arts programs.

The Current Picture.

What has happened to elementary industrial arts? Is it part of school programs? How is it used? Who are the protagonists? What are their emphases?

An honest answer to the question, "Do all schools include elementary industrial arts activities?" is "No." Do most elementary schools include industrial arts activities? The answer is still "No." Reasons for this naturally vary.

Professor Harold Gilbert of Northern Illinois State College, attempted to discover why elementary industrial arts programs were not flourishing.[1] In his study, he polled a random sample (300) of New York elementary school principals. One of his questions was, "What factors hinder the development of this (elementary industrial arts)

[1] Harold G. Gilbert, *An Industrial Arts Teacher Education Program for Elementary Schools.* Columbus: Ohio State University, Ph.D. Dissertation, 1955, p. 124.

program?" The principals' answers, in order of their importance, were as follows:

1. Cost (supplies or salary).
2. Lack of space.
3. Lack of teachers.
4. Lack of facilities.
5. Lack of time.
6. Teachers disinterested.
7. Formal or traditional programs.
8. Large classes.
9. Public does not accept.

The preceding reasons were heavily weighted. There were numerous others, but they were not mentioned often. Some of these were: objection of the Board of Education, inertia, lack of awareness to need, teachers feel incompetent, size of school, more art for industrial arts teachers, no storage, time for teacher training, traditional concept of industrial arts, and others.

Certainly, these firing-line responses give clues as to what can be done to expand programs. This is discussed later.

Even though some school systems have found the above reasons to be impeding factors to programs of elementary industrial arts, others have moved forward in the area. Existing programs seem to be spread out across the country, but published literature (if that is an indicator) seems to show a preponderance of activity in California and New York.

Among the programs that exist, there are varying goals, approaches, and scopes. Robinson mentions three types of programs now in existence.[2] One is classroom-centered, with the classroom teacher responsible for activities. Another program, much less frequently found, involves an industrial arts specialist who works with children (sometimes only the upper grades) in a shop on a regularly scheduled basis. The third scheme, which is gaining popularity, is one that includes an industrial arts consultant. Although the consultant spends most of his time working with children (in a shop or classrooms), he acts as a resource person for classroom teachers, too.

Within these various plans can be seen still different *types* of activities. The overall administrative set-up does not seem to determine what shall be done. More often, it is the personal philosophy of the people involved.

[2] Frank E. Robinson, "Elementary-School Industrial Arts," *School Shop,* Vol. 19, No. 4, December, 1959, p. 7.

What are some of the things that children do? In some programs children construct items that are of particular interest to them (or their teachers). Toys, games, gifts, and other "useful" objects are constructed. Sometimes there is a flavor of the arts and crafts approach here with emphasis on manipulation and experimentation with many media. Usually, a part of this type of program includes basketry, boondoggling (working with lacing materials), clay work, weaving, and other "crafty" experiences. All children have identical experiences and there is usually little, if any, relationship of the work to the general curriculum. Through rationalization, there is often said to be a tie-in with the studies of the classroom. ("We learned more about the Japanese people by making ash trays and decorating them with Japanese designs.")

At the other end of the scale are programs placing emphasis on construction activities which bolster classroom studies. Here, children work in groups on "projects" which grow out of the curriculum. Dioramas of community helpers, models of foreign homes, classroom stores, and scientific apparatus are some subjects for construction. Although there are concomitant manipulative skills involved and a number of different materials used, the goal of these activities seems to be curriculum enrichment. Activities usually occur as they are appropriate, rather than on a regularly scheduled basis.

Naturally, there are varying degrees of each of the mentioned approaches. There also programs which attempt to balance arts and crafts work and curriculum-related activities. One must not be led to believe that because there are many different ideas about the *approach* to elementary industrial arts, there follows a detrimental conflict. Rather, it is gratifying to realize that so many people see that children are improved, both physically and intellectually, as a result of experiences with tools and materials.

Teacher Education. The current picture cannot be fully viewed without mentioning something about teacher education institutions. They, too, have considerable influence on the practices of the public schools. Many schools of education include courses in elementary school industrial arts. It appears that state-supported colleges are doing more about it than private ones. In some places, courses are *required* for future classroom teachers; in others, the work is elective.

For example, State University of New York, College of Education at Oswego, offers courses for three different groups of college students.

1. People studying to be *elementary classroom teachers* are required to take a two semester hour laboratory course in elementary school industrial arts.
2. Others *majoring* in *elementary classroom teaching* may elect a minor sequence in elementary industrial arts. The minor consists of four advanced laboratories (four semester hours each) in addition to student teaching one-half semester (nine weeks) in a public school elementary industrial arts program.
3. Courses are also offered for the *industrial arts major* who studies primarily for the secondary school. For the IA student, there is a two semester hour elective laboratory course, and a three semester hour elective education course dealing with the child and the curriculum. He, too, student teaches for one-half semester in an elementary school program.

The Oswego program is, by no means, typical of teacher education programs. The uniqueness is possible because of available facilities and the interests of enrolled students. Oswego students may pursue specializations in either field: elementary education or industrial arts. For that reason, available staff and laboratory facilities are combined easily to offer elementary school industrial arts courses.

Not all institutions are able to do this. There may be a lack of physical facilities or well-qualified professors (both in elementary education and industrial arts). But if current public school practices are to expand, teacher educators are going to have to do more to interest new teachers in the field and to help them feel competent in the area.

Certifying Teachers.

Another problem is concerned with the *certification* of teachers in elementary school industrial arts. In most states, there are no special certification requirements needed to teach in this area. An elementary industrial arts specialist may be an elementary education major, or an industrial arts major. Certificates in both fields permit holders to head up programs of elementary industrial arts. People from both of these fields enter elementary industrial arts teaching because of special talents or interests, and also because their licenses permit them. The elementary education major usually lacks technical competencies, and the industrial arts major (who has trained primarily for the secondary level) does not have an adequate understanding of *young* children, nor is he as familiar with the organization and curriculum of the elementary school as he might be.

In the past, this has not been of serious concern. Elementary education majors have chosen not to do anything about construction activities, or those who have included it in their own classrooms have done a good job thanks to their special technical talents (self-taught).

Industrial arts majors experienced no special problems because few of them went into the elementary schools. Those who did, quickly realized their weaknesses and completed graduate work in elementary education.

The picture is changing, however, and there is more demand for elementary industrial arts consultants. People are going into the field immediately after the completion of undergraduate work. State licensing bureaus and teacher education institutions must get together to do two things: 1) recognize the need for special certificates in elementary industrial arts, and 2) see to it that courses are offered to meet the special requirements.

Why Programs Fail.

Of lesser concern, because it is not widespread, is the degeneration or elimination of existing programs of elementary industrial arts. Programs fail for a number of reasons. Unreasonably high costs, incompetent teachers, misplaced emphases, and apathy, are a few of the causes. Administrators choose to abandon programs when they do not prove to be successful. "Success" is a relative word, but most often it is measured in terms of benefits for children. Many programs are only moderately beneficial to children. Why? Because, in some cases, they are styled after recommendations in current literature.

Most of the current literature is good, but some is very questionable. For the most part, the questionable literature is coming from college professors (they feel publishing obligations) who merely write about what they have read. When elementary industrial arts is described in such a way that it becomes another subject to be squeezed into the already bulging school curriculum, or when overly intricate "project ideas" are suggested, it is easy to see that the experiences of the writers have been in secondary school environments, and that their ideas are purely theoretical and not very practical. The people who have lived with large groups of children for long periods of time, not one or two years, are the ones who have had real opportunities to *understand* young children. It is unfortunate that more literature does not come from these experts. History shows that the practitioners have been most influential in this movement.

A GOOD PROGRAM OF ELEMENTARY SCHOOL INDUSTRIAL ARTS.

Any educational program is good if it is designed specifically for the learners. This is particularly true for elementary industrial arts. Not only is an understanding of the child essential, but one must also be acquainted with his learning environment—the school.

The Child.

What are some things an elementary industrial arts specialist should know about his learner? Since a considerable part of the child's participation in elementary industrial arts is *physical,* the specialist should know the physical make-up of children. Children are not small adults. They are built differently. In fact, it is difficult to place them in any one classification since they vary so much from age group to age group, and even within like age groups.

The child's muscular development, or lack of it, cannot be overlooked. Due to the slower development of the small muscles, the young child relies on his large muscles for motor activity. Although small muscle development and control improves as the child grows older, even the sixth grader has not reached the peak of small muscle development. Thus the running and jumping of little ones is not coincidental. They do this naturally (sometimes to the dismay of teachers) and enjoy it because they can do it with less difficulty than other "quiet" activities. This is so because running and jumping are accomplished with the large muscles of the legs. Other large body muscles are ready for use in the early years.

Muscle development and control is the key to the appropriateness of construction activities. It tends to determine what tools and materials children can and should use. The large muscles of the arm, shoulder, and back are used to wield hammers and saws. But the small muscles which control the fingers and wrist are needed to use a screw driver successfully. It is possible to go down the list of tools, and their accompanying materials, and predict whether or not children will be able to use them. Children are placed in unsafe and unhealthy situations when they are expected to use tools that are not geared to their physical abilities.

Children can use some tools only to a certain degree. The back and forth motion of the coping saw does not present major problems, but when the wrist and fingers must be used to guide the saw around *intricate* curves, the work becomes difficult. The fine work of inserting the coping saw blade is difficult, too.

The block plane is similiar in this regard. The pushing of the plane brings the large muscles into use, but the smaller motions needed to *adjust* the plane complicate matters. It is easy to see why the file is often substituted for the plane.

The tools that are used naturally determine what materials will be used. (The secondary school theory of industrial arts consisting of experiences with certain materials is not easily applied to elementary programs.) It is quite common for wood to be a very popular construction material for young children because it can be shaped with tools that involve the large muscles. Other materials should be used to lesser degrees. Contrary to what most people think, the fine manipulation needed for weaving, leatherwork, art metalwork, and other "child-like" activities is not really healthful for young children. Certainly, the short interest span of young children enters in here, too.

It is possible, however, to adapt materials and processes to the abilities of children, rather than trying to adapt children to materials. For example, weaving with roving and other thicker yarns on large simple looms does lessen the intricate requirements of this activity. Leatherwork can also be adapted to the abilities of children. The adult strength needed to use a revolving spring punch can be eliminated through the use of a hammer and a drive punch. Small leather modelling operations can be eliminated by tapping with a hammer and nail. Leather shears, or even scissors, can be substituted for knives, which require good control of the fingers. Knives are dangerous for children not because of their sharp edges, but rather because they must be guided by the undeveloped small muscles which control the fingers.

Behind the muscle development theory lies another significant physiological principle. Young children are active and they *need* to be active. To stifle this activeness is to defy human nature. Hence, the big, sweeping motions of the woodworker are more suitable than the sedentary chores of the weaver.

It is emphasized again that as a child matures his physical abilities improve. The sixth grader is able to perform more operations than the kindergartner. For that reason, the more mature child works with a greater variety of materials, too. But since children mature at different rates, teachers must be perceptive and use good judgment in selecting construction activities.

This maturation process is a slow, gradual one. Like growth in stature, it cannot be hastened. The introduction of small muscle work at an early age is an attempt to speed growth. It is not only frustrating for children, but unhealthy.

The intellectual, emotional, and social characteristics of children must also be considered when designing a good elementary industrial arts program. The reminder that "children are not small adults" is appropriate here, too.

As an intellectual, the young child possesses unique characteristics that an elementary industrial arts specialist must take into consideration. A vivid imagination and a flair for the dramatic tend to overshadow the child's awareness of his own limitations. Without proper guidance, the child, in his attempts to mimic his heroes, the pilot, the policeman, the carpenter, and the cowboy, can become involved in construction activities that are beyond his capabilities. The subsequent dissatisfaction often results in a mistrust of the abilities he *does* possess. Teachers can work to help children avoid this disappointment. Teacher-pupil planning, whether it be verbal or with pencil and paper, helps. Planning is not a natural process for younger children. They must be *taught* to plan and to foresee eventualities. Their interest span, which increases with age, will determine how much planning can be accomplished. Eventually, planning becomes second nature.

Since planning involves the abstract, teachers should try to reduce the *degree* of abstraction. Planning with concrete objects—rulers, pieces of wood, pictures, and diagrams, helps to bring things down to earth. The teacher is a very active participant in the planning sessions of lower grades. But as children mature they feel more comfortable at making the decisions required for planning. Gradually, the teacher withdraws and children become the active participants. A word of caution—even older children still possess a relatively short interest span, and overly intricate planning can result in loss of original interest. Sometimes construction never does begin.

An understanding of a child's emotional make-up is essential. Seemingly boundless enthusiasm can sometimes quickly change to unexplained crying or pouting. A teacher's noticeable surprise at these actions makes matters worse. It is the guiding and channeling of enthusiasm that produces rewards for children (and teachers). Guidance is blended with encouragement and praise for work well done. Children need this approval from adults. However, they can often detect praise that is not genuine, or deserved.

The child is a peculiar social animal. In the early years, he is noticeably self-centered, boastful, and lacks a sense of ethics. Younger boys and girls associate freely. In the middle grades they tend to segregate themselves, and then in preadolescence there is a repeat of the free association, but not as strong as that in the lower grades.

What bearing do these social implications have on a program of elementary school industrial arts? There are times when construction activities should be planned so that children can work together, and other times when the work has an independent flavor. It would seem, however, that the emphasis should be on group efforts. In the beginning, children do not work together naturally. Therefore, construction work should be planned so that opportunities for joint enterprises occur.

Co-workers might be all girls, or all boys, or they might be mixed. Through this approach children recognize their own abilities and limitations and compare them with their peers'. Better understandings result.

Children differ intellectually, emotionally, and socially. They change as they mature. For some, the change is rapid, for others it is less noticeable. Since the classroom teacher is in a better position to observe her own children, the wise industrial arts specialist seeks the teacher's advice concerning the peculiarities of individuals and groups.

The School.

For the elementary school industrial arts teacher, knowledge about child growth and development is useful when it is viewed in a relationship to the organization and curriculum of that school. To help the child grow in all respects, construction activities should contribute to the goals of the overall program. Therefore, specialists should have a working knowledge of all phases of the elementary school.

Since organizational procedures vary from school to school, and even from classroom to classroom, it is difficult to describe accurately the typical elementary school. It is possible, however, to review trends and common practices.

The absence of departmentalization of subject areas is a noticeable characteristic of most modern elementary schools. The days of the History lesson occuring at 9:30 every Tuesday have long since outlived their usefulness. Programs today are more flexible, and it is often difficult to detect what "subject" is being studied. It is common to see many areas of learning being considered simultaneously. Language arts (reading, writing, speaking, listening) are often part of social studies (history, geography, citizenship); or social studies are a part of science and arithmetic. The point is that all areas of learning lead in and out of one another.

Construction activities, which make up a major portion of an elementary industrial arts program, should parallel this flexible scheme of interrelatedness. Elementary industrial arts activities should be a part of all other areas of learning rather than apart *from* them. The items that children construct should be related to the goings-on of the classroom. (Rigid schedules of "shop classes" prohibit activities from taking place at opportune times.) This way, many difficult academic concepts are clarified, and simultaneously, children develop the motor skills required for the correct and safe manipulation of tools and materials. It cannot be overlooked that the other fundamental skills, language and numberwork, are also involved in handwork.

Although the emphasis should be placed on curriculum-related activities, a well balanced program also includes opportunities for children to construct items that are of particular interest to them. Toys games, and gifts often fit in here. Even these items could be said to be related to classroom living and learning.

The person who leads a program of elementary school industrial arts must be technically competent so that he can help select appropriate tools and materials, and so that he can instruct others (teachers and children) in their use. But he must also be familiar with the overall curriculum. If he is to help children construct articles related to their studies, he must know what they are studying. His teaching methods should reinforce the methods of the classroom teacher. When do children change their writing styles from manuscript to cursive? What is a second grade reading level? When do children begin to work with fractions? What fractions? What vocabulary is appropriate for sixth graders, for kindergartners? The industrial arts specialist must be an expert, like classroom teachers, in many areas.

Elementary schools are commendably dedicated to the teaching of *all* children: boys, girls, gifted and slow children. For that reason the industrial arts program should be geared similarly. Both boys and girls should participate in construction activities. Handwork should be a challenge to the gifted, and it should enable the slow to taste success.

Recent concern over educable retarded children has resulted in expanding programs in that field. The "learning by doing" principle underlying construction activities for normal children, takes on even greater importance for the education of retarded children. The *physical* abilities of most mentally retarded children are not too different from those of other children. Working with concrete materials helps less-fortunates understand concepts that otherwise would never have meaning. In the near future, elementary industrial arts teachers will be called upon to do more for the retarded child. This is a challenge which needs attention.

The specialist should also acquaint himself with other areas. How do teachers evaluate children? What are the classroom routines of all grade levels? What are the pet peeves of classroom teachers? What administrative policies affect the elementary industrial arts program? There are many avenues to pursue and they all have bearing on the effectiveness of special programs.

Although elementary industrial arts is based on other things—knowledge of the child and his curriculum—the program does have a character of its own. The people who lead the program, the organization of the program, and the learning activities, are the identifying features.

Who are the people? They fall in two categories: classroom teachers and specialists. If construction activities are to enrich classroom studies, then the leader of those studies should assume major responsibility for elementary industrial arts. That leadership can be carried out in many ways. In some school systems the classroom teacher does everything. She plans, purchases, and teaches. In other systems, the classroom teacher shares leadership responsibilities with a specialist or consultant. The consultant helps the teacher in every way possible. This help may be in the area of planning; it may be in supplying needed tools, materials, or ideas; it may be in instruction. Or it may be in all areas. This varies with the interests and competencies of the teachers.

Although construction activities usually proceed on a group basis, rather than on an all-class basis, maximum benefit for all children is gained when construction takes place in the classroom. Research materials are readily available, time is not lost in moving from one room to another, and non-workers who may or may not be otherwise involved, at least see and hear what is going on.

Some work is beyond the scope of the classroom, and many newer schools are equipped with special rooms which become the headquarters for the consultant. Aside from special activities, the consultant uses the special room to extend his services to many teachers. To do this, he works with groups from a number of classrooms, simultaneously, and thus cuts down on the time that people spend waiting for his help.

Construction activities should take place when they are needed. Too often, programs lose their effectiveness because rigid schedules do not permit parallel timing of construction and classroom studies. The consultant must operate on a flexible schedule in order to fit himself in with classroom routines. This flexibility also allows for concentrated work periods, or series of work periods. Child interest is sustained when work projects are not drawn out.

What To Construct.

Finally, learning activities make up the most strategic component of the whole program. What shall children construct? Objects that are related to the curriculum take on many forms. Models, panoramas, and maps, seem to be peculiar to the Social Studies. Illustrative devices, games, and classroom equipment, develop from arithmetic, science, and physical education. Scenery, stages, and other dramatic equipment are characteristic of the language arts. It is with hesitation that any "project ideas" are mentioned since they tend to limit possibilities. There should be no limitations except those set down by the abilities of children and the confines of the curriculum. What is appropriate for first grade might also be appropriate for fourth grade. What is appropriate for science might also be appropriate for music. With this plan, activities will be most benefical for children.

The items that children construct should be original in the sense that they are peculiar to the needs of a given group. Since the needs of groups vary from classroom to classroom and from year to year, it is unusual that identical construction activities repeat themselves. The planning and constructing of items should present real experiences in critical thinking and problem solving. The alert teacher, who is a question-asker rather than a question-answerer, motivates and guides children to the solutions to their own problems. The seemingly small and insignificant decisions of material selection and project design develop into later, larger decisions. There is no room for teachers' pet projects or for looking around for "clever" things to do. Purposes and goals are the determinants for construction activities. These objectives are not afterthoughts.

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CHAPTER IV

Secondary School Industrial Arts

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When one reviews the development of industrial education or industrial arts, it seems traditional to begin with the guild systems, continue by describing the Imperial Technical School at Moscow under the leadership of Victor Della Vos, and then cite the influence of Gustof Larsson, etc. The contributions of Della Vos and Larsson et al were considerable, but this chapter will pass over their accomplishments and consider only the development of industrial arts in the United States, beginning with the organization of the first manual training high school in this nation.

The Manual Training School of Washington University in St. Louis, Missouri, opened on September 6, 1880, with an enrollment of about 50 boys. Each student admitted had been required to pass examinations in arithmetic, geography, spelling, penmanship, and English. The single curriculum listed five subjects: mathematics, science, language, drawing, and shopwork. The drawing and shopwork included freehand and mechanical drawing, carpentry, woodturning, molding, brazing, soldering, forging, bench metal, and machine shop.

The five subjects were scheduled in a six-hour school day, with the academic and drawing classes meeting for one hour and the shop classes for two hours. Therefore, the opening of this Manual Training School might well be thought of as the beginning of industrial arts in American secondary schools.

Purposes of that school, as stated by Professor C. M. Woodward, its director, were those of general training, assistance in selection of an occupation, and preparation for entrance into an engineering college. The school was a part of Washington University and was therefore neither owned nor controlled by the city of St. Louis.

Skill in the use of tools and materials was the principal objective of shopwork taught there. This skill was developed through completion of a series of carefully-graded exercises, all students completing the same exercises. Apparently the more able students were sometimes permitted to complete a useful project. Slower students were merely asked to turn in a unfinished piece. All exercises were then graded on an absolute scale, 100% being the highest score or grade.

Professor Woodward, when advocating manual training subjects for secondary school students, declared: "....the schools persisted in ignoring or decrying the value and necessity for scientific and industrial training as compared with an almost exclusively literary culture; and secondly having in some degree admitted that value, they persistently refuse to adopt the means whereby that scientific and industrial training may be most efficiently secured."[1]

Woodward also advocated an arrangement whereby students in woodturning would be permitted to design their own projects after they had received broad training in the basic operations.[2] Woodward apparently believed in problem solving, because in discussing patternmaking he said, "No work available for school shops more abounds in problems which must be solved by intelligent thinking than this." Then he added, "I repeat that the work is exceedingly stimulating to a boy with a logical mind. He must understand and plan his work with reference to a great variety of circumstances." Yes, design and problem solving were already being advocated in 1890![3]

The first tax-supported manual training high school was opened in Baltimore, Maryland, in 1884. The Philadelphia Manual Training School, also tax supported, was then begun in 1885. The Chicago Manual Training School, operated by the Commercial Club of that city, opened in 1884. These three schools, while not identical in offerings or scheduling, were patterned after the St. Louis school.

The Toledo Manual Training School was the first of such schools to admit girls. In addition to classes in sewing and cooking for them, instruction in typing, woodworking, and clay modeling was also scheduled.

[1]C. M. Woodward, *Manual Training in Education.* New York: Charles Scribners & Sons, 1911, p. 6.

[2]*Ibid.*, p. 96

[3]*Ibid.*, p. 98

These manual training high schools were successful because they appealed to boys--and, in the Toledo school, some girls--who were dissatisfied with the academic offerings of the conventional high school and because many manufacturers saw in these young people a source of skilled workers. Graduates of these schools were quickly employed because they were better prepared to enter a number of occupations than were students with a purely classical background.

The first public high school to include manual training was located in Peru, Illinois, offering a course in woodworking as early as 1884. Aims of this manual training class were:

1. To inculcate a correct knowledge of the use and care of wood working tools.
2. To implant the habit of carefulness in accomplishing work.
3. To develop the power to plan work.
4. To teach quickness of perception; to train the judgment, to render the memory exact and reliable.
5. To turn the pent-up energies of boys into channels of usefulness.[4]

Success of the aforementioned special schools and then introduction of manual training into the conventional high schools created a controversy that continued for years. Statements made in support of manual training by proponents and negative claims made by opponents were often exaggerated and sometimes even fantastic; yet it is interesting to note that some of the claims and charges are heard today. Claims and counterclaims relevant to the merits of manual training were made in many places and in many publications. In fact, the 1882, 1883, 1884, 1887, and 1889 conventions of the National Education Association included programs at which these claims and fears were thoroughly aired. Discussions held at these conventions could easily be summarized under one title: "Manual Training, Its Place and Purpose in Secondary Education." A review of some of the statements which prominent educators and citizens made for and against this new area of instruction is of historical interest:[5]

[4] C. A. Bennett, *History of Manual and Industrial Education* 1870-1919. Peoria: The Manual Arts Press, 1937, p. 389.

[5] *Ibid.*, pp. 360-373.

IN SUPPORT OF MANUAL TRAINING	IN OBJECTION TO MANUAL TRAINING
1. Manual training enriches the curriculum—does not curtail it.	1. There is no information stored up in the plow, hoehandle, steam engine, but there is information stored up in books.
2. There is no issue between manual training and literary training; both are needed in a sound course of mental training.	2. Introduction of manual training will result in the breakdown of academic standards already established.
3. Handwork aids mental development.	3. Manual training does not compare favorably with pure science, history, languages and other branches of school work.
4. It will give boys a better start toward a variety of occupations.	4. The common schools have a sphere of their own, and it does not include shops in the basement.
5. Increases interests in other school subjects because of the application of these subjects in the shops.	5. The business of the public schools is not to educate operatives.
6. The wealth of the nation depends on skill.	6. There is no such thing as general training in the use of tools; there are no fundamental principles.
7. Technical training and modeling are essential elements of general culture.	7. Energy absorbed in manual training exercises is just so much energy withdrawn from mental training.

The controversy about the addition of manual training subjects to the secondary school curriculum included discussions concerning purposes or objectives of such subjects and, if they were to be taught, whether they should be offered by existing high schools or be taught in special manual training schools.

Some educators believed that manual training was a subject which had something to offer all students and which, therefore, ranked with mathematics, language, and science. Others held that the purpose of manual training was to provide trained workers for industry. Still others believed that manual training should be taught in special schools and should not be included as a subject in a conventional high school.

However, in spite of the continuing controversy, instruction in manual training was accepted by many educators by 1890 and also approved by the public in many cities. In fact, many students began to prefer this subject because they were better prepared for employment after graduation from high school. As a result, by 1893 manual training courses were included in the schools of more than fifty cities.[6]

The growth of instruction in manual training was also encouraged by many industrialists and public-spirited citizens who, believing that manual training was a more practical education for many students, contributed substantial sums to operate schools and manual training courses in secondary schools.

In 1889 a department of manual training was added to all twelve grades of the Menomonie, Wisconsin, public schools. This department was made possible by a grant from State Senator James Huff Stout. In 1893 the department was housed in a new building and was placed under separate supervision. Senator Stout operated this school under the name "The Stout Institute" until his death in 1910, when it was turned over to the State of Wisconsin. In 1917 The Stout Institute was made a college with degree-granting powers.

With the general acceptance of manual training in the manual training high school and in the conventional high school, another type of school, the technical high school, came into existence. The technical high school, for the most part, offered a full program of academic subjects, together with a complete range of manual training subjects. Such schools were certainly not trade schools because students attending the technical high schools could, by selecting appropriate courses, attend college after graduation. The development of such technical high schools began about 1890 and has continued to this day.

Therefore, by 1900, manual training courses were offered in three types of secondary schools: The conventional high school, the manual training high school, and the technical high school. Even though expansion of manual training continued at a rapid pace, it soon became evident that these secondary manual training courses or schools could not supply the number of skilled workers needed, nor could such schools guarantee that their students would have the necessary range of skills at the level demanded by industry. Publication of the famous Douglas Report in 1906 pointed out the need for a more adequate vocational training program and instituted a sequence of events which resulted in the Smith-Hughes Act of 1917. This act provided federal funds, on a matching basis, for vocational industrial education. Manual training courses financially assisted by money secured under this act were primarily vocational.

[6] *Ibid.*, p. 397.

In 1893 the term "Manual Arts" was first substituted for the words "Manual Training" to describe the technical subjects.[7] This new term was made part of the name of a building at Teachers College, New York City: Macy Manual Arts building. Identification of technical subjects by the term Manual Arts was widely accepted until 1904, when C. R. Richards suggested a new name, "Industrial Arts,"[8] to designate the technical subjects. Within a few years, Industrial Arts became the accepted title describing technical courses.[9]

Richards preferred the new title because "... We are rapidly leaving behind the purely disciplinary thought of manual training ...and we are beginning to see that the scope of this work is nothing short of the elements of the industries fundamental to modern civilization."[10]

The term "Industrial Arts" to describe shop and drawing courses was defined by Dr. F. G. Bonser as ".... those occupations by which changes are made in the forms of materials to increase their values for human usage. As a subject for educational purposes, industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes."[11]

The development of industrial arts in the secondary schools may then be divided into three periods:[12] (1) manual training, (2) manual arts, and (3) industrial arts.

Some of the characteristics of these three periods of development are included below:

Manual Training—1880

1. Hand skills in woodworking emphasized.
2. Rigid courses of study. All students required to work on same exercise or project at same time; slower students to turn in incomplete exercises.

[7] *Ibid.*, p. 441.

[8] William T. Bawden, *Leaders in Industrial Education.* Milwaukee: Bruce Publishing Company, 1950, p. 23.

[9] *Ibid.*, p. 38.

[10] Bennett, *op. cit.*, p. 353.

[11] Bawden, *op. cit.*, p. 38.

[12] U. S. Office of Education, Bulletin No. 34, *Industrial Arts, Its Interpretation in American Schools.* Washington, D. C.: U. S. Government Printing office 1937. p. 13.

3. Objectives:
   a. Vocational preparation and selection of occupation.
   b. Entrance into engineering school.
   c. Retention of students in school.

Manual Arts—1893

1. Emphasis still on skill.
2. Students permitted to work on useful articles.
3. Some freedom in selection of projects.
4. Development of appreciation of good design.

Industrial Arts—1904

1. Development of technical high schools.
2. Development of the junior high and the exploratory function of industrial arts.
3. Emphasis on design and problem solving.
4. Selection of content from many areas: drawing, woodworking, metalworking, electricity, ceramics, etc.
5. Development of general shops and general unit shops.
6. Instruction sheets and textbooks written and used.

The passage of the Smith-Hughes Act in 1917, and the acceptance of the term industrial arts, separate the technical subjects by purposes. For instance, shop and drawing classes offered as Smith-Hughes courses have a vocational objective, whereas industrial arts courses of shop and drawing are offered for their general educational values.

Struck[13] describes industrial arts courses as a fundamental part of general education, distinguishable from vocational education and helping to make persons intelligent consumers by giving them limited contact with, and some information about, tools, processes, materials, design and life problems. However, he said, such courses do not aim directly toward imparting vocational proficiency. Struck also visualized industrial arts courses as exploratory in nature, describing such classes as "try out" courses.

Using the seven points of Table I as criteria, Struck then compares industrial arts education and vocational industrial education.

[13] F. Theodore Struck, *Foundations of Industrial Education*. New York: John Wiley & Sons, Inc., 1930, p. 37.

Table 1.
Comparison of Industrial Arts and Vocational Industrial Education[14]

	Industrial Arts Education	Vocational Industrial Education
Aim and Objective	Exploratory and developmental experiences	Specific preparation for a given vocation—Vocational proficiency
Age of pupils	Elementary: six to twelve years Junior: twelve to fifteen years	Above fourteen years of age —Best results with boys sixteen to eighteen years and above
Time allotment per week	A minimum of two clock-hours per week in grades seven, eight, and nine	A minimum of one-half of each school day or usully fifteen hours per week of shop instruction (evening and part-time classes for shorter periods)
Teacher qualifications	Experience in teaching adolescent boys. Trade experience desirable but not always essential	Must be expert tradesman at least six years of trade experience plus some professional training
Skill	Manipulative skill less important than development of reasoning and exploration through shop and laboratory work	Trade skill very important
Equipment	Frequently quite inexpensive, and not too large or heavy—suited for light work	Should measure up to actual trade requirements-usually relatively expensive
Reimbursement	Not reimbursable from federal funds (Smith-Hughes)	Varies among the states, but expenditure is reimbursed in some form from federal and state funds in nearly all states

[14] *Ibid.*, p. 39.

Thirty years ago, Struck also defined the several shop organizations existing at that time, identifying a unit shop, a general shop and a modified general shop:

> *The Unit Shop*– The instructor handles one type of shopwork such as woodwork, or metalwork or electrical work.
> *The General Shop*– refers to a shop so organized, equipped and manned that several distinct kinds of industrial arts training are given to a group of students by one teacher.
> *The Modified General Shop*– to include instruction to two or three activities by one teacher.[15]

He then suggested that the type or types of shop to be included in the high school would depend, to some extent, upon the number of students enrolled in that school.

Continued emphasis on problem-solving has characterized the development of the industrial arts program. As was indicated earlier, this method of teaching was mentioned first by Woodward in 1890 and has, over the ensuing years, received increasing attention from the industrial arts teachers and educators. Thus, the Fifth Yearbook of the American Council on Industrial Arts Teachers Education, *Problems and Issues in Industrial Arts Teacher Education,* includes several references to the problem-solving method.

That the value and use of this method should be debatable today is difficult to understand, inasmuch as it has been advocated for many years by many of the leaders in industrial arts education.

For example, Selvidge recognized the value of problem solving on the part of the shop student, listing two fundamental faults of the job sheet: "It takes away from the student two important things, the opportunity to analyze the job to find out what is to be done and the opportunity to plan the doing of a job." He then added this strong indictment, "These are perhaps the two most important phases of the student's training."[16] Problem solving was also advocated by Vaughn and Mays, who suggested the project as the problem. They emphasized the fact that any project selected by a boy must be of interest to him and must fill a real need.[17]

[15] *Ibid.*, pp. 43-47.

[16] R. W. Selvidge, *Individual Instruction Sheets.* Peoria: The Manual Arts Press, 1926, p. 13.

[17] Samuel J. Vaughn and Arthur B. Mays, *Content and Methods of the Industrial Arts.* New York: The Century Company, 1924, pp. 112-116.

Selvidge and Fryklund, in writing *Principles of Trade and Industrial Teaching,* devote an entire chapter to this topic. That the teacher should assist and not dictate is indicated rather clearly by the following statement which they included in that chapter:

> "The teacher should guide the learner into recognizing relationships between the new and the old in forming analogies, setting up hypotheses, solving problems, and should always encourage him to form his own analogies and solve his own problems. If he needs assistance, his difficulty may be in his method or plan of procedure, and the teacher should endeavor to locate the difficulty and guide him in correcting it, but he should not solve the problem."[18]

Fryklund, in advocating planning on the part of the student, identified the incidence of problem solving and the manner in which problem solving techniques apply in shop teaching: "Teachers in the industrial arts and in the trades have the responsibility of including as one of their major aims the task of training youth how to think in shop procedures."[19]

Today, educators have apparently reached some agreement as to the value of problem solving in industrial arts and also some agreement on the definition of the term "Industrial Arts." The Editorial Committee of the Industrial Arts Policy and Planning Committee of the American Vocational Association, in its statement of "Industrial Arts in Education," defined industrial arts as "the study of industrial tools, materials, processes, products and occupations pursued for general education purposes in shops, laboratories and drafting rooms."

This committee then recognized three unique contributions of industrial arts:

1. To help learners develop a degree of skill as they solve problems with the tools, materials and processes of industry.
2. To provide exploratory experiences in a variety of industrial activities.
3. To develop the skill and knowledge necessary to produce and use working drawings.[20]

[18] R. W. Selvidge and Verne C. Fryklund, *Principles of Trade and Industrial Teaching.* Peoria: The Manual Arts Press, 1930, pp. 307-319.

[19] Verne C. Fryklund, "Incidence of Problem Solving in the Shop," *Education,* April, 1935, pp. 464-467.

[20] Industrial Arts Policy and Planning Committee, *Industrial Arts in Education.* Washington, D. C.: American Vocational Association, 1959, p. 1.

The preceding definition and description would, of course, eliminate shop and drawing courses offered for trade preparation or those same courses offered as part of the curricula in most technical high schools.

Basic areas of instruction to be included in a complete industrial arts program have been listed by this committee as follows: drafting, electricity and electronics, graphic arts, industrial crafts, metalworking, power mechanics, and woodworking.

Thompson endorses Wilber's definition of industrial arts: "This curriculum area is a phase of general education that deals with industry—its organization, materials, occupations, processes and products—and with the problems resulting from the industrial and technological nature of society."[21]

The two definitions just cited certainly appear to be in agreement and are generally well-accepted by leaders in industrial arts education. Thompson believes, too, that industrial arts on the secondary school level should include instruction in textiles, ceramics, woodworking, electricity, leatherwork, metalworking, drawing, graphic arts, etc.

When Thompson's list is compared with the listing of subjects prepared by the Industrial Arts Policy and Planning Committee, almost complete agreement is apparent. However, despite these areas of agreement, some confusion and disagreement still exist as to the place and purpose of industrial arts courses in the senior high school.

Conant, in his widely-read book, *The American High School Today,* lists three objectives for the comprehensive high school: first, to provide a general education for all the future citizens: second, to provide good elective programs for those who wish to use their acquired skills immediately upon graduation; third, to provide satisfactory programs for those whose vocations will depend on their subsequent education in a college or university.[22] He then discusses that second objective in terms of vocational education, defining vocational education as a program which receives federal aid and which offers

[21] Robert L. Thompson, "Concepts of Curriculum and Methods," *Problems and Issues in Industrial Arts Teacher Education,* Bloomington: McKnight & McKnight Publishing Company, 1956, p. 107.

[22] James B. Conant, *The American High School Today.* New York: McGraw-Hill Book Company, 1959, p. 17.

technical courses three clock hours each day.[23] Conant visualizes industrial arts as trade preparatory or exploratory courses in schools having a strong vocational program.[24]

After visiting fifty-eight secondary schools—including vocational and comprehensive high schools—Dr. Conant admits that the line between the industrial arts program and the vocational program is not an easy one to draw. His difficulty in making an exact distinction is understandable because some courses labeled "industrial arts" are really not general education in nature, but are actually courses with a vocational objective.

That industrial arts is an accepted part of the secondary school program is indicated by the rapid increase in enrollments in this field during the past 35 years. Enrollments in junior high school industrial arts courses now represent 48.2 per cent of all pupils and 25 per cent of all students in all types of schools.[25] Three-fourths of all students enrolled in industrial arts courses take work in a general shop or in woodworking or mechanical drawing courses. Metalworking and printing enroll 2.8 per cent and 1.2 per cent respectively.[26]

Whether this increase will continue will depend upon our solving the question, "What is the place and purpose of industrial arts in secondary education?" and then acceptance of that solution. Evidence of confusion which presently exists in regard to that place and purpose is demonstrated in Dr. Conant's discussion in his aforementioned volume, *The American High School Today*. There he considers vocational education at length, but includes only a short statement about industrial arts.

Conant then lists twenty-one specific recommendations aimed at improving public secondary education, titling recommendation 7: "Diversified Programs for the Development of Marketable Skills." Elaborating on this recommendation, he advocates, "For boys, depending on the community, trade and industrial programs should be available.

[23] *Ibid.*, p. 53

[24] *Ibid.*, p. 54

[25] U. S. Office of Education, *Biennial Survey of Education in the United States 1948-50.* Washington, D. C.: U. S. Government Printing Office, 1954, pp. 18-19.

[26] *Ibid.*, p. 18.

Half a day is required for this vocational work...... Federal money is available for these programs."[27]

Fales, when describing industrial arts in the senior high school, declares, "Senior high school industrial arts is more difficult to describe. Actually, many students in these grades are mature enough to select specific vocational or trade preparation." He then adds, "It remains for the industrial arts senior high school teacher to recognize that his work, though technical or mechanical, is still general education involving a continued interest and exploration in the broad resources surrounding any article a boy makes."[28]

The short reference to industrial arts by Dr. Conant and also his recommendation relevant to marketable skills, plus Fales' statement of the difficulty of describing industrial arts in the senior high school, would seem to indicate that many persons in industrial arts education are confused as to the purpose of industrial arts in our secondary schools. Certainly this difficulty must be resolved in the years immediately ahead if industrial arts is to continue to develop and attract capable students.

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[27] Conant, *op. cit.,* pp. 51-54.

[28] Roy G. Fales, "50 Years of Progress in Industrial Arts Education," *American Vocational Journal,* December, 1956, pp. 77-78.

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CHAPTER V

Development of the Collegiate School Industrial Arts

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HISTORY.

Early Programs.

Since the beginning of recorded history man has been striving to pass on facts, concepts and skills to posterity. As society became complex, specialization appeared. Preparation of certain of their number to teach the young was no exception.

Socrates learned sculpturing from his father. Foresaking his trade or art, he spent his life as a teacher. No formal school existed but at least one student, Plato, speaks for his teaching ability. Plato established the academy where he taught for many years. We might then think of Socrates as one of the first teacher educators. Twelve hundred years later we read of Mr. Dunstan, Archbishop of Canterbury, (960) who required his clergy to learn handicraft so that they could teach the youth of their parish some forms of skilled labor.[1]

Father De'Mia taught the first teacher training class at Lyons, France in 1672.[2] The first normal school was founded at Rheims, France in 1685.[3] The first state normal school started in Denmark in

[1] Lewis Flint Anderson, *History of Manual and Industrial School Education.* New York: D. Appleton and Company, 1926, p. 5.

[2] Merritt M. Thompson, *The History of Education.* New York: Barnes & Noble, Inc., 1951, p. 136.

[3] *Ibid.*

1789.[4] Reverend S. R. Hall startedthe first normal school in the United States at Concord, Vermont in 1823.[5] Starting in 1850 the teacher pre-aration program expanded rapidly.

Manual training became a part of the teacher preparation curriculum in the United States during the nineteenth century. Oswego State Normal School, under the leadership of Edward A. Sheldon, the father of manual training, started in 1861.[6] It was first known as the Oswego Training School and it was not until 1880 that a shop was fitted in the basement.

Other normal schools such as the State Normal Schools at Bridgewater, Massachusetts; Whitewater, Wisconsin; New Britain, Connecticut; San Jose, California; and Trenton, New Jersey all followed before the turn of the century.

A study of industrial arts teacher education institutions in existence at the present time was made for this Yearbook. One hundred and and eighteen institutions responded. Opening dates started with State University of New York Teachers College, Oswego, and continued to 1954. A graphic analysis of growth is shown in Figure 1. Generalizing, one might say that industrial arts college programs have increased steadily since the beginning. One should also realize that the collegiate program in industrial arts is but a half century old.

Objectives.

Objectives of applied education have progressed through what might be considered a complete cycle. Education in its infancy was established for the favored few who because of social class or economic status were permitted to go to private schools. Literature informs us that part of the curriculum was devoted to *understanding and appreciating the work of men in the laboring groups*. Classes were taken to the agricultural field so that students could see the men at work and could also indulge a little themselves. Another objective, change, the respite from books to chopping wood, walking or building objects was recognized as valuable in the education process. Along with the worthy

[4] *Ibid.*

[5] H. G. Good, *A History of Western Education.* New York: The Macmillan Company, 1947, p. 417.

[6] Charles A. Bennett, *History of Manual and Industrial Education 1870 to 1917.* Peoria: Charles A. Bennett Company, Inc., 1937, p. 464.

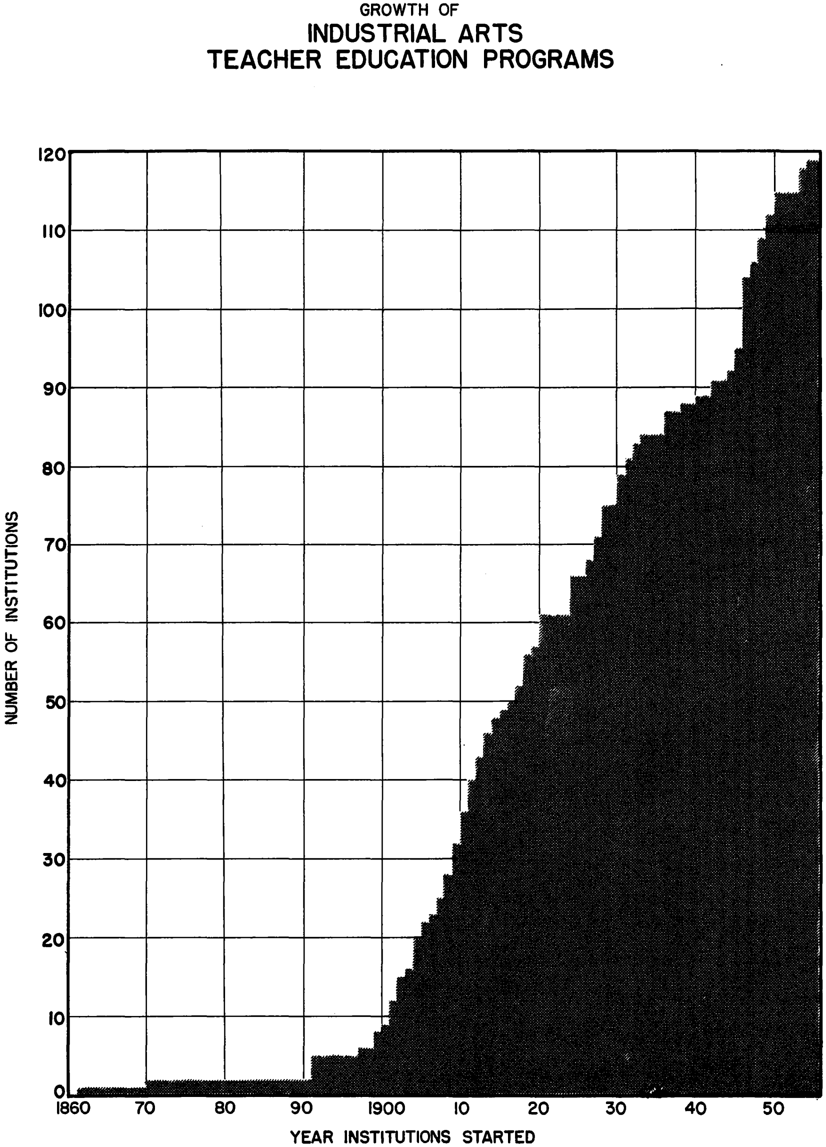
GROWTH OF
INDUSTRIAL ARTS
TEACHER EDUCATION PROGRAMS
NUMBER OF INSTITUTIONS
0
10
20
30
40
50
60
70
80
90
100
110
120
1860
70
80
90
1900
10
20
30
40
50
YEAR INSTITUTIONS STARTED

Figure 1

objective of change two other virtues became obvious. One was the healthful activity and the second was the economic. Chopping wood is a healthy endeavor and has economic value as well.

Character building was also named as an objective. Industriousness and love of work is a virtue worth cultivating. Education for leisure as an objective of education has been important in all social systems. Last but not least the objective of vocational education or preparation for earning a living stands as a worthy educational objective. The wealthy classes of another day assigned a slightly different value. Rousseau, for instance, thought of the acquiring of a trade as social security.

Today, the major objective of industrial arts is one of acquiring *appreciation and understanding of industry*. In other words, we have progressed the complete circle to the first objective named above. A slight difference between the original and present objective, however, does exist today. We teach industrial arts so that we might better appreciate the efforts of every man in our society. Early educators taught appreciation and understanding of industry and the laboring classes so that they might better be able to rule the lower classes.

The objective of the collegiate industrial arts program from the beginning has been teacher preparation. As early as 1917[7] other objectives have been named. Three listed at that date were: (1) teacher preparation, (2) preparation of directors and supervisors of manual arts, and (3) broadening liberal studies for all college students. Preparation for responsibility in industry was introduced at a later date. Massachusetts Institute of Technology's technical program undoubtedly served as the prototype for the industrial or technical major.

Ten objectives for industrial arts teacher education were proposed in 1934 by the Manual Arts Conference. Sixteen years later Schwalm[8] asked heads of departments of industrial arts to rank the ten objectives in order. Evidence exists that no great changes had taken place. Only one item was juxtaposed by four places, two items by three places, four items by two places and three objectives maintained the same rank.

[7] *Ibid.,* p. 492.

[8] Ray Alvin Schwalm, *Philosophy and Organization of Industrial Arts in Teacher Education.* Corvallis: Oregon State College, Ed.D. Dissertation, 1952.

Majors.

Industrial arts, previously known as manual training and manual arts, was introduced into the normal school, college and university primarily for the purpose of teacher education. Many of the institutions offering a collegiate program in industrial arts today have but one program, teacher education.

During the years since World War II, institutions of higher learning with curriculums in industrial arts have added programs which prepare students for industry. These programs are known by various names such as industrial management, industrial technology and technical.

Students, after completing the baccalaureate degree, accept positions in industry in the fields of administration, supervision, personnel or as technicians. Catalog descriptions lean heavily in the direction of preparation for management.

No one closely associated with industrial arts education at the college level is at all surprised by the growth in this program. Some institutions in the country admit that they place a very small percentage of their teacher education majors in the teaching profession. Two factors influence graduates' decisions. Industry is capable of paying higher salaries than education and secondly, the industrial arts graduate has proved himself in competition with management and engineering.

A third major is offered in industrial arts at the collegiate level. It may be a general major in the industrial arts department or may be structured under the aegis of a division or college. Students go to college and many do not pick a major for the first year or two. In other words, young people know they want a college education but do not feel any desire to concentrate in a specialization. Industrial arts programs in most institutions of higher learning have for years required students to not only elect a major but also to decide between a career in teaching or industry. Students majoring in other specialties of a college need not designate a professional choice—why should the industrial arts major? In some colleges, students may elect to major in industrial arts without specializing for professional employment. Surely there are both boys and girls who seek a college education who would enjoy the discipline of industrial arts without looking forward to teaching or industry. There is a chance that specialization will be pursued in industrial arts at the graduate level.

Most industrial arts departments offer service courses to other departments of a college and also provide students the opportunity to minor in industrial arts. In addition, students since 1917 or before have been privileged to elect industrial arts courses because of interest or for the reason stated by the University of Wisconsin's program.

> Those who wish to broaden their educational horizons and enrich the traditional program of liberal study by electing some work in manual arts, usually on the side of drawing, design, and the crafts.[9]

Curricular programs for the general major are structured to provide understanding, appreciation and some skill which will educate the student about industry. Majors in industry or management study industrial psychology, industrial management, motion and time study, and other courses which will prepare for a specialty in industry. Both of the above majors usually require a pattern of courses as well as a minimum number.

Curriculum.

Majors in teacher education meet requirements in three areas: (1) general or liberal education, (2) professional education, and (3) special or technical education. It has been a continuing problem to decide what proportions of a student's time during a four year curriculum should be allocated to each. As early as 1917, the University of Wisconsin stipulated a technical requirement of 30 units minimum and 40 units maximum within the 128 required for graduation. It was assumed that the graduate would be prepared to teach manual arts.[10]

A second description of an early program stipulates the following requirements:[11]

Area			Semester Hours	Per cent of Units
Technical Manual Arts			47	39
Science	10			
Cultural	28		38	32
Education			9	7
Elective			26	22
		Total	120	100

It would be interesting to know what courses students elected. Unless capable and aggressive guidance was given it is plausible that all or most would be taken in the first category. If graduates antic-

[9] Bennett, *loc. cit.*

[10] *Ibid.*

[11] *Ibid.*

ipated teaching responsibilities in subject areas in addition to manual arts, they elected other courses.

Twenty-four years later, Mr. Pawelek[12] proposed an ideal industrial arts teacher education curriculum:

Area		Per cent of Units
Shop Work		30
Industrial Arts Professional Courses		8
Supervised Teaching		6
General Education		38
Professional Courses		18
	Total	100

Mr. Tate[13] studied the industrial education programs in 51 selected colleges in 1949 and proposed the following program of studies:

Area		Semester Hours	Per cent of Units
Technical		40	31
Professional		25	19
Academic		66	50
	Total	131	100

Three years later, 1952, Schwalm[14] made a study of industrial arts teacher education. He learned that the technical requirement for graduation varied from 20 semester hours minimum to 65 semester hours maximum. An average of 37.5 semester units were required by the 67 institutions considered. He also polled 120 industrial arts department heads who wished in most cases for more technical education. The average of the requests expressed by department heads was 42.2. Eight hundred and eighty-eight industrial arts teachers were asked to indicate the number of semester hours of technical courses they believed appropriate. Their requests averaged 51 semester units of work.

Most respondents on Schwalm's study wanted more general shop courses. The teacher educators indicated a hope for the fifth year. The majority of the teachers believed four years to be sufficient. Of the

[12] S. J. Pawelek, *An Analysis and Evaluation of Certain Common Functional Characteristics of Teacher Preparation in Industrial Arts.* University Park: Pennsylvania State College, Doctoral Dissertation, 1941.

[13] John Bruce Tate, *An Analysis of Industrial Arts Education Curriculums in Fifty-One Selected Colleges and Universities in the U. S.* Stillwater: Oklahoma A & M College, Master's Thesis, 1949.

[14] Schwalm, *op. cit.*

485 teachers participating in the study, 184 believed industrial arts teachers did not need industrial experience. In another study[15] completed in 1949, it was learned that most industrial arts teachers do not believe industrial experience is necessary but thought the experience to be helpful. Those who indicated a belief that industrial experience is necessary, had industrial experience themselves. Other parts of the study proved that industrial arts teachers believed those characteristics and experience to be most worthy if they possessed them. Both the Seefeld and Schwalm studies indicate that greater emphasis is being placed on objectives which make the industrial arts person a teacher first and an expert on the subject of industry and the processes of teaching second. Schwalm asked the question if too much time was spent on the academic. Of the 477 respondents 209 said "yes," 268 said "no." Remember that teachers of manual arts at one time had little or no academic preparation. Much progress toward preparing the industrial arts teacher as an educated man has been achieved.

Teachers believe that the general subjects required by most colleges are greater than necessary. They also believe, contrary to newspaper articles, that all professional education courses required should be increased with the exception of educational psychology and principles of secondary education. Technical education courses requirements are *considerably* lower than they believe necessary.[16] Most new teachers feel insecure in their subject field rather than in professional education or general education.

Robert L. Thompson, in the Fifth Yearbook, 1956, of the *American Council on Industrial Arts Teacher Education*[17] generalizes as he describes the curriculum. Approximately 60 units of general core area are required. Twenty units of educational theory, including student teaching constitutes the professional requirement and approximately 50 units are required in the major. Thompson's proposal assumes a graduation requirement of about 130 units.

[15] Kermit A. Seefeld, *The Competences of Industrial Arts Teachers.* Stanford: Stanford University, Ed. D. Dissertation, 1949.

[16] Schwalm, *op. cit.*, p. 123.

[17] Robert L. Thompson, "Concepts of Curriculum and Method," *Problems and Issues in Industrial Arts Teacher Education,* Fifth Yearbook, American Council on Industrial Arts Teacher Education. Bloomington: McKnight & McKnight Publishing Company, 1956, p. 94.

PROBLEMS, TRENDS, AND PROPOSALS.

Introduction.

Colleges and universities have for years placed more emphasis on their custodial function than on change or innovation. Accepting the assumption that progress is possible only via change, the following ideas are proposed for consideration. One further admonition, studies have been cited which portray averages. It is hoped that changes which are made in the future will not only be in the direction of conforming to the average but rather change which will raise averages or establish new standards in the industrial arts profession.

Objectives.

The prime objective of teacher education since its beginning has been one of preparing people so that they could expertly and effectively teach young students. Obviously it is necessary for teachers to be educated individuals. Also, they are expected to learn the art and science of teaching, and they must be specialists in a subject area. These objectives have not changed except that research has provided more information on how to teach, and our subject, industry, has changed at an unbelievable rate. If our subject, industry, is to be taught as general education, the industrial arts teacher must become more liberally educated.

Curriculum and Method.

It has already been indicated that the industrial arts teacher education program needs more general education, more professional education and according to the classroom teachers decidedly more technical education. A ready solution to the problem would be to extend the program to five years. Others would suggest a Master's at the termination of the fifth year. Secondary school salary schedules will definitely influence a decision in favor of the Master's Degree. Idealistically, no one should worry about degrees but rather preparation for a very important responsibility.

Industrial arts teachers rarely fail because of the lack of technical know-how.[18] They do become conspicuously inadequate, how-

[18] Theodore S. Ellenwood, *Problems of the Beginning Industrial Arts Teacher.* Claremont, Calif: Claremont Graduate School, Master's Thesis, 1950.

ever, because of not being truly educated people. Is it not true that the industrial arts teacher can by summer session, summer work in industry, or self study and practice achieve all the technical know-how he needs? It is also true that psychology and method can be acquired after graduation by observing and reading books. Surely general or liberal education can be acquired by the same method, but is the industrial arts teacher likely to do so?

Is there truth in the statement, "teachers teach as they are taught"? Probably there is, even though teacher educators point out that higher education is concomitant with the trade or professional school and is primarily interested in the ultimate amount of knowledge and skill acquired by the student. Surely the teacher educator should motivate, but is his job the same as the secondary teacher? It is not, for the college student is older, has made a choice of life's work, and is highly motivated. It is unfortunate then that he should mimic his college professor.

By the same rationale, high school courses mimic college courses– same wood, same projects, only bigger and better. Maybe the teacher education curriculums should be reviewed with the thought that there may be a better way. Could a future teacher be taught the things he needs to know by a series of courses in (1) planning, (sketching, drawing, design and invention), (2) materials, (all the materials of industry–some not now used in industrial arts), (3) processes (all the processes–some are identical for several materials), (4) power, (hand, manual, machine, natural, atomic), and (5) measurement?

We might propose yet another: (1) planning, (2) cutting, (3) forming, (4) fabricating, (5) financing, (6) finishing, (7) power, and (8) merchandising. A course in organization management and method must be taught in the areas in which a student will teach in the secondary schools. This course would be taught at the termination of his work just prior to employment.

Substantial evidence does exist to prove that a course in general shop should be taught in higher education.[19]

We read about problem solving. What method is used in teacher education? Should a school board call you, an expert in industrial arts, and describe a progressive industrial arts program, the industrial development research type which they hope to begin, could you truthfully tell him you have a candidate who could fill the position? You may

[19] Schwalm, *op. cit.*

have a good candidate, but he would be conventionally educated. You would hope that he could succeed because of the individual initiative and ingenuity.

The study conducted for this Yearbook indicates that of the 112 institutions responding, 120 to 130 units are usually required for graduation. An average of 42 semester units are required in the major. One institution required as few as 24 units and one required 74 units. It is difficult to determine if some methods courses or professional courses are included as part of the 74 units. If the courses in question carry an industrial arts number such as I.A. 190, rather than Ed. 190, the courses can appropriately be listed as a departmental requirement, although in reality it is a professional course.

In the institutions studied, the requirements in four general education subjects are as follows:

Area	Ave. Units Required	Lowest No. of Units Required	Highest No. of Units Required
English	11	4	19
Social Science	12	6	28
Math	3	0	10
Science	9	3	18

Generalizing, it is fair to state that the industrial arts teacher is being prepared for his professional responsibility commensurate with other teachers, that he is better educated than his predecessor, probably not because of pattern of work, but because of better quality education. Trends indicate he will be even better prepared in the future when certification will demand five years of preparation.

Methods courses must be taught in terms of principles rather than a bag of tricks. Regardless of number and quality, tricks will one day fall short. Principles intelligently applied will function, at least to a degree in all instances. Classes in the teaching of a subject, woodwork for instance, should be taught by the industrial arts faculty, but the general methods courses might be better taught by an industrial arts professor, or professor of education who has a broad perspective, preparation and experiences demanded for the responsibility.

Students report that education courses duplicate one another. In fact, the indictment is more severe in some instances—they (the courses) are all alike. What duplication does exist may be because of the limited literature in the field, and secondly because of programming which requires one person to teach a series of professional courses. Surely, a professor will repeat himself. If at all possible, each professional course should be taught by a different professor, thereby eliminating the presentation of advice, concepts and admonitions in the same terminology.

Trends indicate that there will be more emphasis on method. We might take a look at the Russian potential teacher who spends 248 clock hours on drawing and the method of drawing.[20]

Faculties.

Success achieved in industrial arts is in large measure dependent upon the industrial arts teacher education program. It follows that improvement of industrial arts or improvement of industrial arts teacher education depends, for the most part, on the faculty in industrial arts teacher education programs. What sort of a person should he be? First, he should be a healthy, personable individual. Next he should be liberally educated—liberated from ignorance and prejudice. He should have had ample professional education—through the Doctor's Degree, if possible. Some time during his career, he should have worked in industry and should have taught at least five years in the public secondary schools. In addition, he should be intellectually alive and curious, morally sound, ambitious and possess an attitude which will force him to achieve. The profession needs this type of man and is willing to pay him less than a skilled laborer can earn in industry. How do we solve our problem?

Fortunately for the profession, educators assign values different from other professional people. In seeking qualified employees, we speak of fringe benefits, free time, opportunity for self improvement, opportunity for advancement, opportunity for research, service to society, pride in work, freedom to plan and execute the job, pride in employer, feeling of security, general atmosphere, variety of responsibility, prestige, working conditions, type of associates and independence.[21]

This idealistic approach does not infer that current salary schedules are acceptable. Whenever the Russian pattern for education

[20] Raymond L. Klein, "Teacher Education: U.S.A. & U.S.S.R.," *The Journal of Teacher Education,* Vol. XI, No. 1, March, 1960, p. 21.

[21] Walter E. Goff, *A Study of Certain Incentives in Attracting and Retaining Teachers.* Los Angeles: University of California, Ed.D. Dissertation, 1959.

is mentioned, we should endorse certain aspects of it with gusto—particularly their college professors salary schedules.[22]

Professors salaries have been creeping up slowly but increases are no guarantee of maintaining quality in the future. Obviously we are asking for more experience and preparation than expected of the average professor and are, at the same time, competing with industry for their services. The great growth in college education is about to begin.

It could well be that institutions of higher education will be forced to employ industrial arts teacher education professors at higher academic rank than indicated for the average. Certain areas of the nation cannot employ a master high school teacher with five or more years of teaching experience because the secondary school salary schedule is higher than the college or university for the academic preparation and experience in question.

Salaries of professors as indicated by the National Education Association Research[23] are about six per cent higher than two years ago, but in some instances are less than those received by their 1960 Bachelor's Degree graduates who accepted employment in industry. The survey also indicates percentages of faculty in each professional rank and the average salary.

Rank	Percentage	Median Salary
Professors	20	$ 9109.
Associate Professor	24	7332.
Assistant Professor	31	6231.
Instructors	19	5095.

Instructors who usually carry the largest teaching load receive, in some instances, as little as $4,710 per year. Any graduating student in industrial arts can acquire innumerable positions in industry which will pay more and in many instances can secure a position in secondary schools at a higher salary.

What does this information portend? Will the collegiate program sacrifice quality as less capable professors accept responsibility? Again, we should turn to industry for help as we seek social recogni-

[22] Association for Higher Education, *Current Issues in Higher Education.* Chicago: The Proceedings of the Fourteenth Annual National Conference on Higher Education, 1959, pp. 52-57.

[23] "Salaries in Higher Education," *NEA Journal,* Vol. 49, April, 1960, p. 3.

tion and also for financial assistance in the form of scholarships, research grants, and chairs for outstanding professors.

Eight hundred and thirty-three professors teach in the 118 institutions responding to the study conducted for this Yearbook. Two hundred and one, or twenty-four per cent of the industrial teaching faculties have the Doctor's Degree. Five hundred and thirty-eight hold the Master's Degree which represent sixty-five per cent of the whole group. Seventy have earned the Baccalaureate Degree, or eight per cent of the group, and twenty-four or three per cent, apparently do not have a degree. This three per cent, in some instances, may not truly be classified as faculty, but are rather teaching assistants. In a number of instances, outstanding craftsmen who are born teachers have been making a great contribution regardless of limited academic accomplishment. A number of these people have earned units of credit far in advance of what is required for degrees but have been victimized in securing a degree.

Facilities.

Evidence exists to prove that the collegiate program in industrial arts has fared well in terms of securing facilities. Many new and decidedly adequate buildings have been constructed in the last ten years. Equipment has been provided to complement buildings. Admitting that great progress has been accomplished in acquiring facilities does not infer that all programs in the country are decidedly adequate. Many lack laboratories and classrooms in which to accomplish their goals. Milestones achieved via new facilities will serve as a standard to all lesser programs.

There is much to be accomplished and so little time. If laboratories were open to students at all times we would accomplish more. Science and engineering do, why should industrial arts be different? Your voice of protest can be heard. What about loss of tools; what about accidents? All students will in the future, some in a few months, be the sole custodians of a laboratory and will not only be responsible for their own safety but for that of a hundred or more students. Students should cultivate the habit of being in a laboratory at times other than during class.

Students.

The destiny of the nation rests in the hands of teachers. What then is the responsibility of the industrial arts teacher education program? The best efforts in the world will not produce outstanding results unless students in the programs are scholars, technicians, and gentlemen. Now, as in the past, teacher education institutions have faced problems in recruiting outstandingly capable young men. High school counselors direct capable young people into the prestige professions and not teaching. In addition, the potential industrial arts teacher needs not only intellectual ability in the realm of books but he needs intellectual and physical ability in the realm of things as well. Consequently, the persons who are qualified are fewer. Also, students are forced by university and college entrance requirements to take solid courses, hence, the potential industrial arts student cannot, because of the lack of opportunity, take subjects in his major. If the student takes industrial arts subjects which he likes, he may be victimized as he seeks admittance to higher education institutions. Either his industrial arts classes taken in high school will not meet the entrance requirement pattern or his industrial arts courses (not solids) are not counted for scholarship. Art, music, home economics, and physical education are victimized similarly. Colleges and universities should accept work in the student's major as worthy for entrance requirements both for pattern and for scholarship.

Much could be accomplished in the realm of recruitment of capable young men if the profession cooperatively faced the problem. We are living in a technological culture where the machine is a very important and ever-present part of everyone's life. Yet, industry has not realized the potential in good will, understanding, and appreciation which can be achieved through the secondary school industrial arts program. A few industries have seen the light. Ford Motor Company's Industrial arts Awards, Fisher Body's Scholarship Program and Chevrolet's Soap Box Derby are cases in point. The American Manufacturers Association and industrial organizations should begin an action program by (1) starting a scholarship program, (2) beginning a recruitment program, and (3) launching a campaign to raise the prestige of the teacher who presents industry to the people of the nation in the classroom.

Assuming the most capable people can be recruited for industrial arts teachers, what is the responsibility of the teacher education program? What sort of a person should the secondary industrial arts teacher be when he leaves the institution of higher learning?

He should be a person in whom a thirst for knowledge, concept, and idea has been created. He should be intellectually and mechanically curious. He should have learned a body of facts which have been organized as knowledge and he should be capable of implementing his knowledge so as to demonstrate wisdom. In addition, he should have creative potential, a sense of wonder, an urge to explore and a restless mind. One might ask if this person can be prepared in the courses now offered in existing programs. Probably not, but the profession should continue to strive for higher goals. Most of the success of this part of the students' preparation is dependent upon the attitude and ability of the teacher education faculty.

Growth.

Available evidence would indicate that the industrial arts teacher education profession will be busy in the future. Figure 1 (page 67) indicating the growth in number of industrial arts teacher education institutions has increased by a steady rate since 1900. Projecting the growth curve we have reason to believe that one to three additional institutions of higher education will begin to offer teacher preparation in industrial arts each year.

Population has increased in one year (October 1, 1958 to October 1, 1959) from 175.6 million to 178.5 million persons or 1.7 per cent. During the same time the school population increased by 1.5 million or 3.6 per cent. Note that the rate of increase of the school population is much greater than the rate of increase for total population.

We are also aware of the fact that 10.9 per cent of the elementary and secondary teachers left their profession during the school year, 1957-58. This figure does not include teachers who transferred from one school to another. The separation rate (which included transfers) during the same period reached seventeen per cent of the average number of teachers employed during the same year.

According to the annual report of teacher supply and demand by the National Education Association[24], the present graduates of industrial arts teacher education programs are more than sufficient. Industrial arts is rated sixteenth in the order of demand. During the year 1958, 1,144 new teachers were prepared while the demand for new teachers was 965. We should remember, however, that national statistics indicate that only three quarters of the newly prepared teachers accept teaching positions immediately upon graduation.[25] Knowing

[24] *Teacher Supply and Demand in U. S.* Washington, D.C.: National Education Association, Research Division, Annual Reports.

[25] *Ibid.*

that industrial arts graduates are able to succeed in industry in greater measure than the rank and file teacher graduate, we have reason to believe that more than one quarter of the industrial arts graduates do not teach. As a result, industrial arts shortages become all the more acute. An economic recession and concomitant unemployment may cause many certified industrial arts teachers to return to the profession.

Should the people of this country continue to be influenced by education patterns adopted by Russia, we can look forward to great emphasis in technical education as well as the study of industry for the sake of general education. Literature prepared for both the layman and professional educators are replete with evidence of the Russian emphasis on technical education and the study of industry.[26]

Another factor which will affect the supply-demand rate is the class size. Pupil-teacher ratio has decreased slightly from 26.1 pupils per teacher in 1958 to 25.8 in 1959.[27] If the American people believe in education and are willing to support the venture, class sizes will continue to decrease; thereby, creating an even greater demand for teachers.

Secondary school population is increasing (5.5 per cent 1958-59) more rapidly than the elementary (2.6 per cent).[28] This data indicates in part the fact that a greater percentage of students will continue their education through the high school, which will increase teacher demand.

We face yet another problem in the realm of teacher supply and demand. Our social and economic demands during the past two wars have caused the teaching profession to yield to sub-standard certification as a method of meeting an emergency. If education is to be improved, sub-standard certification must be eliminated. In the fall of 1959, 98,800 full time teachers did not have a regular teaching certificate. More disturbing is the fact that the 1959 figure represents an increase over the 1958 figure.[29] Should the people of the United States

[26] Association for Higher Education, "Russian Education Re-examined," *Current Issues in Higher Education.* Chicago: The Proceedings of the Fourteenth Annual National Conference on Higher Education, 1959.

[27] Samuel Schloss and Carol Joy Hobson, *Enrollment, Teachers and Schoolhousing.* Washington, D.C.: U.S. Government Printing Office, 1959.

[28] *Ibid.,* p. 2.

[29] Schloss, *op. cit.,* p. 4.

decide that only qualified teachers should be employed in the future, the present supply of industrial arts teachers would become conspicuously inadequate.

At this date in the 118 institutions responding to the study conducted for this Yearbook, are 15,656 majors of whom 8,416 are potential teachers. There are 3,053 studying for industry and 1,181 are unclassified. It would appear that the industrial arts teacher education profession is growing and will provide teachers for the schools of the nation in spite of attrition suffered through drop out and loss to industry and in spite of population growth, change of educational emphasis and hoped for smaller classes.

Prestige.

One of the problems of industrial arts teacher education is the hardship suffered by lack of prestige. Why does industrial arts rate low in the academic hierarchy of respectability? If one seeks a reason for what appears to us as an injustice or phenomenon, we find that we suffer for three reasons: (1) we are not academic purists, (2) we are relatively young, and (3) we are victimized by limited research.

Speaking to the first accusation, it should be noted that some of the most highly respected higher education specialties involve the body as well as the hand. Think of the activity of the medic, (surgery specifically) artist, musician, laboratory scientist, engineer; yes, even the attorney and orator. Accusations are made which brand us as all body or hand. However, in industrial arts an either/or thesis does not exist, but rather the harmonious cooperation of mind and body which in truth is education at its best.

It is true that our research is limited and the quality permits improvement. Most of our teacher education institutions are fifty years or less old. How much and what type of research existed in the fields of chemistry, physics, and engineering when their disciplines were but 50 years old? Admittedly, we represent a young profession which the world cannot expect to emerge full bloom at the time of introduction. Research and concomitant quality evolve in an ascending order. Give industrial arts time and it, too, will have extensive and quality libraries.

Let no one use this rationalization as cause to relax. We do lack research and libraries and all should realize that respectability and quality will be achieved by aggressive cooperative efforts.

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PART TWO

Industrial Arts Graduate Programs in Action

Part II of this Yearbook is devoted to a study of industrial arts graduate programs. In the discussions which follow the authors portray the historical background of graduate education as it has developed in industrial arts. The relationship between existing programs is defined. Present trends in research and examples of current programs are evaluated and serve as points of departure for speculations concerning the future of industrial arts graduate education.

CHAPTER VI

The Evolution of Graduate Work in Industrial Arts

Karl Schulz
San Jose State College

Graduate study in American universities dates back into the seventeenth century. Graduate instruction in these early days followed the English and European practice of conferring the "earned" Master's Degree on their own graduates of three years' standing with good moral character — after pursuit of professional or other studies and payment of a fee. "Before the middle of the nineteenth century American colleges and universities seldom offered what would be regarded today as substantial graduate work." [1]

The first *earned* Ph.D. was conferred in 1861 by Yale University, fifteen years prior to the founding of the first graduate school, Johns Hopkins University, in 1876.

During these developmental years of graduate study in the United States, industrial arts, then referred to as manual training, was being established in the public schools. "Teachers were recruited from craftsmen in industry or from academic teachers, already employed, who were handy with tools and who had an interest in this new teaching area." [2]

[1] Carter V. Good, "History of Graduate Study in Education," *Graduate Study in Education,* 50th Yearbook, Part 1. Chicago: University of Chicago Press, 1951, p. 3.

[2] Heber A. Sotzin, "The Problem of Graduate Study in Industrial Education," *Industrial Arts and Vocational Education,* Vol. 46, No. 8, Oct. 1957, p. 235.

The need for trained teachers quickly became obvious as manual arts expanded. Its role and function within the educational structure was only partially defined. Many problems dealing with teaching objectives, content, and methods remained unanswered. In order to raise the program to professional status and seek answers to the many specialized problems facing manual arts, a need for post graduate and research programs in this area developed.

Graduate study in industrial education had an early beginning in one American university. Shortly after Teachers College became a part of Columbia University (1893), the graduate program of the College was considered. Charles A. Bennett, directing the manual arts program at the College, included his offerings in the over-all graduate program accepted by the University.[3]

The development of graduate programs proceeded very slowly during the early years of the twentieth century. Prior to the first world war, "....there were only three or four men in the United States holding the Doctor's degree whose graduate major had been in vocational education, using that term in a broad, inclusive interpretation."[4]

The need for graduate programs continued to increase. Industrial educators took their problems to the graduate divisions of various colleges and began the laborious tasks of justifying manual training as an area worthy of graduate work. The colleges and universities began to listen, but with caution, as described by an anonymous author in 1920:

> When a great university opens its doors, even for a few inches, to manual arts courses, we always feel like taking a holiday to celebrate. Inch by inch American Universities have set their doors ajar to manual arts and have allowed them to count toward degrees. This is very encouraging even though an armed guard is still stationed at the door to scrutenize each course as it enters. It still enters on suspicion." [5]

One of the first major universities to offer a graduate degree with a major in manual arts was the University of Wisconsin. In 1920,

[3] Charles A. Bennett, "Then and Now," *Industrial Education Magazine,* Vol. 39, No. 5, Nov. 1937, p. 272-273.

[4] ----------, "Leaders in Industrial Arts, Industrial Education, and Guidance Who Hold Doctors' Degrees," *Industrial Education Magazine,* Vol. 37, No. 3, May, 1935, p. 146-147.

[5] ---------- "The Master's Degree in Manual Arts," *Manual Training Magazine,* Vol. 21, No. 10, June, 1920, p. 345.

the graduate faculty of the University authorized the granting of the Master's Degree to students having manual arts as their major subject.[6] Bennett, commenting on the University of Wisconsin's authorization of the Master's Degree stated:

> When a conservative university faculty recognizes the manual arts by giving them place among its graduate courses, it is an event worthy of notice ..... It has required years of persistent effort and efficient departmental teaching to bring this about .... Now all vocational fields are recognized officially in the graduate school. There is no longer any barrier preventing students in these fields[7] from working for the Master's and Doctor's degree.[8]

Other schools began to offer post graduate courses and develop graduate programs in industrial education.[9] Students traveled long distances to attend schools offering graduate study. In 1932, Iowa State College brought together a group described as the largest group of industrial education post graduates in the country. The enrollment included fifty-six candidates for the Master's Degree, representing sixteen different states.[10]

Oklahoma A. & M. organized their graduate program in 1932. In June of their first year, nine candidates completed work for the Master's Degree, followed by thirteen more at the end of the summer session.[11]

[6] *Ibid.*, p. 345.

[7] The passage of the Smith-Hughes Bill plus the introduction and acceptance of the term "industrial arts" resulted in the development of the terminology now accepted in the profession. At the same time, the terms manual training and manual arts were officially discarded, even though they have remained in limited use.

[8] Charles A. Bennett, "Editorial Comments," *Industrial Education Magazine*, Vol. 24, Feb. 1923, p. 229.

[9] Most of these early programs were developed and supported by the trade and industrial phase of vocational education. Industrial arts was integrated with trade and industrial offerings into industrial education. Otto Hankammer pointed out this trend in his doctoral dissertation, written at Ohio State University in 1936 when he stated, "Many more institutions appear to be offering graduate work of a vocational industrial nature than graduate in industrial arts education. The reason for this, in part, may be that such courses are federally aided."

[10] ———— "Graduate Students at Iowa State College," *Industrial Education Magazine*, Vol. 34, No. 3, Sept. 1932, p. 3A.

[11] ———— "Industrial Education at Oklahoma A. & M. College," *Industrial Education Magazine*, Vol. 34, No. 12, June, 1933, p. 3A.

The emphasis on post graduate industrial education gained momentum. In 1933, William T. Bawden conducted two graduate courses at the State Teachers College, Pittsburg, Kansas while Charles A. Bennett taught the summer graduate program at Iowa State College.

In November, 1934, the *Industrial Education Magazine* published a list of the name of men who had earned their Master's Degree in industrial education. This was followed by lists of Doctor's Degrees granted, degrees earned by administrators, etc. It was hoped that industrial educators would be encouraged to "prepare themselves for higher types service" by seeing what their colleagues were accomplishing.

While considerable emphasis was being placed on the development of graduate programs leading to the Master's Degree during the early thirties, some attention was also being focused on the doctorate. The Committee of the Manual Arts Conference of the Mississippi Valley reported in 1930 that there were "fewer than ten institutions in the United States offering work leading to the Doctor's Degree, and providing adequate facilities for graduate majors' study in these fields."[12] Doctoral programs were being developed, but at a much slower pace than Master's programs.

The need for graduate education continued to develop during the thirties as educators began accepting the Master's Degree as a requirement for teaching. This position was emphasized by Chris Groneman when, in 1938, he pointed out that "in this present period of professional expansion, many schools demand that the applicant has a Master's Degree for even a teaching position. Many teachers forget that they are living in an age when the educational requirements of the teachers of the past are no longer looked upon as sufficient."[13]

Roderick Kohler found that the greatest spurt of growth of graduate programs occurred after 1945. Other dates which saw rapid development of graduate study were 1926 - 1931 and 1936 to 1941.[14] It might be assumed from these figures that graduate study in industrial

[12] ———— "Teachers in the Industrial Arts, Industrial Education, and Guidance, Who Hold Doctor's Degrees," *Industrial Education Magazine*, Vol. 37, No. 3, May, 1935, pp. 146-147.

[13] Chris H. Groneman, "Some Values of the Master's Degree," *Industrial Education Magazine*, Vol. 40, No. 5, Nov. 1938, p. 238.

[14] Roderick G. Kohler, *Status and Trends in Graduate Industrial Teacher Education in the United States*. Columbia: Ed.D. Dissertation, University of Missouri, 1952.

education became a recognized part of this country's educational program in the late twenties and has grown steadily, with interruptions occurring only during the depression years and the second world war.

Ray Doane and H. H. London reported the results of a compilation of Master's and Doctor's Degree granted in industrial education between the years 1930 - 1955. This report only included Master's Degrees containing a thesis requirement.

Doctor's Degrees Granted with Emphasis in Industrial Education[15]

1930 - 1948	163
1949 - 1950	69
1951 - 1955	139
Total	371

Master's Degrees with Theses Granted with Emphasis in Industrial Education

1930 - 1955	3,420

Since many graduate programs offer Master's Degrees which do not contain a thesis requirement, the ratio of nine Master's Degrees to one doctorate during the twenty-five year period reported is well below the existing situation. The ratio might be as high as twenty or thirty to one if all Master's degrees were counted.

Graduate programs in industrial education are well established in many of the major universities and colleges in the country. The post war years have seen a major increase in the number of candidates. In many states, the Master's Degree or its near equivalent of a fifth year of post graduate education are minimum requirements for all teachers, including industrial arts.

In the past, graduate education in this area has usually followed an integrated path in which industrial arts is joined with trade and industrial education. During recent years, many programs emphasizing only industrial arts have been established. In general, they are Master's Degree programs. In a few cases, however, doctorates with an emphasis in industrial arts are being offered. The future growth of graduate education in this area may well be concentrated in the expansion of graduate study in industrial arts education.

[15] Ray C. Doane and H. H. London, "Doctor's and Master's Degrees with Theses Granted in Industrial Education, 1930 to 1955," *Industrial Arts and Vocational Education,* Vol. 46, No. 4, April, 1957, pp. 115-116.

CHAPTER VII

The Relationship Between Undergraduate and Graduate Programs in Industrial Arts

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The assumption that there should be a close, clearly discernible relationship between undergraduate and graduate study in a given field is so obvious as to deserve no more than a passing comment. Just what this relationship *is* in the field of industrial arts, as suggested by current practice, cannot be clearly indicated, however. The points of view concerning the appropriate relationship between undergraduate and graduate study in industrial arts are so numerous and diverse that consensus as to what this relationship *should* be has never been achieved. The difficulty in identifying an appropriate relationship stems from: (1) the fact that practice in industrial arts at the collegiate level provides only the slightest hint as to what undergraduate work is in this field and throws even less light on the question as to what constitutes graduate study, and (2) the equally obvious fact that there is no theory which enjoys understanding and acceptance sufficiently widespread to result in anything even approaching consensus concerning what undergraduate on the one hand and graduate study on the other should be.

The problem then is not merely a matter of discrepancy between practice and theory. The basic problem is with theory. Until this problem is resolved, one may anticipate that any and everything may go on under the name of industrial arts, not only in undergraduate and graduate programs conducted in the college and university but in the elementary and secondary school as well. This assumption dictates the emphasis which is to characterize the present treatment of the relationship between undergraduate and graduate programs in industrial arts. Emphasis will be placed upon what the relationship should be, rather than upon what programs, as they now operate, indicate this relationship to be. There will be more attention afforded developments which the future demands than an analysis and evaluation of past and present programs.

In treating the problem, certain issues will be taken into account, a position will be taken with reference to each, and the factors and considerations affecting the proposed resolution will be presented. Finally, an attempt will be made to develop guiding principles and policies which may be useful in the establishment of an appropriate relationship between undergraduate and graduate study in industrial arts. Although some reference will be made to surveys and studies which have been reported, there has been no attempt here to survey practice or assess points of view by sending out questionnaires or circulating any other devices.

One important limitation must be recognized if there is to be a direct attack upon the problem of outlining an appropriate relationship between undergraduate and graduate study in industrial arts and if this relationship is to be clearly indicated. The concern here is only with industrial arts undergraduate and graduate curricula whose clear purpose is that of preparing industrial arts teachers, supervisors, and other professional personnel in the field of industrial arts proper. Excluded from consideration are such courses, curricula, and activities as the following ones in which personnel engaged primarily in industrial arts teacher education become involved in many institutions: industrial arts courses of a service nature for elementary majors, physical education majors, prospective science teachers, occupational therapy majors, etc.; industrial arts offerings at the college level for general education purposes; and the programs offered by an increasing number of college industrial arts departments for students who seek preparation for some type of industrial employment. The name and the professional interests of the Council which sponsors this yearbook suggest that this limitation imposed is appropriate.

Industrial Arts and Industrial Arts Teacher Education

Reasons have been stated for limiting this discussion to the relationship between undergraduate and graduate programs which have as their purpose the preparation of industrial arts teachers and other professional workers in this field. A systematic treatment of the relationship of undergraduate and graduate programs demands, however, that consideration be given the elementary and secondary school programs of industrial arts for which the industrial arts teacher education programs prepare instructor and supervisory personnel.

Industrial-arts teacher educators take great pride in being "practical" people. What is taught in the industrial arts programs in the public schools, the methods employed, the conditions under which industrial arts is taught, the facilities in use, and the teaching combinations sought by employing officers have been surveyed over and over to obtain data to be used as a basis for planning industrial arts teacher education programs. Frequently this admonition is heard: "This is what is going on in industrial arts, and these are the demands of the current elementary and secondary school positions in industrial arts. We must prepare people for the kinds of jobs and for the conditions which exist in the public schools."

A review of the various surveys which have been conducted, participation in numerous professional meetings involving industrial arts personnel, visiting public school programs of industrial arts in many communities, examination of brochures descriptive of these programs, observation of the work displayed in industrial arts exhibits, and the expression of many urgent pleas for improvements in industrial arts suggest that all is not well in this field of work in the American school. There are industrial arts teachers who conduct programs which undoubtedly represent education of the highest quality. These imaginative teachers and their outstanding programs are in such a small minority, however, as to influence only slightly the image of industrial arts as perceived by school people in general and by the lay public.

There is no point in enumerating the many weaknesses which characterize all too many industrial arts programs. It is important however, that industrial arts teacher education personnel acknowledge the major weaknesses where they exist. Further, since the graduates of industrial arts teacher education departments are the ones who conduct the weak as well as the outstanding programs in the public schools, teacher educators must accept a major responsibility in connection with whatever weaknesses there are. Each generation of industrial arts teachers must receive preparation superior to that afforded the preceding one if continuous improvement in industrial arts is to be effected.

Important to the effective planning and development of industrial arts teacher education programs is a clear conception of what the objectives of industrial arts should be and the essential emphases which characterize the program which will achieve these objectives. While deriving objectives and building a program to achieve them are tasks which demand the best efforts of all members of the profession, the following are presented as one attempt to characterize industrial arts and indicate the direction in which it should develop: [1]

1. The fact of technology as the dominant element in the culture and the social complexities which it brings will be afforded increasing importance in deriving educational goals. While numerous activities in the school will be responsive to this, consideration of the technological aspect of the culture will lead to a central, integrating purpose in industrial arts for the great majority of youth who study industrial arts at the junior and high school levels. Thus, the commonly accepted definition of industrial arts will require little alteration; but contrary to what has occurred in the past, there will be acceptance of a central purpose consistent with this definition. There will be as much emphasis upon the applications of mathematics and science to the solution of technical problems whose solutions involve tools, materials, and equipment as time, age, and ability level permit. This will be done, not primarily because of the need for more technicians, but to enable pupils to experience as much of the technological aspect of the culture in which they live as can be reflected in the school. [2]

2. Emphasis upon the development of the potentialities of the individual will be of the same order in industrial arts as in all other aspects of education in the school in a democracy.

[1] Adapted from: M. R. Karnes, "Improving Industrial Arts Education," *Industrial Arts Teacher*, Vol. XIX, No. 5, May-June, 1960.

[2] For an example of the type of curriculum research needed, see: Delmar Olson, *Technology and Industrial Arts*. Columbus: Ph. D. Dissertation, Ohio State University, 1957.

3. The major purpose of activities in the elementary school which have been termed industrial arts will be to further the basic objectives of the elementary school, rather than to further objectives which may be considered as being uniquely those of industrial arts.

4. The hobby-recreational objective will be no more important in the industrial arts program conducted as a phase of the basic education of youth than will be the case in numerous other subjects which have potential for leading to interesting, worthwhile hobbies which lead to effective use of leisure time. This objective will receive attention, but will not be allowed to detract from the central purpose. There will, however, be special industrial arts offerings where the hobby-recreational objective will be the major consideration. The great majority of these offerings will be for adults with whom there is a good prospect of achieving this objective.

5. Home planning and maintenance and the handy man skills associated therewith will disappear as emphases in the upper elementary and junior high school industrial arts offerings. These will quite appropriately become major emphases, however, in special industrial arts programs conducted for people who have already or will soon become homemakers. The consumer education emphasis will also be strong here.

6. The troublesome conflict between industrial arts and vocational-industrial education will be resolved. Industrial arts will be perceived as bearing essentially the same relationship to occupational life for youth headed for industrial employment as do such subjects as mathematics, science, and communications.

7. For some youth who are headed for college, quite advanced industrial arts courses will stand alongside the most advanced courses in mathematics and science as pre-professional offerings. This will become increasingly important for prospective engineering students as the current trend toward the elimination of drafting and other applied courses in engineering curricula is projected.

8. Manipulative skill development will continue as a prime objective. Every pupil will be encouraged to perform every task he undertakes at the highest level of skill performance which time permits. Time will not be devoted to skill development for the sake of skill alone, however.

9. The guidance function will be a total school responsibility. Industrial arts will share in this on the same basis as other school offerings related to the world of work.

10. As the secondary school makes realistic provisions for the slow learner and the mentally retarded, some industrial arts and other practical arts personnel will join in developing for these groups an appropriate program which may comprise as much as half the school day. The purposes and the methodology of this program will be thoroughly consistent with the distinguishing characteristics and the major educational needs of this group. An important need of these groups will dictate a strong occupational emphasis. All industrial arts personnel entering either this program, occupational therapy, or manual arts therapy will receive special preparation for their work. It is doubtful whether these special programs should be called industrial arts, but some industrial arts personnel will make important contributions to their development.

11. Design will be defined as problem solving, and this will be recognized as a part of the content drawn from the technology. The methodology to be employed in industrial arts will accomplish the old purpose of providing creative and aesthetic experience in a way not previously achieved. Research, investigation, identification and solution of problems, evaluation and discovery will characterize method.[3] While these will receive more than the usual emphasis in courses for the very brightest pupils in the school, industrial arts teachers will learn that appropriate emphasis of them is important to the learning of pupils at all levels of ability.[4]

[3] Donald G. Lux, "The Role of Art in Industrial Arts," *Industrial Arts and Vocational Education,* Vol. 47, No. 5, May, 1958.

[4] See series of doctoral dissertations completed at the University of Illinois.

Willis E. Ray, *An Experimental Comparison of Direct and Detailed and Direct Discovery Methods of Teaching Micrometer Principles and Skills,* 1957.

John D. Rowlett, *An Experimental Comparison of Direct-Detailed and Directed Discovery Methods of Teaching Orthographic Projection Principles and Skills,* 1960.

Nelson Grote, *A Comparison of the Relative Effectiveness of Direct-Detailed and Directed Discovery Methods of Teaching Selected Principles of Mechanics in the Area of Physics,* 1960.

Jerome Moss, Jr., *An Experimental Study of the Relative Effectiveness of the Direct-Detailed and the Directed Discovery Methods of Teaching Letterpress Imposition,* 1960.

12. Some interesting developments will occur here and there in industrial arts for general education at the college level, but the major development will be in connection with part-time classes for adults.

13. Emphasis upon breadth, insofar as content is concerned, will yield somewhat to emphasis upon depth. This will be done in the interest of achieving both breadth and depth in the development of the individual. The general shop will undergo drastic change, with much greater emphasis upon depth, as content selection is accomplished through the rigorous utilization of valid criteria for selection. Exploration will be redefined, and some means other than the superficial sampling of a wide array of content areas will be employed to provide for exploration.

The assumptions made here about industrial arts and the directions in which it should develop are necessarily placed in the context of the good school. Even though the median school in America is still to small, too inadequately staffed, and too poorly equipped to make quality education feasible for all individuals and groups to be served, there is not much point in thinking or talking about significant improvements in industrial arts or any other phase of education in a setting other than one in which quality can be achieved. It seems appropriate that, before presenting proposals with reference to the undergraduate in relation to the graduate program in industrial arts, some assumptions be set forth concerning the kind of a school in which the graduates of industrial arts teacher education programs will function:[5]

1. The school of the future will serve an increasing proportion of the total population of a given age bracket. Only the most severely of the physically and mentally handicapped will be institutionalized. To illustrate, an increasing proportion of the totally blind and totally deaf will be provided for in the public schools. On the aptitude continum, pupils will range from the barely trainable to the very brightest in the population. Even though it was only during the 1950's that the educational level in the United States reached the point where fifty per cent of high school age youth actually completed high school, and not withstanding the fact that the drop-out rate resulting from efforts to raise the quality level of education reached alarming proportions in some communities during the past two years, the school of the future

[5] Adapted from: M. Ray Karnes, "Competencies Needed by the Industrial Arts Teacher to Meet the Challenge of the Future," a paper presented at the U. S. Office of Education Conference on Industrial Arts, June 20-21, 1960.

will see the great majority of youth through at least twelve years of formal education. The proportion of youth pursuing education beyond the high school will likewise continue to increase.

2. While some very difficult problems will be faced and some hard decisions will be made concerning purposes to which the school of the future should be responsive and the offerings and activities consonant with those purposes, the enrollment of an ever-increasing proportion of a given age group will mean that the school must be multipurpose in character and that offerings must be many and varied. The term "comprehensive" will be truly descriptive of the school, and multitrack programs will be made available.

3. To provide the necessary services and to make available to all the highest possible quality of education at a cost economically feasible, the school of the future must be large.

The Undergraduate Program

The undergraduate programs of industrial arts teacher education have lagged even farther behind what is required than have the public school programs for which teachers are being prepared. Survey after survey and one report after another have pointed out the inadequacies of industrial arts teacher education.[6] Rather than accent these inadequacies here, the approach is to project a conceptualization of what is needed in the way of an undergraduate teacher education in this field and to indicate its essential characteristics and emphases. In so doing, the assumption has been made that spelling out the program in terms of so many semester hours of credit required in each specific subject will be of little value.[7]

[6] For an example, see: Ray Alvin Schwalm, *Philosophy and Organization of Industrial Arts Teacher Education.* Corvallis: Ed. D. Dissertation, *Oregon State College* 1952. Schwalm sought, through the questionnaire as the device, information from and opinions of staff members of 120 industrial arts teacher education departments and 1433 experienced industrial arts teachers.

[7] *Ibid.* Schwalm's report illustrates the inadequacy of the survey of present practice and opinions concerning semester hours to be required as the basic approach to planning industrial arts teacher education programs. He reports that for each of 65 industrial arts technical (shop) courses listed, 51 or more of the 456 respondents indicated that the course should be required of all prospective industrial teachers in the four-year undergraduate program. Of this list of 65 courses, 36 were placed in the required category by 236 or more of the 456 respondents. He reports the mean number of semester hours these 456 respondents would require in each of the twelve technical courses to be completed by all general shop teachers. The sum of the means is 82.34 semester hours. What use can and should be made of such findings?

Teacher education is the weakest link in the total industrial arts program. Just how urgently major improvements are needed can be inferred from any systematic assessment of the total resources and the offerings of industrial arts teacher education departments in America, the adequacy of teacher education staffs, the facilities provided in industrial arts teacher education departments, the range and the variations which characterize the requirements to be met by students, the aptitudes and capabilities of students enrolled in industrial arts teacher education programs, the quality of work performed by these students, and the adequacy of their preparation for teaching in public school industrial arts programs of excellence. The need for improvement is obvious. Getting from where we are to where we should be in industrial arts teacher education is a major undertaking, no part of which will be easy. The following are presented as basic considerations and general guiding principles which may be helpful as members of the profession work energetically to bring about improvements urgently needed:

1. Teacher education should be the first order of business.

Personnel involved in industrial arts teacher education must make up their minds concerning the major function to which they are to be responsive. Preparing industrial arts teachers is a legitimate undertaking which has its own rewards. All too many college staff members employed to conduct industrial teacher education programs have permitted other interests to interfere with, and have dissipated their energies on activities only remotely related to, industrial arts teacher education. While there are important service activities which may contribute to the preparation of such professional personnel as occupational therapists and to a variety of teachers other than the ones who will conduct industrial arts programs in the public school, the central purpose of an industrial arts teacher education department is the preparation of industrial arts teachers.

Industrial arts teachers all over the country have faced the question: "If we do not prepare the industrial technicians so urgently needed, who will?" Their answer should be, in every case, "Someone else." The response actually given has, however, led to the promotion and development, in one industrial arts department after another, of either a two- or a four-year program which goes under some such title as "industrial technology" or "industrial education for industry" and which purports to prepare technicians. While there can be no quarrel with the decision made by the governing board and the administrative officers of an institution to develop such programs, this task should not be assigned the industrial arts department. Preparing personnel for industry is clearly not the function of industrial arts teacher education.

It is clear that industrial arts teacher education departments need to be upgraded quite substantially in a technical direction, but this is a development which should occur for the specific purpose of preparing industrial arts teachers adequately for the technical demands placed upon them as teachers in an industrial arts program of high quality. If industrial arts teachers are adequately prepared, technically, for teaching industrial arts, their services will be in demand in industry, but this is no reason for prostituting industrial arts teacher education.

2. Specific limits should be set.

If industrial arts is to acquire professional status, every person who assumes the primary responsibility for preparing industrial arts teachers, and every department so committed, must make some tough decisions about what is feasible and what can be done well. Specifically, the suggestion is that, in addition to guarding against the dissipation of energies in connection with activities not even remotely related to industrial teacher education, personnel committed to teacher education must make some difficult decisions concerning the kinds of industrial arts teachers they propose to prepare and for what kinds of positions.

3. Prepare teachers who will be intolerant of intolerable conditions.

There has been too much of an attempt to prepare teachers for the substandard programs which operate in many parts of the country, in both large and small schools. What the profession needs is a whole army of teachers who know what programs of excellence are like and who know how to conduct such programs. We should have teachers who are intolerant of inadequate programs and of the conditions under which they are conducted. We should have teachers who will let this intolerance be expressed through every legitimate and professional means at their disposal. Particularly, should these teachers go forth with the understandings, skills, and abilities which will enable them to prepare both short-term and long-range plans for program improvement.

4. Prepare teachers for the good school of the future.

Personnel engaged in the preparation of industrial arts teachers should get out of the business of attempting to prepare teachers for all kinds of industrial arts teaching assignments and all kinds of teaching combinations found in the small, inadequately equipped school. The school which is so small that it has need for only one industrial arts teacher who must teach in two or three additional fields to round out a full-time assignment is too small to provide a quality program in industrial arts or in any other phase of education. To attempt to prepare teachers for the conditions found in the kinds of schools which cannot meet the high demands placed upon education in our complex society represents the perpetuation of inadequacy rather than the pursuit of excellence. The way to make industrial arts of high quality available to a maximum number of America's youth is to concentrate upon the preparation of the industrial arts teacher who can earn his place as a respected member of a professional faculty in the good school of the future.

5. Depth and specialization should be encouraged.

The good school of the future will require the services of the industrial arts teacher whose preparation is characterized by substantial depth and a degree of specialization. Depth and specialization should be considered with reference to: (a) the age and grade level of the pupils the prospective teacher will serve, (b) the distinguishing characteristics of the pupils with whom he will work, and (c) the industrial arts subject matter area he will teach.

Space permits only a few examples. The industrial arts teacher who is adequately prepared for a professional assignment in the good high school of the future will be a specialist in the sense that he has real and substantial depth in whatever subject matter area he teaches and he has studied the problems of teaching at the high school level. If drafting is his area of specialization, he will be at least as competent, technically, as is the best drafting technician in industry and thus possesses a higher order of skill and technical competence in the area of graphics than does the typical engineer. He will not be called upon, and will not be expected, to teach machine shop, auto mechanics, cabinet making, power and transportation, and electronics in the high school. He is not prepared for teaching general shop in the junior high school. He would not be called upon to teach in the industrial arts program in the junior high school any more than would the high school teacher of chemistry, physics, or mathematics be given such an assignment.

The preparation appropriate for the prospective teacher of industrial arts in the elementary school is another example of specialization. The activities of the elementary school with which the term "industrial arts" is frequently associated are conducted in response to purposes which more nearly coincide with the over-all purposes of the elementary school than with functions which are uniquely those of industrial arts. Therefore, the person responsible for these activities should be an elementary teacher first and an industrial arts teacher second. Insofar as the lower grades of the elementary school are concerned, he will function as a consulting teacher, and he must have the special competencies which enable him to meet this responsibility well.

There are some industrial arts purposes and some special programs which might be termed peripheral but which are, nevertheless, important. Each of these requires some special competencies on the part of the teacher who responds to each. If the hobby-recreational objective is a legitimate one, for example, the industrial arts teacher who seeks to achieve this purpose must have not only the broad preparation demanded of all industrial arts teachers, but he must, in addition, have much of the professional preparation of the recreational expert. If industrial arts personnel are to continue to move into the fields of occupational and manual arts therapy, they must, in order to perform their tasks well, possess the additional competencies required of the therapist. If industrial arts teachers are to develop special programs, along with personnel from other practical arts areas, for the slow learner and the mentally retarded, these teachers must become professional students of the problems of this particular group and they must be thoroughly conversant with the purposes of education of particular importance to this group.[8] These are only some of the examples in which special competencies are required in order to achieve particular purposes effectively.

[8] M. Ray Karnes, "Industrial Arts and the Education of the Mentally Retarded of Secondary School Age," a paper presented at the 1958 convention of the International Council for Exceptional Children.

6. A central purpose of industrial arts should dominate the technical offerings to be required of all industrial arts teachers.

The central purpose assumed here, as can be inferred from previous statements, is that of developing genuine insight into the technological aspect of the culture and developing skill in the solution of technical problems involving the use of the tools, materials, and processes characteristic of industrial endeavor. The major curriculum problem here is that of determining: (a) what tools, what materials, and what processes are most representative of the expanding technology; (b) which of these affect most directly the lives of producers *and* consumers; (c) which of these afford the greatest possibilities for posing and solving technical problems.

7. The total program pursued by the industrial arts teacher should provide a broad, fundamental education.

The advancement of knowledge and technology and the increasing social complexities accompanying this advance are making education of increasing importance to all people, both from the standpoint of living the full life and discharging the responsibilities of citizenship in a democracy as well as for the purposes of effective performance in occupational life. There is no occupation to which a broad education of high quality is more important than to the profession of teaching. While there has been a strong tendency to slight and even to look with disfavor upon studies whose contributions to teaching effectiveness in the industrial arts are not direct and obvious, there is no reason why the general education of the industrial arts teacher should be any less in scope, breadth, and rigor than that of any other teacher.

8. The general education phase of the curriculum should be structured.

The use of the device called "electives" has been heavily relied upon to "round out" the general education of teachers, industrial arts teachers particularly. While some latitude and some choices should be afforded, the recommendation here is that the teacher education curriculum be structured to the extent that the undergraduate major pursues studies in each of the following broad areas: the arts, literature, and the humanities; languages and communication; the physical and biological sciences; the social and the behavioral sciences; and mathematics.

Certain aspects of the general education phase of the curriculum should receive special emphasis. Just what part of the teacher's preparation makes him an educated man and what sets him apart as a truly professional person cannot be clearly indicated. It can be said with considerable assurance, however, that certain studies which are considered of value in the general education of all people have particular relevance to the preparation of teachers. Insight into the teaching-learning process is heavily dependent upon data coming from the behavioral sciences. One of the most urgent needs in the area of industrial arts is to upgrade the program technically. The basic, distinguishing characteristic of technology is the application of science and and mathematics. The need for emphasis upon mathematics and the sciences, physics and chemistry particularly, in the industrial arts teacher education curriculum is obvious. In addition to basic work in the behavioral and social sciences, the relevance of study in industrial and economic history, industrial sociology and industrial psychology to both the general and the professional preparation of the industrial arts teacher should be equally obvious.

9. Industrial employment should be exploited in the preparation of industrial arts teachers.

This employment can contribute substantially to the teacher's ability to achieve the central purpose of industrial arts, depending upon the nature of that employment.[9] The essential condition of this employment is implied in the following quotation from a previous paper: "...we generally agree that industrial experience is highly desirable for, though not necessarily essential to, the industrial arts teacher. How valuable and essential might such experience become if we plan it, supervise and co-ordinate it, and make it an integral part of industrial arts teacher education?"[10]

[9] Donald G. Lux, "Operating Policies and Procedures," *Industrial Cooperative Teacher Education.* Columbus: Ph. D. Dissertation, Ohio State University, 1955.

[10] M. Ray Karnes, "Current Issues and Problems in Higher Education: How Their Solution May Affect the Preparation of Industrial Arts Teachers," a paper presented at the 1955 convention of the American Council on Industrial Arts Teacher Education.

10. Teacher education staff and facilities should be concentrated in fewer institutions.

A major deterrent to the substantial improvements required in industrial arts teacher education to prepare teachers for the good school of the future is the fact that staff and facilities are scattered among approximately three hundred colleges and universities in the United States. The mean number of industrial arts teachers in the field per institution is approximately one hundred. The typical industrial arts teacher education department is, relatively speaking, and in view of its task, less adequately equipped, staffed, and financed than is the submarginal industrial arts in the small high school to which reference has been made. The recommendation here is that the industrial arts teachers of America start a concerted movement in their respective states and urge the consolidation of staff and facilities in one institution in the smallest states, and in not more than four or five in the largest, in which there is the best chance of developing a teacher education program of the breadth, depth, and quality required to prepare industrial arts teachers to meet, with credit and distinction, their professional responsibilities in the good school of the future.

Graduate Study in Relation to the Undergraduate Program

The purpose here is to present a conceptualization of graduate study in industrial arts education and to indicate the appropriate relationship between undergraduate and graduate work in this field. An assumption is made that the undergraduate work completed by the in-

11. Selection and retention procedures should be responsive to high standards.

The omission of public relations and recruiting as points for special emphasis stems not from oversight but from deliberate intent. Of course, a program of public relations and recruiting should and will be fostered. If, however, the major effort is devoted to building a teacher education program of the quality demanded, there will be something to publicize with enthusiasm. The recruiting problem will be diminished. The student of high ability will seek out the quality program, and the one of low ability will either fail to survive the screening process or run the risk of becoming an early dropout.

dividual who enters the graduate program will be of the rigor, quality, and depth suggested in the preceding sections of this chapter. Under this assumption, achieving the purpose indicated becomes a relatively easy task. Setting forth the essential characteristics of graduate study which logically follows the undergraduate program previously described, and outlining the appropriate relationship of the two, will require only a few paragraphs. Had the authors addressed themselves, instead, to the problem of presenting a conceptualization of the graduate program which bears an appropriate relationship to the myriad of undergraduate programs now in operation, the task would have defied completion.

The following are suggested as characteristics of and specifications for an adequate program of graduate study in the field of industrial arts education. Although the controversial issues which are debated by industrial arts personnel are not specifically identified and listed for emphasis, the reader will recognize that the authors, nevertheless, kept certain issues in mind and assumed a position with reference to each as the following statements were formulated:

1. Adequate undergraduate preparation should be a prerequisite to graduate study.

This is a requirement so generally accepted in graduate and professional schools, and with reasons so obvious, that there would seem to be no need for elaboration. And yet, current practice suggests that, at the master's level particularly, the major purpose of graduate study in industrial arts is that of filling the gaps in, and overcoming the inadequacies of, undergraduate programs. A program in industrial arts teacher education which satisfies the requirements of graduate study can never be developed if the major purpose of this program remains that of remediation.

If undergraduate programs are weak, the first order of business in industrial arts teacher education is to upgrade them as *undergraduate* programs. A year of additional study in pursuit of the master's degree on the part of individuals who complete weak undergraduate programs will not only fail to make up for the inadequacies of undergraduate preparation but will prostitute the legitimate purposes and potentialities of graduate study. Using the master's program for remediation purposes is comparable to the employment of remedial reading teachers to work with pupils whose reading competence falls far below expectancy and doing nothing about the basic reading instruction in the elementary school.

When a prospective candidate for a graduate degree fails to present evidence of having adequate undergraduate preparation in each area in which he proposes to study at the graduate level, he should be required to make up his deficiencies. No graduate credit should be allowed for courses completed for this purpose. There is the presumption of the possession of considerable competence in a given field prior to the beginning of graduate study in that field, and this applies to industrial arts no less than to any other phase of education. The practice of allowing graduate credit for introductory laboratory courses omitted at the undergraduate level represents the most common violation of the characteristics of graduate study.

2. Graduate study should build upon competencies previously acquired.

Continuity should characterize the relationship between undergraduate and graduate study. In treating undergraduate work, a case for depth and a degree of specialization was presented. Graduate study should likewise be characterized by depth and specialization, and in the same basic areas represented in the undergraduate preparation. For example, the industrial arts teacher who pursued the undergraduate program which prepared him initially for teaching industrial arts at the elementary level would be expected to continue in this phase of industrial arts as he pursues the master's degree. If he proposes to use the master's program for "retreading" purposes and thus convert himself to a teacher of electronics in the senior high school, two major difficulties arise: (1) Much of what he studied at the undergraduate level will be lost. (2) He will lack many of the prerequisities to graduate study appropriate for the high school teacher of electronics. Both difficulties will apply with reference to the content he teaches as well as to the psychological foundations of methods to be employed in teaching. Any candidate for the master's degree who plans to prepare himself for teaching in a field quite different from the one into which his undergraduate program led him is simply asking too much of graduate study from one standpoint, and far too little from another.

The major purpose of the master's program should be to strengthen the preparation of the professional teacher.

It is high time that, in education generally and in industrial arts education particularly, the further preparation of the career teacher be accepted as the major, compelling purpose of graduate study at the master's level. A forthright response to this purpose will result in considerable change in emphasis and in requirements. The master's program will not be dominated by concern for the small minority of teachers who will continue their formal study and ultimately complete the requirements for the doctorate. The master's will become a professional program for classroom teachers. At least half of the total master's program, especially for junior and senior high school teachers, will be devoted to the further study in depth in the subject matter areas of specialization. The formal thesis which purports to yield new knowledge will be dropped from the list of requirements. Even so, there will be a stronger emphasis upon research and research findings in every graduate course in education than formerly, but this will be a consumer emphasis.

A major problem in developing a master's program for career teachers in the field of industrial arts is that of providing advanced work of graduate level and quality in the subject matter areas. In sharp contrast to the opportunities open to the teachers in such academic fields as chemistry and mathematics, there is little opportunity for the industrial arts teacher to draw upon the resources of academic departments of the institution to acquire in depth the specific skills and the technical knowledge which will add directly to his competence in the subject matter field in which he teaches. Much can be added to his comprehension of the technological aspect of the culture by pursuing selected courses in such fields as economics and industrial sociology, and he should have the prerequisities for and be encouraged to pursue graduate study in these areas. For a few industrial arts teachers who teach at advanced levels such a technical subject as electronics, there may be some work available in the physical sciences and among the engineering offerings. The burden of providing advanced offerings of direct benefit to industrial arts teachers rests primarily with the industrial arts department, however. This raises quite directly the problem of developing shop and technical offerings which merit graduate credit.

The authors take a firm stand on this issue. Laboratory courses can be developed which do merit graduate credit. They must be developed if the master's program is to achieve for industrial arts teachers the purpose previously suggested. Not merely to provide the characteristics expected of courses offered for graduate credit but to elevate industrial arts technically as demanded, the following are suggested as conditions to be met as laboratory courses are included in the master's program of the career teacher of industrial arts: (1) All such courses should demand an order of skill development comparable to that of the competent craftsman or the technician who utilizes in his work the tools and materials involved in the course. (2) The application of science and mathematics should be such as to provide an extremely high order of competence in the solution of problems involving the tools and materials appropriate to the course. (3) Every student admitted to the course should already possess competence in the subject which will enable him to perform at an advanced level. In no sense should the course offered for graduate credit be introductory. The standards to be imposed would rule out the great majority of shop and laboratory courses presently taken for graduate credit by industrial arts teachers.

The possibility of utilizing cooperative arrangements for actual work experience in industrial occupations closely related to the subject taught by the industrial arts teacher should be afforded serious consideration in designing the master's program for industrial arts teachers.

4. Advanced graduate study should prepare for supervisory and administrative, teacher education and research functions.

If the master's program is committed to the preparation of the career teacher, it is appropriate that advanced study beyond the master's be responsive to the need for specialists in the field. Curriculum specialists, consultants, supervisors, and administrative officers, teacher educators, and research workers demand the rigorous preparation of the teachers with whom they work, and, in addition, the preparation for the new responsibilities which confront them in positions of leadership. For many, a year of graduate study beyond the master's will suffice. For others, particularly the group who will conduct research, the doctorate will be required.

It is most unfortunate that the system of rewards in teacher education departments is such that the person who teaches the shop and technical courses feels compelled to pursue graduate study through to the doctorate. A strong case has been made for shop and technical courses of high quality in the program for the master's degree. The doctorate as a requirement for the college teacher of such courses is open to question. The studies included in doctoral programs simply do not contribute to the technical competence required of this member of the teacher education staff, and it is doubtful whether there will be any change in this regard. The major need of this particular member of the staff is technical competence in his field of specialization. He should be encouraged to seek, and be rewarded for obtaining, that competence.

The doctorate is appropriate for the member of the teacher education staff whose major responsibilities are in connection with the strictly professional aspects of teacher education. For the research worker, the advanced graduate degree is essential. Experience in education as well as in many other fields indicates, however, that the assumption that every recipient of the degree will do research is ill-advised. While a research emphasis is appropriate in the program of every doctoral student, special effort should be made to identify the individuals who, by virtue of temperament and interest, are likely to engage in research, and their programs, both the formal and informal aspects, should be designed to contribute maximally to research competence. Research in industrial arts education, as in the field of mathematics, will be done by only a few of the people who complete the requirements for the advanced degree.

CHAPTER VIII

Trends in Industrial Arts Graduate Study

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To determine a trend, at least two points of reference must first be established. For this chapter, *Trends in Industrial Arts Graduate Study,* the two reference points were periods of time between (1) January 1, 1951, to August 31, 1955, 4-2/3 years; and (2) September 1, 1955, to December 6, 1959, 4-1/3 years.

Next, reliable sources must be used in securing the data at the reference points selected. The graduate studies completed and reported in the Office of Education bulletin, *Research in Industrial Education: Summaries of Studies,* 1930-55,[1] constituted the first basic source for identifying the research for the first period of time (1951-55). The second basic source used to identify graduate studies during the second period of time (1955-59) were the lists of studies *Research in Industrial Education: A Bibliography,*[2] prepared by the Research Committee of the National Association of Industrial Teacher Educators, and studies reported to the Office of Education. Without the splendid efforts of the previous committees of the NAITE, who were primarily

[1] U. S. Office of Education, *Research in Industrial Education: Summaries of Studies, 1930-1955.* Washington, D. C.: U. S. Government Printing Office, 1957, 527 pp.

[2] National Association of Industrial Teacher Education, Research Committee, *Research in Industrial Education: A Bibliography.* (Lists of research studies from September 1, 1955, to July 25, 1958; supplement to October 15, 1958; and July 25, 1958, to December 6, 1959.) Mimeographed.

responsible for the collecting and editing of the two basic sources, this analysis would not have been possible at this time, and credit should be given to them.

Procedures Used in This Analysis

Table 1 was devised to show the number and kinds of research categories as reported in the Office of Education bulletin, *Research in Industrial Education: Summaries of Studies, 1930-55*. The research studies were classified under forty-nine different categories. One of the research categories, "courses of study," was further divided into fifteen subcategories.

The Office of Education bulletin contained not only studies in industrial arts, but those for vocational industrial education as well. Since it was necessary to read all studies reported during the periods of time selected, the research of both programs was recorded in order that greater value could be realized through this effort.

Each graduate study in the bulletin was first coded according to the first period of time (1951-55). Next, the title and/or summary of each study was read in order to further classify it under one of the following headings: (1) industrial arts education, (2) vocational industrial education, (3) applicable to both industrial arts and vocational industrial education, and (4) unable to classify. The total number of studies and the degree levels (master's and doctor's were also recorded.

A similar plan of procedure was used for the graduate studies reported during the second period of time (1955-59). The titles of these studies, however, were entered on 3" x 5" cards and then ordered into the forty-nine different categories. By ordering the latter group of research studies, as near as possible, into the same categories as the first group, trends could be established for each category, and for the totals under the main headings of "administration," "guidance," "history and trends," "instruction," "supervision," "surveys," "teacher education," and "types of programs."

During the tabulation procedure, seven studies were not used in the bulletin because their dates were not given. The lists contained six studies that had dates earlier than 1955-59, and three of these studies were tabulated in the first period of time (1951-55) and incorporated in the table. Fifteen duplicates were discovered and discarded.

Because of the nature of the research reported during 1955-59, it was not possible to order all the data into the forty-nine categories established by the bulletin. Therefore, another category, other research, was established. Thirty-nine studies were reported in this new category. The thirty-nine studies dealt with:

1. Programs in foreign countries (seventeen studies).
2. Relation of industrial arts or vocational industrial education to other curriculum areas (eleven studies).
3. Driver education (four studies).
4. General research procedures (two studies).
5. Elementary education (one study).
6. Slow learners (one study).
7. Technicians (one study).
8. Miscellaneous (two studies).

Limitations.

As in any study, certain limitations must be recognized and taken into consideration in interpreting the results—in this case, trends in graduate study for industrial arts. The classifying and ordering of the research studies rests on the writer's interpretation of what was written about the study. The studies classified for the first period (1951-55) had few listed under the heading "unable to classify" because the bulletin contained a short summary of each study. Therefore, whenever the title did not sufficiently indicate clues for classification, the summary generally contained enough information to make a valid judgment. This, however, was not the case in the second period of time (1955-59) because only the titles were given in the lists made up by the National Association of Industrial Teacher Educators. It was, therefore, necessary to check, where possible, each study for abstracts in the professional literature before classifying and ordering the studies into the various categories and programs.

Another procedure that was used was to check the college or university department that was responsible for the study to help determine its classification. With the various procedures used, it was, nevertheless, impossible to accurately classify seventy-four, 15.3 per cent, of the studies during the second period of time (1955-59), whereas only eight, less than one per cent of the studies, were not classified during the first period of time (1951-55).

Examples of Classifying the Graduate Studies.

Under the heading of "industrial arts," studies with titles such as the following were recorded: (1) *State Aid for Industrial Arts Education in the Public Secondary Schools of Louisiana,* (2) *The Evo-*

lution of Machines and Equipment Studied in the Industrial Arts Comprehensive General Shop, and (3) *A Study to Determine Student Interests and How They Affect Drafting Course Content.* This latter study, although it did not specifically state industrial arts in the title, pertained to this phase of education as reported in the summary. For example, in the findings and conclusions a statement reads: "Drafting courses are becoming more exploratory in nature and are covering a wider variety of fields."

Titles of studies that were recorded under the heading of "vocational industrial education" were similar to the following: (1) *Private Trade Schools Operating in Missouri from 1944 though 1951,* (2) *Effectiveness of Audio-Visual Aids in Vocational Machine Shop,* (3) *A Study of Selected Corporation Apprenticeship Training Programs,* and (4) *Employment Requirements and Opportunities for Women as Technicians in the St. Louis Labor Market Area.*

Titles of graduate studies that were recorded as "applicable to both industrial arts and vocational industrial education" were those that did not indicate clearly a single education program, either in the title or summary, yet implied or stated an interrelationship. Examples of these studies are as follows: (1) *Differentiate Between the Aims and Objectives of Vocational Industrial Education and Industrial Arts Education,* (2) *General Education Through Integration of Industrial Arts and Home Economics, and* (3) *Industrial Education in the Colleges and University of Louisiana.*

Also, whenever the title and/or summary of any study was not sufficiently clear for recording it under the heading "industrial arts" or "vocational industrial education," but the content was similar to both fields, for example, glues, the study was placed under the heading where it was applicable to both industrial arts and vocational industrial education.

It is fully recognized that another researcher doing this same classifying and ordering of data may place some of the studies under a different category and program. Nevertheless, it is felt that, in the main, the data as presented would be quite similar. Every effort was made to be as reasonable and yet as specific as possible in classifying the studies.

Suggestions for Reading Table 1 and Table 2.

Table 1, Number of Graduate Studies Classified by Research Categories and Types of Educational Programs (1951-59), has the total of the number of graduate studies tabulated on the top line of the table. Column 1 lists the research categories as reported in the Office of Education bulletin previously mentioned. Columns 2, 3, 4, 5, and 6 pertain to the research studies reported in the bulletin from 1951-55 and classified under "types of educational programs." For example, the number of graduate studies reported for industrial arts was 517; for vocational industrial education, 193; applicable to both industrial arts and vocational industrial education, 145; and under unable to classify, 8.

Table 2, Per cent of Graduate Studies Classified by Research Categories (main headings) and Types of Educational Programs, gives the percentage for the total for each type of educational program. For example, the per cent of research studies completed for each educational program in 1951-55 is as follows: industrial arts, 59.9 per cent; vocational industrial education, 22.4 per cent; applicable to both industrial arts and vocational industrial education, 16.8 per cent; and unable to classify, 0.9 per cent.

The number and per cent of master's and doctor's degrees for each period of time can be determined by referring to columns 12, 13, 14, and 15 in both Tables 1 and 2. In Table 1, the figure 863 given in the "total," column number 6, refers to the total number of studies for the years 1951-55. This figure also refers to the combined total of master's and doctor's degrees given for this period (See columns 12 and 13). Of the total number of degrees reported (863), Table 2 shows that 83.8 per cent were master's and 16.2 per cent were doctor's. Likewise, the figure 482 given in the "total," column No. 11, Table 1, refers to the total number of studies for the years 1955-59 and to the combined total of master's and doctor's degrees given for this period (See columns 14 and 15). The total number of master's degrees reported for 1951-55 (columns 12 and 13, Table 1) was 723; and the total number of doctor's degrees reported for this period, was 140.

Trends in Industrial Arts Graduate Research.

One of the most significant trends identified in Table 1 involving the graduate research studies is the reduction in total numbers from 863 to 482 during the nine year period. There were 55.9 per cent fewer studies reported for industrial arts and vocational industrial education programs in 1955-59 than in 1951-55. In industrial arts alone, graduate research studies dropped from 517 in 1951-55 to 241 in 1955-59; that is, 46.6 per cent fewer studies were reported than in 1951-55.

Various factors have influenced this reduction in graduate research. Some of these factors, no doubt, are the following: (1) The increased tendency of many college or university departments of industrial arts and/or industrial education is to offer an option for the graduate student to choose to write either a thesis or a problem, in partial completion of the requirements for a degree. More students in 1955-59 may have taken the option to write a problem, in which case their research would not appear in the tables because the Research Committee of the National Association of Industrial Teacher Educators and the bulletin reported only bonafide master's and doctor's theses. (2) The periods of time reported in this research are not quite equal. The first period of time, where the greatest number of studies are reported, is 4-2/3 years; while the second period of time contains 4-1/3 years. This variation is further amplified because the first period contains the completion of research during the summer session of 1955, and few research studies, as a rule, are completed during the remainder of the year from September to January. (3) The number of degrees conferred during the years selected for this study varied. For example, according to the U. S. Office of Education, Circular No. 461, *Earned Degrees Conferred by Higher Educational Institutions:* 1954-55 the number of degrees conferred at the second degree level (master's) was 544; and at the doctor's level, 14. This school year had the greatest number of degrees recorded in a ten-year period from 1948-58.[4] In 1955-56, the number of master's and doctor's degrees conferred was 367 and 23, respectively. However, since 1955-56, there has been a steady increase. It is interesting to note that the number of degrees conferred in industrial arts during 1951-55, as reported in the circulars, was 1,946; yet only 863 studies were reported in the profession's literature. This latter figure even includes both industrial arts and vocational industrial education. Although the periods of time do not match exactly, they nevertheless indicate that large numbers of graduates either do not elect to write a research thesis, or that their research does not get reported in the professional literature. It was not possible to get comparable figures on graduates to make the comparison for the second

[3] U. S. Office of Education, Circular No. 461. *Earned Degrees Conferred by Higher Educational Institutions: 1954-55*, Washington, D. C.: U. S. Government Printing Office, 1956, p. 86.

[4] *Ibid.* (See circulars 262, 282, 333, 360, 380, 418, 461, 499, 527, and and 570.)

period of time, 1955-59, because the data in the circulars are not fully available.

The total number of graduate studies in the research categories under "guidance" is the only area where an increase of graduate research was noticed. However, the greatest gain was made in the studies that could not be classified accurately as to the educational programs. Nevertheless, guidance in industrial arts gained from seven studies in 1951-55, to twelve studies in 1955-59.

Graduate studies relating to the research sub category of general shops dropped from sixteen in 1951-55 to two in 1955-59, but the studies relating to the overall "curriculum" were up from ten in 1951-55 to twenty-two in 1955-59.

More industrial arts studies were recorded in the research category of "evaluation" in 1955-59 (fourteen) than in 1951-55 (eleven).

The graduate studies increased in the research category of "analysis of textbooks and manuals, professional and scientific terms and vocabulary" from eight to eleven. This increase was due primarily to the number of studies applicable to both education programs and the increase in this type of study in vocational industrial education.

The following research categories were not represented by any research during 1955-59:

1. Building construction.
2. Education in higher institutions.
3. Private trade schools.
4. Building trades.
5. Plastics.
6. Coordination.
7. Handbooks, teacher guides, and materials available from industry.
8. Job operation, information and assignment sheets.
9. Bibliographies.
10. Certification, college credit for trade experience.
11. Continuation.
12. Correctional institution.
13. Vocational rehabilitation.

Aviation (subcategory) and "continuation", research category, had no studies recorded in 1951-55.

Although the degree levels do not show the breakdown by type of educational program, they do indicate that a greater per cent of doctoral graduate studies are being devoted to research categories (main headings) of "instruction," "supervision," and "types of programs." However, the latter is devoted almost exclusively to the vocational industrial education programs.

When considering the total percentage of studies that could be considered applicable to either industrial arts or vocational industrial education (add percentages under total in columns 2 and 4 or 7 and 9, Table 2), 76.7 per cent could be considered applicable to industrial arts in 1951-55, and 66.2 per cent in 1955-59. Likewise, for vocational industrial education, during the same periods, the percentages were 39.2 and 34.7, respectively.

Other trends and specific details regarding the various research categories and educational programs can be observed by examining Tables 1 and 2 in more detail.

Implications for Research in Industrial Arts.

Any profession, or, for that matter, any endeavor, that wishes to grow, gain new insights and relationships, accumulate new knowledge, and search for truth, must engage actively in research. This is a real challenge.

The industrial arts profession has demonstrated this vitality and met the challenge to engage in research as evidenced by the graduate studies completed in the field. This does not mean that the profession has arrived, but rather it has just begun to meet the challenge.

What Provisions Should Be Made for the Future?

As in any study of this kind, each researcher gains insights and understandings that may have some value in determining future direction. The following recommendations are listed for the professions' consideration:

1. *Improving Quality.* There should be established a set of criteria to assist graduate departments in determining the significance and quality of their individual research studies to the field of industrial arts. It is quite possible that some of the so-called "master's problems" are of greater value to the profession than some of the reported master's and doctor's theses. There may be much research lost in not reporting some of these studies because the reservoir of talent is large. Ways and means must be devised to tap this source.
2. *Identifying Basic Problem Areas Needing Research.* This analysis has helped reveal the emphasis placed on the various research cat-

egories in which studies have been completed. It is recommended that more effort be put toward directing graduate research to the basic problems in the field. For example, it would do well to accumulate more research dealing with the following:

a. Determining more effectively the psychological, sociological, and economic bases for the industrial arts.
b. Identifying technical talents possessed by individuals.
c. Evaluating programs of an experimental nature.
d. Improving the individual's problem-solving ability through using tools, materials, and machines.
e. Developing ingenuity and creativity through industrial arts experiences.
f. Determining industrial arts experiences commensurate with growth levels of youngsters.
g. Establishing curriculum content for programs based on sound educational practices.

Industrial arts national associations, leaders, and others should identify the profession's main problems that need to be solved and assign priorities to the most crucial ones.

3. *Directing Research Effort.* Once the problems have been identified, the combined efforts of the various research organizations should be brought to bear upon them. A multiple attack toward solving one problem would bring rich rewards in much less time than through an individual nondirected approach.
4. *Publishing Lists of Research Studies.* The organization that publishes the next research bulletin should consider dropping those categories of research not used in the 1955-59 tabulation, and establish new categories for studies dealing with (a) programs in foreign countries, (b) interrelationship with other curriculum areas, and (c) driver education. Also, any such publication should be cross-indexed by the name of the researcher as well as the category of research.
5. *Publishing the Results of Research in a Specific Problem Area.* A new publication should be developed and published dealing with the results of research in one area of investigation. For example, the results of all the past research dealing with the relationship of industrial arts to mathematics and science ought to be available to the profession. A publication dealing specifically on that problem would be of considerable help in giving direction to industrial arts. Research is of little value unless it can be made readily available and used by the profession.

TABLE 1. NUMBER OF GRADUATE STUDIES CLASSIFIED BY RESEARCH CATEGORIES AND TYPES EDUCATIONAL PROGRAMS (1951-59)

RESEARCH CATEGORIES	1951 to August 31, 1955 (4 2/3 years) — Types of Educational Programs					Sept. 1, 1955-59 (4 1/3 years) — Types of Educational Programs					1951 to August 31 1955		Sept. 1 1955 - 1959	
	Industrial Arts	Vocational Industrial	Applicable to IA & VI	Unable to Classify	Total	Industrial Arts	Vocational Industrial	Applicable to IA & VI	Unable to Classify	Total	Masters Theses	Doctors Theses	Masters Theses	Doctors Theses
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TOTAL	517	193	145	8	863	241	89	78	74	482	723	140	379	103
ADMINISTRATION	92	26	30	1	149	25	7	6	5	43	123	26	35	8
General	3	4	1	-	8	1	-	1	2	4	5	3	3	1
Advisory Committees–Management Labor Attitudes	-	3	1	-	4	1	1	-	-	2	3	1	1	1
Building Construction	4	-	1	-	5	-	-	-	-	-	5	-	-	-
Costs-Control-Budget	7	-	1	-	8	4	-	1	1	6	7	1	6	-
Education in Higher Institutions	12	2	8	-	22	-	-	-	-	-	13	9	-	-
Equipment	16	2	3	-	21	3	-	-	2	5	17	4	5	-
Extracurricular Activities	7	-	-	-	7	2	-	-	-	2	7	-	2	-
Junior Colleges-Area Schools-Technical Institutes	1	3	2	-	6	-	1	-	-	1	5	1	1	-
Legislation, Federal and State	1	3	2	1	7	-	1	1	-	2	5	2	2	-
Private Trade Schools	-	2	-	-	2	-	-	-	-	-	-	2	-	-
Program Planning	21	4	5	-	30	-	3	-	-	3	28	2	-	3
Public Relations	4	1	2	-	7	7	1	1	-	9	7	-	7	2
Shop Organization and Planning	16	2	4	-	22	7	-	2	-	9	21	1	8	1

GUIDANCE	7	13	10	-	30	12	14	6	17	49	21	9	42	7
General	2	5	-	-	7	3	3	1	4	11	6	1	9	2
Counseling	-	1	-	-	1	3	2	-	4	9	1	-	8	1
Follow-up	4	6	8	-	18	3	5	4	7	19	13	4x[1]	17	1x[1]
Occupational Information	-	1	1	-	2	-	4	-	1	5	-	2	4	1
Selection and Placement	1	-	1	-	2	3	-	1	1	5	1	1	4	1
HISTORY AND TRENDS	31	8	15	-	54	14	7	9	3	33	42	12	28	5
General	31	8	15	-	54	14	7	9	3	33	42	12	28	5
INSTRUCTION	165	29	28	4	226	108	12	9	35	164	215	11	134	30
Courses of Study														
Aviation	-	-	-	-	-	-	-	-	1	1	-	-	1	-
Building Trades	2	7	-	-	9	-	-	-	-	-	9	-	-	-
Drafting and Design	14	4	3	-	21	10	1	2	2	15	21	-	11	4
Electricity	11	2	1	-	14	7	2	1	2	12	13	1	6	6
Engines	5	2	1	4	12	4	-	1	6	11	11	1	11	-
General Shop	16	-	-	-	16	2	-	-	-	2	15	1	1	1
Girls and Women	7	-	-	-	7	2	-	-	-	2	7	-	2	-
Graphic Arts	12	6	1	-	19	5	2	-	1	8	18	1	7	1
Handicraft	11	-	-	-	11	10	-	-	-	10	11	-	8	2
Home Mechanics	5	-	-	-	5	2	-	-	-	2	5	-	2	-
Metal Work	7	1	2	-	10	5	2	-	5	12	10	-	10	2
Miscellaneous	6	-	2	-	8	6	-	-	5	11	8	-	11	-
Photography	5	-	-	-	5	2	-	-	-	2	5	-	-	2
Plastics	5	-	1	-	6	-	-	-	-	-	5	1	-	-
Woodwork	20	-	1	-	21	9	-	2	5	16	19	2	15	1
Curriculum	10	2	3	-	15	22	4	1	4	31	15	-	25	6
Teaching Aids and Techniques	29	5	13	-	47	22	1	2	4	29	43	4	24	5

Continued on next page

x[1] means staff research study.

x[2] unable to determine degree.

TABLE 1. (CON'T) NUMBER OF GRADUATE STUDIES CLASSIFIED BY RESEARCH CATEGORIES AND TYPES OF EDUCATIONAL PROGRAMS (1951-59)

RESEARCH CATEGORIES	1951 to August 31, 1955 (4 2/3 years) Types of Educational Programs					Sept. 1, 1955-59 (4 1/3 years) Types of Educational Programs					1951 to August 31 1955		Sept. 1 1955 - 1959	
	Industrial Arts	Vocational Industrial	Applicable to IA & VI	Unable to Classify	Total	Industrial Arts	Vocational Industrial	Applicable to IA & VI	Unable to Classify	Total	Masters Theses	Doctors Theses	Masters Theses	Doctors Theses
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SUPERVISION	66	39	31	3	139	27	6	20	1	54	114	25	38	16
General	6	1	2	-	9	2	-	2	-	4	6	3	2	2
Coordination	1	1	1	-	3	-	-	-	-	-	2	1	-	-
Evaluation	11	9	1	1	22	14	3	6	1	24	16	6	17	7
Handbooks, Teacher Guides, Materials Available from Industry	9	10	1	-	20	-	-	-	-	-	16	4	-	-
Job Operation, Information and Assignment Sheets	1	1	1	-	3	-	-	-	-	-	3	-	-	-
Production Work	3	1	-	-	4	1	-	-	-	1	2	2	-	1
Safety	12	2	4	2	20	3	3	8	-	14	19	1	12	2
Student and Teacher Grading, Rating Scales, Forms, Progress Records and Reports, Accounting and Guide Sheets	9	1	2	-	12	3	-	3	-	6	12	-	11 3	3
Testing	14	13	19	-	46	4	-	1	-	5	38	8	4	x2
SURVEYS	64	20	12	-	96	22	16	7	2	47	81	15	39	8
Educational Program	60	11	10	-	81	19	7	7	-	33	67	14	28	4 x1
Industry, Occupational and Community	4	9	2	-	15	3	9	-	2	14	14	1	1	3

TEACHER EDUCATION	78	6	13	-	97	21	6	10	3	40	73	24	29	11
General	49	4	8	-	61	13	2	4	3	22	46	15	15	7
Analysis of Textbooks and Manuals, Professional and Scientific Terms and Vocabulary	7	-	1	-	8	2	4	5	-	11	5	3	10	1
Bibliographies	3	1	4	-	8	-	-	-	-	-	8	-	-	-
Certification, College Credit for Trade Experience	4	1	-	-	5	-	-	-	-	-	3	2	-	-
Consumer Education	6	-	-	-	6	3	-	-	-	3	4	2	2	1
Philosophy	8	-	-	-	8	1	-	1	-	2	6	2	1	1
Social Adjustment and Trends	1	-	-	-	1	2	-	-	-	2	1	-	1	1
TYPES OF PROGRAMS	14	52	6	-	72	-	12	1	-	13	54	18	5	8
Adult Education—Trade Extension—Out-of-School Youth	8	5	1	-	14	-	4	1	-	5	12	2	1	4
Apprenticeship	-	10	-	-	10	-	2	-	-	2	8	2	1	1
Continuation	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cooperative	-	4	-	-	4	-	3	-	-	3	3	1	1	2
Correctional Institution	-	1	1	-	2	-	-	-	-	-	1	1	-	-
Diversified	-	6	1	-	7	-	1	-	-	1	7	-	1	-
Training in Industry	-	19	-	-	19	-	1	-	-	1	13	6	1	-
Vocational Rehabilitation	5	6	1	-	12	-	-	-	-	-	9	3	-	-
Work Experience	1	1	2	-	4	-	1	-	-	1	1	3	-	1
OTHER RESEARCH	-	-	-	-	-	12	9	10	8	39	-	-	29	10

[1] x means staff research study.

[2] x unable to determine degree.

TABLE 2. PER CENT OF GRADUATE STUDIES CLASSIFIED BY RESEARCH CATEGORIES (main headings) AND TYPE OF EDUCATIONAL PROBLEMS (1951-59)

RESEARCH CATEGORIES	1951 to August 31, 1955 (4 2/3 years)					Sept. 1, 1955-59 (4 1/3 years)					1951 to August 31 1955		Sept. 1 1955 - 1959	
	Types of Educational Programs					Types of Educational Programs								
	Industrial Arts	Vocational Industrial	Applicable to IA & VI	Unable to Classify	Total	Industrial Arts	Vocational Industrial	Applicable to IA & VI	Unable to Classify	Total	Masters Theses	Doctors Theses	Masters Theses	Doctors Theses
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TOTAL	59.9	22.4	16.8	00.9	100%	50.0	18.5	16.2	15.3	100%	83.8	16.2	78.6	21.4
Administration	61.7	17.5	20.1	.7	100%	58.1	16.3	14.0	11.6	100%	82.6	17.4	81.4	18.6
Guidance	23.3	43.3	33.4		100%	24.5	28.6	12.2	34.7	100%	70.0	30.0	85.7	14.3
History & Trends	57.4	14.8	27.8		100%	42.4	21.2	27.3	9.1	100%	77.8	22.2	84.8	15.2
Instruction	73.0	12.8	12.4	1.8	100%	65.9	7.3	5.5	21.3	100%	95.1	4.9	81.7	18.3
Supervision	47.5	28.1	22.3	2.1	100%	50.0	11.1	37.0	1.9	100%	82.0	18.0	70.4	29.6
Surveys	66.7	20.8	12.5		100%	46.8	34.0	14.9	4.3	100%	84.4	15.6	83.0	17.0
Teacher Education	80.4	6.2	13.4		100%	52.5	15.0	25.0	7.5	100%	75.3	24.7	72.5	27.5
Types of Programs	19.4	72.2	8.4		100%		92.3	7.7		100%	75.0	25.0	38.5	61.5
Others						30.8	23.1	25.6	20.5	100%			74.4	25.6

CHAPTER IX

Examples of Graduate Programs in Industrial Arts

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Education is one of the most sought after commodities in our country today. More young men and women are obtaining baccalaureate degrees and are continuing their education at the graduate level. Today it is practically mandatory that people working in the field of public education have training beyond the baccalaureate degree.

Graduate programs have been developed in many colleges and universities throughout the country to meet this increasing demand for more education. These may vary in scope and content, but are designed to accomplish the same objectives and in most cases fulfill these satisfactorily. They have been implemented to upgrade the individual professionally and to place him in a more advantageous salary classification. They have also been developed to provide training for positions of leadership and responsibility. All these have been formulated on the precept that education beyond the baccalaureate degree is both essential for and beneficial to the individual enrolling in the program.

Various types of graduate programs have been developed to provide advanced work in the area of industrial education. A survey was conducted to ascertain whether or not a typical graduate program in industrial education does exist.

Questionnaires concerning the graduate program were sent to 63 schools through out the United States. All of the schools that indicated in the *Industrial Teacher Education Directory* that they offered a doctorate in some phase of industrial education were included. At least one school in each state listed in the directory as offering a masters degree was included. Schools offering degree programs in industrial education were located in 37 of the 50 states.

A total of 63 questionnaires concerning graduate work were sent to department heads in the selected schools. Of the 63 questionnaires which were sent, 57 or 90 per cent were returned. The returns represented 36 of the 37 states included in the survey which represented 97 per cent of the states. There were several states which have schools offering undergraduate degrees in industrial education, but no graduate degrees. These states were not represented in the survey.

Of the schools surveyed, 36 offered the Master of Science Degree, 42 offered the Master of Arts Degree, 26 offered the Master of Education Degree, 27 offered the Doctor of Philosophy Degree, and 24 offered the Doctor of Education Degree. A few of the schools offered all five degrees, others offered some combination of the five and a few offered only one of the masters degrees. Some of the degrees offered are not in industrial education per se, but are offered in the education department and have an emphasis on industrial education. Needless to say, it would probably require sound undergraduate training to complete an advanced degree in either case.

When the question was asked about the advanced degrees offered in industrial education, it was found that 27 schools offered the Master of Science Degree, 25 offered the Master of Arts Degree, 25 offered the Master of Education Degree, 11 offered the Doctor of Philosophy Degree and 15 offered the Doctor of Education Degree. The degree offered most frequently in industrial education appears to be the Master of Science. The doctorate offered most frequently in industrial education is the Doctor of Education.

In terms of length of time that the various degrees have been offered it appears that the PhD is the oldest degree with the MS and and MA as the next oldest. The newest degrees are the MEd and the EdD. It appears from the survey that schools which are starting new graduate programs are initiating the MEd and/or the EdD degrees. A few schools in the last five years have started the MS or the MA and one school the PhD.

Seven of the fifty-seven schools which returned the questionnaire contemplate initiating a doctorate program. Of the seven, two plan to start offering a PhD, whereas five plan to offer the EdD. It appears that the trend may be toward establishing a teaching doctorate rather than the research degree.

In recent years pressure has been applied on the public school teacher to upgrade himself. In the main, he is being forced to either obtain a graduate degree or a certain number of graduate credits. The pressure for advanced degrees is also being felt at the college level. There is a growing demand for college teachers to have an earned doctorate.

This trend toward more graduate training could create problems if there were an age limit on entrance into a graduate program. It was found that of the colleges surveyed, one school imposed an age limit on students starting on an MEd Degree. Several schools, on the other hand, have an age limit specified for admittance to the doctorate program. The most common limit appears to be 45 or 50 years of age. Many schools have no specific age restriction, but question the advisability of admitting people over 45 who desire admittance into a doctorate program. The feeling, on the part of many, seems to be that by the time a man reaches 45 he should be well enough established so that a Doctors Degree would not enhance his position. If he is not that well established, he is usually not the caliber of person they would want in the doctorate program.

Closely akin to the age limit is the time limit for completing the degree. There appears to be no typical set time limit for any of the degrees. The limits for completing a Masters Degree range from four years to no restrictions. The average time allowed for completing the Masters Degree seems to be between five and seven years. Doctorate degree time limits are divided into three categories: a time limit of seven to eight years, a time limit of ten years, or no time restriction. The trend seems to be toward allowing a longer time to complete the doctorate, with some schools having provision for an extension if the candidate has cause.

There seems to be no uniformity of requirements for admission to the masters degree program. The most frequently mentioned requirement was graduation from an accredited institution with a bachelors degree. A specific undergraduate grade point average was the next most frequently mentioned requirement with a "C" plus average being the most commonly accepted. The successful passing of an entrance examination such as the Graduate Record or the Miller Analogies test was the third most frequently mentioned requirement. Other requirements include a specific number of hours in industrial education courses, teaching experience, interviews and approval by the department or a committee.

The requirements for admission to the doctorate program are similar to those for the Masters Degree with some additions. More of the schools require a test, such as the Graduate Record Examination or the Miller Analogies Test. Many of the schools require teaching experience as an admission requirement to the graduate program. The usual number of years of experience required is two. Some schools do not require teaching experience, but recommend strongly that the candidate have experience in the classroom. One school does not require teaching experience, as such, but does require the prospective student to have a teaching credential. Almost all schools require a screening of the candidates by an individual or a committee, with several schools requiring a personal interview.

In the typical graduate program, the department has a chance to approve or disapprove a candidate for admission. Most departments have a committee, as opposed to an individual, investigate the candidate for admission and make recommendations concerning the approval or disapproval.

There are several apparent differences between the three Masters Degrees. The MS and MA Degrees appear to be more of a research degree than the MEd. With few exceptions, both the MS and MA Degrees require a thesis. Most of the schools offering the MEd required no thesis; however, some required a field study. In those schools not requiring a thesis for the MA and MS Degrees, a small per cent of the students elect to write the theses. However, few students working toward the MEd Degree elect to write a thesis where it is not required. With no exceptions, the PhD and the EdD Degrees require a thesis or dissertation.

The MA and MS Degrees are usually offered in a subject matter area; whereas, the MEd is offered in professional education. The MA Degree usually has an emphasis on liberal arts. The MS has the emphasis placed on some aspect of science. Some schools require a foreign language for the MS and MA. No language is required for the MEd. Some schools are requiring teaching experience prior to starting work on the MEd. It would appear that the MA and the MS Degrees are structured more for individuals looking toward a more advanced degree or research; whereas, the MEd Degree is intended as a teaching Degree and is, in most cases, terminal.

Several of the MA and MS programs require a foreign language; however, in some cases this may be waived in the field of industrial education. Not a single MEd program requires a foreign language. Without exception, the PhD programs require at least one foreign language and in most cases two. Very few of the EdD programs require a foreign language. It may be concluded that the research centered degrees require a foreign language; whereas the teaching centered degrees do not.

Few of the masters degree programs require training in the area of statistics; whereas, most of the doctorate programs do require some training in this area. Most of the schools reporting require some training in research methods for all advanced degrees. In many instances, this is the only training in research methodology or techniques that a student receives. Many colleges are permitting a certain number of technical shop credits to be applied toward the Masters Degree. This may eventually lead to a Masters Degree which is an upgrading degree in the area of the teacher's technical specialization.

Approximately one-half of the schools offering the Masters Degree require a written final examination and the other half require an oral examination. A very few require no examination; whereas, even a smaller number require both a written and oral examination. Almost all the schools offering the doctorate require both a written and oral examination. One school, which now requires only an oral examination for the Masters Degree, indicated that they plan, in the near future, to require both a written and oral examination.

The graduate program in most schools is very flexible. Many of the schools require a clearly defined major, which is industrial arts, or industrial education. Other schools have no specific major, but tailor the program to fit the candidate. Some schools require one minor area of study; whereas, others have no required minor. A few have no required minor but do require a specific number of credits outside the major.

There appears to be no typical number of credits required for the major and minor. Suffice to say that usually fewer credits are needed outside of the department for the MEd Degree than for the MA or MS Degrees. Some schools have no specified majors or minors as such; thus, the program is adapted to individual needs. Even though other schools specify certain majors and minors, most graduate programs are formulated on an individual basis, by the advisor and the candidate.

The EdD Degree usually requires at least one minor area of concentration. However, the PhD Degree requires two minor areas of concentration. In some instances, the candidate may major in industrial education and minor in general education.

The typical graduate program requires a certain time in residence with the usual period specified as one year. This means in most instances two semesters or three quarters for the Masters Degree. With the Masters Degree the residence requirement may be met by attending summer sessions. The usual number of summers required is three or four.

With the doctorate program the usual residence is one or two years. However, with few exceptions, the residence requirement cannot be met by attending only summer sessions. It appears that the Masters Degree is being made readily available to public school teachers, but the doctorate is intended only for the student who is willing to spend at least one academic year in residence.

The usual number of units required for the MA and the MS Degree is 30 to 35 semester hours or 40 to 45 quarter hours. The number of units required for the MEd Degree varies between 30 and 45 semester hours. There appears to be no typical number of units of credit required for the doctorate. The Doctors Degree is designed for the individual student.

Most of the schools surveyed allow an average of six semester hours of transfer credit to be applied towards the Masters Degree. The number of transfer units accepted range from zero to 15 semester hours. The usual procedure for the Doctorate Degree is to allow credit for the Masters Degree completed at another school. Some schools do allow a limited amount of transfer credit to be applied toward the doctorate; however, the number of units allowed is usually not specified but is determined by appropriate college authorities.

Of the 57 schools reporting, 33 required a standardized test be taken by graduate students. These were graduate aptitude tests, such as the Miller Analogies or the Graduate Record Examination. Various uses are made of the results of these tests. Some schools use these, with other factors, for screening applicants for the degree program. Some schools make no specified use of the results, but have them available for examination in borderline cases. In addition to the tests, screening committees usually evaluate prospective graduate students. In most schools there are a number of factors evaluated before admiting new students. Standardized tests, committee evaluation, interviews, and a survey of undergraduate records and grades are all used for evaluation of prospective students.

In most of the schools admission to do graduate work or to the graduate school does not necessarily mean admission to candidacy for the degree. The graduate student must apply for admission for a degree after complying with certain requirements. The usual prerequisite for admission to candidacy appears to be a specified number of units of graduate credit usually with a "B" average. In the case of the doctorate, there are usually qualifying exams which must be passed with a satisfactory score and approval by a faculty committee. However, in several schools, admission to enroll in graduate courses automatically admits the candidate to the masters degree program. In such cases, there is no other step between admission and graduation providing the candidate does acceptable graduate work.

All of the schools surveyed which offer the doctorate require a qualifying examination before admission to candidacy. For the Masters Degree only one-half of the fifty-seven schools surveyed required a qualifying examination.

The qualifying examination is usually written; however, many schools are requiring that this be both a written and an oral examination. The number of units of course credit the student may carry is reduced depending upon the amount of time the student is required to spend on his job. In most schools there is some form of assistance available for the graduate student. This usually takes the form of scholarships, fellowships, assistantships, or some type of part-time instructorship. Students working on a doctorate are in most all cases given assistance in the form of assistantships or part-time instructorships.

Graduate programs in industrial education have changed in recent years. Now there is more opportunity to secure courses in technical areas of specialization at the graduate level. It is apparent from the results of the survey that there is no typical graduate program. Each school has peculiarities of its own incorporated within its program. The typical graduate program appears to be the one which meets the needs of its students and is suited to the individual. In some cases, the section of the country in which the school is located determines what is emphasized in the graduate program. This is true in California where provision is made for obtaining both the graduate degree and/or a fifth year general teaching credential.

For these reasons several types of graduate programs are listed as representative of those available to prospective graduate students. The basic requirements for the MA and MS programs, the MEd program, the PhD program and the EdD program are listed as representative of those currently being offered.

Master of Science and Master of Arts.

The MA and MS programs require admission to graduate standing. A bachelor's degree with a major in industrial education is required or in lieu of this a bachelor's degree with a prescribed number of units in industrial education courses. A graduate aptitude test must be satisfactorily completed. The student, in consultation with an advisor, formulates a program of studies which includes certain prescribed professional courses. Upon completion of 12 units of graduate work, the student is advanced to candidacy.

An overall grade average of "B" must be maintained in courses that apply toward the degree. Students working toward the MA or MS Degree must complete 18 to 22 units of upper division and graduate level industrial education courses. A minimum of 12 units of graduate level courses are required in the program. For the MA and MS Degrees the student must take a minimum of 8 upper division or graduate level units outside the area of industrial education. This is a feature incorporated into the MA and MS programs to broaden the student's educational perspective. A minimum of 30 semester units must be completed prior to graduation. One course in the tools of research is required. By far the greatest portion of the MA and MS programs require a thesis or research paper. The MA and MS are more research oriented degrees than some of the others. However, provision is made for upgrading the teacher in his area of specialization. A maximum of 10 units of upper division technical courses may be applied toward the MA or MS Degree. In recent years there appears to be an increase in the number of technical units which may be applied toward the MA or MS in industrial education.

Master of Education.

The Master of Education Degree is usually considered to be a professional terminal degree. The requirements for admission to the MEd Degree program are usually similar, if not identical, to those required for the MA and MS Degrees.

The candidate must have received a bachelors degree from an accredited college. In addition, the candidate must meet other entrance criteria, such as:

(1) Specified units in industrial education.
(2) Teaching experience or a valid teaching certificate.
(3) Fulfilled other entrance requirements to the graduate school, such as: standardized tests and department evaluation.

The student is assigned an advisor who helps him work out a program of studies. The student is required to complete a minimum of 24 to 32 semester units depending upon the school. Usually a certain maximum number of technical units may be applied toward this degree. The student is required to pass a final comprehensive examination covering the areas of professional education and technical concentration. There is no thesis required for this degree.

Doctor of Education.

The Doctor of Education Degree is a professional degree conferred in recognition of a candidate's command of a comprehensive body of technical knowledge in the field of education. This degree also requires the ability to recognize problems in the field of education and to be able to pursue the solution to these problems through research.

To be admitted to the EdD program the student must usually possess a Masters Degree with a specified number of units in education which should include units in industrial education. The prospective student usually must have had one to three years of successful teaching experience. The EdD program requires a specified minimum number of units of course work for the degree. As with the PhD Degree, there is a faculty committee appointed by the graduate dean to aid the student in formulating a program of studies.

Before being admitted to candidacy the student must pass qualifying examinations which are comparable to the preliminary examinations for the PhD Degree. The qualifying examination is both written and oral in nature and is administered by the candidate's committee. Upon passing the qualifying examination, the student may then be advanced to candidacy. After advancement to candidacy a certain number of prescribed courses must be completed prior to graduation.

A dissertation embodying the results of the candidate's independent efforts must be submitted. This must be done in education, usually in some phase of the student's specialization. An oral final examination, primarily over the dissertation, is required. This is conducted by the candidate's committee. Upon passing the final examination the candidate is eligible for graduation.

Doctor of Philosophy.

The PhD Degree is a research oriented degree. As such, this requires demonstrated ability in the area of research methods, statistics and independent study. The PhD is not granted on the basis of successful completion of a definite number of courses, but primarily in recognition of high attainment in the field of industrial education. These attainments include the preparation of a worthy piece of research and successfully passing the required examinations.

The candidate either selects or is assigned an advisor by the department or the graduate dean upon entrance to the graduate program. During the first year the emphasis is placed on completing course work and on passing the language requirements. The PhD usually requires the passing of examinations in two languages. In some schools additional courses in statistics may be substituted for one of the languages if the candidate's committee deems it advisable.

The PhD requires a major area of concentration and one or two minor areas. Usually, one of these minor areas is outside the field of education which provides the student broadening experiences. Upon completion of the prescribed number of units of course work and the passing of the language requirement the student may make application for the preliminary examination. This examination is both written and oral and covers work in both the major and minor areas.

The PhD thesis must show originality and power of independent thinking. It should result in research that forms a contribution to knowledge, exhibits mastery of literature and familiarity with sources of information.

There is a final examination covering the thesis and such other material as the committee deems appropriate. After the examination, the thesis is deposited with the librarian and the candidate is given clearance for graduation.

CHAPTER X

A Core for Graduate Study in Industrial Arts Teacher Education

Part 1: A Core for Graduate Study in Education

Daniel Lopez
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If we could first know where we are, and whither we are tending, we could better judge what to do and how to do it.

Abraham Lincoln, House Divided Speech
Springfield, Illinois
June 17, 1858.

These philosophic words of Abraham Lincoln were given expression shortly before the states became involved in civil war. They were uttered amid the challenges of that time as an expanding America was building its industrial roots and advancing its frontiers west. Seven years after the close of the Civil War, the first graduate school in America had its inception at Johns Hopkins University in 1876. Philosophic as Lincoln's words were in his time, they are so true in our times as Man seeks his Utopias in outer space with its multitude of challenges.

The 20th century characterizes the flowering of graduate level education in the American universities. Prior to 1850, graduate education was sporadic and unorganized with earned Ph.D. degrees unknown. The common practice was to confer honorary degrees by undergraduate colleges and universities. It was common practice for educators to go to Europe for their degrees at the graduate level.

The passing of the Morrill Act by Congress in 1862 represents a milestone for graduate industrial arts education, as the Land Grant colleges were established to give "instruction in agriculture and the mechanic arts, but without excluding other scientific and classical studies." Legislatively, this put the practical arts on a par with the traditional humanities on the college and university level. The Land Grant colleges currently promote the general welfare through education, research, and service in the fields of agriculture, mechanical arts, science, and the liberal arts.

The purpose of this chapter in the 1961 Yearbook is to *speculate* about the feasibility of a *suggestive* core of studies for graduate work in industrial arts education. To set down rigid avenues to *best* educate and train the prospective industrial arts graduate student is impossible without agreement upon criteria in a profession which is still evolving. What *is* possible is the suggestion of strands and guidelines for consideration and further speculation. There is no "Royal Road" to the truth—only tentative considerations with which to grapple in the quest for truth.

Curriculum, for purposes of this chapter, can be simply defined as: (1) *what is taught,* the subject matter content; (2) *how it is taught,* the methodology involved; (3) *who teaches it,* the professional educationists involved. At the base of any curriculum design would be the *Why?* or the philosophical considerations for establishing aims and objectives to transmit, maintain, and improve the cultural heritage.

Ultimately, all that has been written in this yearbook should help to implement the curriculum of the graduate school. It is pointless to hypothesize that there is one *best* curriculum which epitomizes what the graduate school curriculum *should be* in the opinion of the authors. Each student who applies for admission to candidacy in graduate school needs to have a curriculum tailored especially for him. To do it in any other manner is to deny differences both in individuals and in undergraduate programs.

This does not make it untenable to consider a core of professional studies for graduate students. An analysis of the professional role of the industrial arts educator would reveal that in order to become a successful practitioner, there are "cues for practice" which stem from other disciplines. This has long been true in professions, such as law, medicine, and architecture; and it is certainly true in education.

If teaching were an "art" to be learned by apprenticeship to an adjudged master teacher, then the educative process could be construed as being a "bag of tricks" at the undergraduate level and the acquisition of "more tricks," the role of graduate education. That there is an "art" to teaching should not be rejected in its entirety, since teachers differ in individuality and the manner in which they put "cues for practice" into reality. There is no assumption implied that it is an horrendous educational practice to apprentice or intern teachers to master teachers. Woodring[1] makes it clear that internship is very desirable in training the prospective teacher. Currently many experimental programs involving internships are underway in many colleges and universities under the auspices of the Ford Foundation for the Advancement of Education. The point to stress is that teacher education goes beyond an "art" or a system of internship. It is insufficient to have subject matter, a teacher and a learner in a static sense. The learner in the educative process is a complex dynamic person. Much is known of his growth and developmental patterns and much less about the way he learns and re-adapts his experiences. He is born into a culture and lives amidst symbols and man made social institutions. He lives in space and time and speculates of his relationship to the universe. He apes his dreams by his very actions. As Alexander Pope so appropriately said, "the proper study of mankind is Man." It is respectable to assume that a goodly portion of graduate work in industrial arts should find proper direction in the study of Man and his activities.

Current undergraduate teacher education programs attempt to professionalize the prospective teacher by embracing such disciplines as educational history, psychology, sociology, philosophy, and educational methodology. It is the contention that insufficient time is allotted in a four year curriculum of liberal arts and teacher education to get more than the rudiments necessary for effective beginning teaching. As Alfred North Whitehead, the late Harvard philosopher said, "We must take it as an unavoidable fact, that God has so made the world that there are more topics desirable for knowledge than anyone can possibly acquire."[2]

Philosophical considerations or idealism is the foundation for any education design. Man through the ages has looked to the cosmos and reached for the stars seeking *Truth, Beauty, Adventure, and Peace.*

[1] Paul Woodring, *New Directions in Teacher Education.* New York: Ford Foundation, Fund for the Advancement of Education, Interim Report, 1957, p. 77.

[2] Alfred North White head, *Aims of Education.* New York: The Macmillan Company, Mentor Book, 1957, p. 40.

This was true in the culture of Athens; as it had to meet the challenge of the Spartans who espoused such ideals as *Obedience, Utility, Security, and Combat.* Ironically, in our time the same problem persists, giving credence to the thought that Santayana so well expressed ..."that those who forget the past are doomed to repeat it."

In simple societies, the imperatives for living are easily discernable. Aims and objectives for living are readily observable in face to-face behaviors to be punished or rewarded. Shamans, witch doctors, and medicine men readily direct change or perpetuate static modes of living. Education is informal in transmitting the culture.

Formal education in the 20th century is institutionalized amid complexities of material progress, technology, science, social disorganization, and conflicting ideologies. Problems which beset mankind are no longer local, regional or national in character but worldwide in their implications. Public school personnel are expected to have the answers for the successful transmittance, maintenance, and improvement of the culture. Such cultural transmission is not guideless but has its roots in wise value choices directed to the attainment of specified ends.

What is the good life?
What is the good man?
What is a good citizen?
What should the schools teach to attain the good life?
Who shall be educated?
Shall the humanities be emphasized over technical education?

These are questions which are speculative with no one right answer. Industrial arts graduate students need not be philosophers but certainly need backgrounds to philosophize effectively, both logically and critically. Curriculum designs, which school personnel organize, are designs or blueprints for putting philosophical assumptions into practice. As such, they are constantly being evaluated to determine their effectiveness in meeting cultural expectations.

Industrial arts educators are team members in the educative process. They have no *a priori* rights or vested interests in guiding and directing learning. All the objectives and aims of education cannot be met by industrial arts. Other curriculum areas, too, make their contributions equally. Philosophical assumptions, both social and educational, should well be part of the core of industrial arts profession graduate education. If curriculum is a blueprint rooted in the ideals of the culture, then ideals will have to rise above pedantry and practice or lead to stagnation.

It is difficult to study philosophy without becoming involved in history. The thoughts of men determine their actions. Educational history could well be labeled the history of mankind. This would include not only Western Man, but man throughout the world in Middle East and Eastern cultures. Western Man has often been provincial in thought and accomplishments when compared to other cultures. The study of educational history is an amalgam of the living past and has no priority in Western Man. As such, it is the study of man's perennial struggle to achieve the "good life." At times it has centered about intellectual pursuits vested with philosopher kings; later in the *heart* of man with the *hand* of man being the last to be considered. Pestalozzi, in his educational philosophy, considered all three as essential for effective living; the head, the heart, and the hand.

The study of educational history is not to discover eternal truths in the past, but only to discover by fragments how man tried to solve his problems through his intellect, social institutions, science, and technology. The past with its lessons of successes and failures were only approximations of reaching the truth. Science and technology have played important roles as man has progressed to this the brink of the 21st century. What their roles will be as man seeks his Utopias for tomorrow are well within the province of graduate education in industrial arts. Civilizations of the past, which glorified the intellect, epitomized the warrior and denied status to slaves and craftsmen, have disintegrated and perished. Only thinking men heeding the past can give intelligent direction for tomorrow.

Earlier in this chapter, it was alluded to that educating is neither an *art* or a system of apprenticeship, but a synthesis of both. The prediction of human behavior has grown from its mother science of philosophy to the more mature science of educational psychology whose central core has its focus on the learner. While it is true that there are diverse schools of learning, this does not make the discipline less respectable. Each school in generating hypotheses about learning is experimentally complimenting the other. Schools of psychology perhaps have more in common than they have differences. Using the experimental methods of science in attempting to hold variables constant in discovering generalizations about human behavior gives educational psychology the status of a science.

Significant contributions to research have been made since

1900 concerning the role of nature and nurture in learning, individual differences, transfer of training, motivation, concept formation, attitudinal change, problem solving, reward and punishment, role analysis, perception, achievement, diagnostic and prognostic testing to provide the educator with "cues for practice." General and specific aims in industrial arts education philosophically derived, have no validity unless they lead to changed or modified behavior on the part of the learner. The graduate industrial arts student needs to understand, in depth, theories of learning to enable him to generate hypotheses for the attainment of his aims and objectives in the classroom or laboratory. An *if then* approach to this problem can illustrate the case. Example: An industrial arts teacher operating from theoretical dimensions knows that *cooperation* and *aggression* are learned behaviors and not innate. One of his objectives is to teach cooperation. In order to reach this objective, he might entertain the following hypotheses:

1. I can talk about cooperation to the class and expect my verbalizations to transfer.
2. I can pick students to assist with laboratory clean-up and check them off on a grade sheet according to their performance.
3. I can identify the personal needs of each individual for having a safe clean laboratory to work in and then allow students to pick a partner with whom to work in a clean-up assignment of their choice.

In each case, the instructor is saying to himself, "*If* I follow hypothesis (1), *then* cooperation may result." "*If* I follow hypothesis (2), *then* I can guarantee results." "But, *if* I follow hypothesis (3), *then* results may be lasting and will have been achieved in a natural setting for most effective transfer to other life situations." In each case, the instructor is making a hypothesis about learning which he will validate in terms of behavior on the part of the students. Should the expected behavior not result, then he will entertain new hypotheses or critically analyze the merits of his objective. Graduate work in learning theory and in the behavorial sciences can enable the industrial arts teacher to operate with an experimental bias in the attainment of objectives in both the classroom and laboratory. The industrial arts teacher holds a unique position as a director of learning in the school. Much of what he teaches need not rely on *inference* for the supposed attainment of objectives. He is in a position readily to observe and validate changes of behavior in his students. In the final analysis, unless educational objectives can be stated in terms of behavior that can be validated, teaching then resolves itself into "black-magic."

Education as a discipline is replete with "universal truths" held dogmatically to be immutable. Often, these truths have been established without research data. They are true because someone in a position of authority or prestige has held them to be tenable. Such logic is illegitimate. Socrates is alleged to have said the following concerning the establishment of "truth":

> Go to all the people.
> If you can't go to all the people, go to some of the people.
> If you can't go to some of the people,
> Go to the wise men.
> If you can't find the wise men,
> Find the *Wise Man.*

Much of the research in industrial arts education has been of the "wise man" caliber, which in the final analysis is based on opinion and value judgments which are difficult to validate. There is no suggestion here to cloud the reliability of "experts," but only to suggest that *what the expert holds tenable* should be put to the test experimentally. Progress in industrial arts education can be made by the methods of science (e.g. controlling the experiment at hand by holding variables constant). Hypotheses generated in the behavorial sciences can best be put to the test if founded on an statistical base.

If the educationist is to be an intelligent user of research, he needs to have a background in statistics in order to interpret data reported in journals and research reports. Should the graduate student carry on experimentation, he will need statistics in designing his research. Statistics can best be thought of as a tool in decision-making. Whenever evaluations or probabilities are involved in experimental research, statistics are used. Statistics in themselves have no value. It is the skill and insights whereby a researcher can make logical inferences from his statistical data about the problem under investigation which are of value. A statistic in itself never proves a thing. They can be moral or immoral depending on the integrity of the researcher and the inferences he makes concerning his problem. Statistics can help other researchers to replicate experiments; to accept or reject data as significant or not in respect to *chance* findings. Better "cues for practice" for the industrial arts educator at the graduate level can result if hypotheses about learning are subjected to experimental treatment.

Topics discussed in this presentation do not attempt to prescribe a model program for graduate industrial arts education. These topics only tend to tell us where we are in this the brink of the 21st century. It is hoped that a study of the present foundations of graduate level education will lead to change and improvement as the future is faced with its myriad of challenges to the leaders in industrial arts.

Part 2: A Core for Industrial Arts Graduate Education

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After we acknowledge the obvious fact that every graduate program will differ, depending on the staff, facilities, and the academic and industrial environment of that program; and after we further agree that each student will desire or require his own special interpretation of any particular program; we come to the consideration of the factors which will, in the future, give our programs identity as industrial arts graduate programs. What is the particular body of knowledge which characterizes this specific area of specialization?

It would provide a curriculum developer a secure and relaxed feeling to believe sincerely that one such core exists; however, if industrial arts as an area of teacher preparation is to achieve its fullest potential, or meet the student needs which seem to fit its unique characteristics, we are forced to acknowledge at least *three totally different cores,* or different programs. These programs would require different *types of individual students* and would lead to totally different types of teaching duties after graduation. If this position has validity, it is, of course, damaging to any unitary concept of industrial arts as a field. It could lead to a dividing of existing graduate schools or to a specializing of existing and new programs into increasingly unrelated disciplines. Let us examine the problem from the point of view which leads to this conclusion.

Graduate work, as it now exists, assumes a varying degree of control or relationship to the undergraduate program preceding it. The purpose of this yearbook is *not* to determine an ideal pattern for teacher education in the industrial arts (although this would make a valuable yearbook if it could be accomplished) but to consider the possible nature and content of an extension of training which is added to a four year program at some indeterminate time.

Since the above condition exists in a majority of graduate programs today, we must assume two aspects of any graduate program in addition to the "core." The first of these can be called supplemental education. We must assume that there is some ideal four year program, or at least an advisor must have some frame of reference such as this in mind when he assists a student. The difference between an ideal program and the program actually taken by the student (or the difference between an ideal teaching candidate and the particular student) would determine the supplemental work which might be included in a program. It should be pointed out that this work, by definition, is not graduate work at all, and from certain points of view should precede graduate work, even though its exact nature would, of necessity, differ with each school or each different concept of the ideal.

The second category which should be included is the area of special interests. Where supplemental work will tend to include those fields not adequately covered in undergraduate work, the area of special interests will probably include courses similar to those chosen as senior year electives. The development of such a special interest is important to the student both as an individual and as a teacher.

Having commented briefly on the two aspects of graduate education, which are *not* the subject of this chapter, we may turn our attention back to the matter of the core. This is the portion of any graduation program which should be an expression of the perceived function of that program. It is the portion which will determine the characteristics held in common by the graduates; and, therefore, the portion which will determine the nature of the professional group of the future. While the supplemental work will vary with each individual student, his strengths and weaknesses, the core would only vary with differences in the specific objective or with differences of concept concerning the ideal for that specific objective.

The number of units which can be devoted to the core, the nature of the courses or work to be included, and the sequence and manner in which it is presented and related must be considered. Despite the crucial importance of the core work, it will necessarily be limited by the other two aspects of graduate training.

How extensive can a graduate core be? How many units could be allocated to such a preparation? These questions can, of course, only be answered in terms of a specific school program. The matter of the Master's thesis is involved. If a thesis is a part of the requirement it should be considered in the special interest category. Considering, as an example, an eighteen semester unit core, two to six units could be devoted to supplemental work while six to ten units could be applied to a special interest or a thesis project. This eighteen unit core would probably be considered a minimum although this matter cannot be discussed in a general way, each individual college situation requiring differing considerations.

The first and second categories, then, depend on individual differences of specific students, while the third, the core group, depends upon one's concept of the ideal industrial arts teacher. We are therefore, forced to look into this matter in order to make any statement about what should be included in the core. It may be reasonable, when speaking about graduate students, to speak about those we now have, but it certainly is not reasonable, when speaking about teachers or teaching tasks, to consider only what is now being done. We are preparing our students to teach in the future.

If there is any validity in the above classification of potential teacher orientations for industrial arts, some thought might be given to modifications in our undergraduate programs. However, for purposes of this consideration, the establishment of a three-option graduate core would seem to represent a reasonable beginning. The selection of a special interest area for a graduate program would, of course, be a supporting one to the core selection.

The Graduate Core for the Pre-Vocational Orientation.

It is my belief that this approximates the typical orientation of the past decades. It is probable that, as larger percentages of our students continue into junior college and college that the need in this area diminishes, but it will certainly be an important area to industrial arts and to education in general for a long time. The need is probably greater in schools where larger numbers of students come from the lower socio-economic groups.

Specifics, in terms of working techniques, have been the stock in trade for this orientation. Specifics, in terms of plant operation and business procedures, may have been less emphasized. When this has been the case, teacher experience and knowledge may have been the cause. A general knowledge of the broad aspects of vocational fields, union procedures, insurance and medical benefit legislation, political action, personnel, testing and training procedures and small business operation should be areas of interest if not a part of the core for this orientation. Courses which would comprise the core for this orientation would include a number of upper division courses in the departments of business and of engineering. A new course which might be established in either the engineering or the industrial arts department would be some type of industrial observation, spending perhaps a month in a selected plant, then making short two and three day visits to several plants in the same general vocational area.

Assuming an undergraduate program which provided a sound general education, this type of core experience supported by a special interest or thesis problem, either of which might involve some laboratory work, would provide a sound basis for this type of industrial arts teaching.

The Graduate Core for the Craftsmanship and Creativity Orientation.

This teacher is not primarily concerned with the interpretation of industry nor with the training of individuals for jobs in industry. He is interested in helping the individual find a means of gaining satisfactions, pleasures, and challenges within the pattern of our present social order. Most of us have watched the shifts in life patterns in this country since World War II. At an earlier date, a discussion about the need for satisfaction through creativity for those who do not find such satisfactions in their work might have seemed an idle waste of time. Today, we see it as a very real problem for many people, perhaps for some of us, even a personal problem.

You will, of course, note that a teacher capable of carrying out the task mentioned above must be a different personality from a person in the pre-vocation orientation. Accordingly, the only overlapping of courses in the core might be seminars in industrial arts teaching techniques, organization and preparation. The core for this person should be a minimum one to permit a maximum number of units in the special interest area. This person must be an artist in his craft area, must participate with local craft groups and must, therefore, have a maximum of units for individual development, both of technique and of style. Courses in history of art, anthropology, and psychology will be of great importance in the core for this teacher, as well as upper division courses in free hand drawing, painting and design to strengthen his undergraduate work in these areas.

The Graduate Core for the Scientific-Technological Orientation.

If the interpretation of industry on a contemporary basis has any value as a part of our secondary school curriculum, for high school students other than the pre-vocational group, this type of industrial arts teacher assumes constantly increasing importance. Individual craftsmanship is still highly important in our technology. It does not however, seem to be a central or an organizing concept around which to develop an understanding of contemporary industry. The direction of scientific research, and the application of that research information to practical problems of human value seems the central problem of our industry as a whole.

In order to be prepared for this type of industrial arts instruction a teacher needs an appreciation of science, an appreciation of business, economics and sociology and the most complete understanding attainable of the contemporary industrial method.

The core in this case must be predicated on a sound undergraduate program including physics, chemistry, and mathematics. It might include some additional work in these fields, but should emphasize industrial management, either from the engineering or the business view, industrial planning and control courses in engineering, econnomics, sociology, and perhaps philosophy. There is some overlapping between the core for this orientation and for the pre-vocational orientation except that this program must be conceived on a much broader plane. Some observation of industry should be included here also but not the intensive month long type. Shop or laboratory work can be eliminated entirely from this program unless needed as supplemental education. In its place, although the more rigorous core will leave very little free time, should be methods courses in science as well as in industrial arts, and a consideration, through seminars, of the very special and very difficult type of high school instruction required for success in this area.

Each of you, reading this, recognize one of these orientations as your "dish"–The sort of thing you do well–the sort of thing you enjoy doing–the sort of thing which you trained yourself to do, not only through school and college experiences but through life experiences as well. You very possibly do not agree with me that the other two orientations are valid ones, or indeed that there are such definable orientations. If this is the case then you may also feel that the unusual kinds of "Industrial Arts" graduate work which I suggest are not the answer. But if this *is* the case, then there may be little reason for graduate work in this field.

If there is any validity in these three projections for types of industrial arts teachers in the future there is also an irony for which

I have no answer. In my own daily experiences, I find a good many young men who will undoubtedly make fine industrial arts teachers of the pre-vocational orientation type. When we team up with our friends in the art department (and we are doing this more and more), we find quite a few young people who would make a real contribution as an industrial arts teacher–Type II (Craftsmanship and Creativity Orientation). When we look for people capable of handling a situation dealing with the scientific–technological orientation, the area in which there is a cogent need in *every high* school today, we don't find these people. They must exist, somewhere in our crowded colleges, but they are not being attracted to industrial arts education. Perhaps the reason is that there are so few examples of Type III programs in our high schools. Also, there may not be many graduate programs developing teachers in this direction.

One important aspect of the establishment of one or more of these new directions for graduate work would include a communication of purpose and direction from the Industrial Arts Department to other departments and advisors. Until this is possible, the aforementioned types of students will not enter industrial arts graduate or undergraduate programs. In the terms of the business world today, a new "Corporate Image" must be created and projected for industrial arts education. Only after this has been done, and after there is some evidence that the image created was a valid one, will we begin to receive students of the type that are capable of fulfilling the requirements of these new challenges.

Since the establishment of three types of graduate programs at one school might present problems in the initial stages, an interim solution might lie in the modification of the existing program in the direction of the Pre-vocational Orientation working with the Departments of Business and Engineering in the particular college. The industrial arts faculty might then select either the Creativity Orientation or the Scientific Orientation (working either with the Department of Art or the Department of Science) as a second option for certain of their graduate students. Since extensive coordination with other departments would be involved, often in situations where little communication has been the case in the past, the choice would probably depend on the nature of the particular college structure as well as on the particular area. After a developmental period during which time only two options are offered, the third option might be considered. With the establishment of this concept of the nature of industrial arts education as an interdepartmental activity, reflecting the "interdepartmental" nature of our industrial patterns of behavior, then the character of undergraduate industrial arts education might become less cloistered and isolated from other aspects of college education and, therefore, a more vital aspect of that education for all our young people. Establishing options for core programs in several graduate schools of industrial arts, would be one step in this direction.

PART THREE

Summary

The contributing authors have presented material which describes both the evolution of industrial arts in public education and the graduate programs which have been developed to serve the needs of industrial arts teachers. Many ideas which have been presented may be used to improve existing graduate programs. In addition, the content of these preceding chapters should provide numerous topics for the consideration of graduate committees and faculty seminar groups planning and developing graduate programs.

Instead of a formal itemized summary of concepts developed by contributing authors, the final chapter of this yearbook will be presented as a prospectus of graduate industrial arts education. Some of the suggested changes mentioned in the preceding pages will again be explored to determine what effect they might have on future programs.

CHAPTER XI

A Look Ahead

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Our society is learning at an ever increasing rate. New knowledge is being gained so rapidly that our total knowledge more than doubles every decade. Education is placed in the center of this development. It has the responsibility of teaching youth how to cope with the problems being created by this expansion of knowledge, and how to assemble the correct combination of this knowledge necessary to become a contributing citizen. Considering the objectives and responsibilities outlined by the authors of Part I (Evolution of Industrial Arts in Public Education) of this Yearbook, industrial arts has a major role in providing this needed education. Graduate programs of industrial arts, then, have the responsibility of providing teachers, teacher educators, and administrators who can fulfill the needs of professional education.

In order to provide the best instructional program and plan for future improvement, industrial arts first must adjust course content and instructional methods to parallel established aims and objectives. For example, a graduate class in industrial arts may be discussing the introduction of new units using new industrial materials, old materials in new ways, power mechanics, problems of designing industrial products, or new developments in electronics, while an undergraduate class in the same building may be constructing the traditional projects and emphasizing the traditional skills, while ignoring the new methods and content being discussed in the graduate class. The traditional program of industrial arts should be maintained only to the extent it serves either as an historical representation of our industrial development or as the basic foundation of modern industry.

The Minnesota Plan is an excellent example of the planning one university has done in an effort to adjust their undergraduate teacher preparation program to prepare teachers capable of presenting instructional programs designed around the aims and objectives of industrial arts.[1] This type of self evaluation, or action research, permits all faculty members to become involved in program improvement. As a result, each faculty member is interested in implementing the program within his instructional responsibility.

Coupled with self improvement is the need to dispel the misconceptions others have acquired toward industrial arts. New methods of displaying our efforts must be devised. The present industrial arts award programs, fairs, and displays do an excellent job of exhibiting artistic ability coupled with a high degree of skill in developing projects. We must, however, improve upon these through the display of industrial models showing plant operations, experiments, student demonstrations, comparative designs of industrial products, and course aims with examples of how these aims are being fulfilled.

While the project is still important both as a method of organizing content and motivating students, it can no longer be the only representative of industrial arts. Many educators predict a continual de-emphasizing and general decrease in the time devoted to project construction. The time saved will be used in demonstrations, experiments, group projects, and other types of activity programs. If industrial arts is going to be explained and described to the public, it seems essential that all facets, including how the objectives of the course are being fulfilled through both classroom and diversified laboratory activities, be demonstrated.

In addition to a re-evaluation of undergraduate teacher preparation as illustrated by *The Minnesota Plan* and the publicizing of industrial arts, a look ahead shows numerous changes possible in the organization and presentation of graduate programs.

[1] Micheels, William J. and Sommers, Wesley S., *The Minnesota Plan for Industrial Arts Teacher Education.* Bloomington, Illinois: McKnight & McKnight Publishing Company, 1959.

The Masters Degree.

This degree has been changing rapidly due to the continual pressure of school administrators for all teachers to continue their education through completion of the masters degree. Many school districts require the masters degree in order to teach in secondary schools – others strongly encourage all teachers to obtain the degree as soon as possible. Some states have credential structures which require five years of preparation and either include a masters degree or bring the teacher very close to one.

In addition, many educators question the value of a master's thesis in relation to the time and effort involved. As described in an earlier chapter, most MEd degrees do not require a thesis and many MA and MS programs are beginning to follow the same pattern.

In view of these two conditions, it seems that the masters degree will become the minimum requirement for teaching. Along with this trend, the six-year teacher preparation program will gain many supporters and may become a reality. In at least one state, the general teaching requirement is a five-year program with the masters degree adding from one-half to one year. A slight reorganization would change it into a six-year teacher education program providing both a teaching credential and masters degree.

Some of the advantages of the six-year program are the acquisition of a thorough liberal arts education coupled with an undergraduate major. The last two or graduate years would center around the professional preparation for teaching including educational philosophy, methods, student teaching, etc. Modification of this program includes an internship substituted for student teaching and a major and minor instead of a single major in the undergraduate program. The masters degree in education would be issued at the end of the sixth year. The program would produce a more liberally educated person and help develop the concept of a well educated master teacher.

The de-emphasis of the thesis as a requirement for the masters degree does not mean that it may soon cease to exist. Many believe that a masters degree involving the thesis will become a preliminary step to the doctorate. The thesis plus research training could be planned within the six-year teacher education program as preliminary training for the doctorate. After acquiring some teaching experience, this specially trained person could continue his graduate work leading to the doctorate and an eventual position in administration, research, or teacher education.

The Doctorate.

In general, three objectives are held for a doctoral program within a teacher education area. They are:

1. Preparation for college or university teaching.
2. Preparation for administration or supervision.
3. Preparation for both conducting and supervising research activities.

As has already been described in an earlier chapter, both the EdD and the PhD programs are designed to educate people for either one or more of the above objectives. The actual programs for completing this education are quite diversified. However, most of the programs provide a strong background in education and research and require a written dissertation.

Probably the greatest problem facing the profession in relation to the doctorate is the limited number of programs in existence. Many industrial arts teachers have been forced to enter programs that provide little or no professional training in industrial arts or industrial education. Under these circumstances, they select majors such as art education, teacher education, administration and supervision, and secondary education. While these programs provide the professional education aspects, they often fail to provide the opportunity to gain further insights into the problems and needs of industrial arts. That is, their education courses are not related to their major interest (industrial arts) and they have no contact with an advisor versed in industrial arts.

The relationship of the doctorate to the six-year credential and master's degree program should also be explored. Should the total program involve seven years, that is, three years beyond the baccalaureate? Or should it consist of two years beyond the masters, thus making it an eight-year program? Since a doctoral dissertation normally provides credit for one to two semesters of graduate study, the eight-year program becomes a necessity if instruction in research procedures and professional education is to be included.

If the doctoral program is studied in terms of the three objectives listed at the beginning of this section, it is noted that only item (3) – preparation for research activities – is adequately covered by the present program. In completing this objective, the candidate studies research techniques and procedures in organized classes and then conducts a research program which culminates in the dissertation. The student thereby learns both theory and application and has the opportunity to apply his acquired abilities.

This same concept is accepted in the undergraduate teacher education program where practical experience in the form of student teaching or an internship is almost universally accepted. This concept has not, however, always applied to the doctoral program objectives of (1) preparation for college or university teaching and (2) preparation for administration or supervision.

Many doctoral programs now provide practical experience for college or university teaching for a limited number of candidates. This is accomplished through teaching fellowships and grants whereby a candidate is permitted to teach in the undergraduate program as part of the fellowship program. This plan should be expanded to become part of the regular doctoral program. Supervision and evaluation of these graduate teachers through observation, conferences, and seminars should become an integrated phase of this program.

The last objective to consider – preparation for administration and supervision – offers the greatest challenge to provide practical experience. Two avenues which might be utilized are:

1. Provide the candidate with student teaching supervision responsibilities. This could be accomplished as a part of the fellowship program or as a part of an organized or independent study course. This supervision should involve the doctoral candidate in all the problems of supervision and evaluation that normally occur in the school program. Evaluation of the doctoral candidate's progress should be made through evaluative type conferences and seminars.
2. Involvement in the college or university program of public school assistance. This might include assisting in the conduct of teacher extension courses for upgrading instruction, consultation services, school plant planning, etc. Again, instruction for the candidate should be completed through conferences and seminars.

Inclusion of real experiences in these three objectives – college teaching, supervision and administration, and research – will help provide the doctoral candidate with the information and experiences necessary for continued growth and major contributions to the profession.

A program which has often been suggested, and implemented in a few schools, is two years of professional preparation beyond the masters degree, but excluding the dissertation and formal research training.

The advantage to this program is the fact that they can be completed in two years. In addition, the tremendous amount of individual attention often needed by the doctoral candidate in completing the dissertation is eliminated, thereby providing opportunity for more students to profit from the instructor's time. The future of this program may well depend upon the respect the profession gives to the graduates and their degrees.

Another important factor to be considered in a discussion of the doctorate is the prestige of the profession. Industrial arts is young, less than fifty years old. An educationally sound and well organized doctoral program with high standards will help focus attention on industrial arts and provide both citizens and other educational groups an opportunity to understand the objectives and aspirations of industrial arts.

Research.

Most of the industrial arts research has been completed by doctoral students as they develop their dissertations. Essentially, two problems exist with these research studies. First, they are, in reality, learning situations for the students doing the research. Second, they are first attempts. These factors are somewhat offset by enthusiasm and interest. Many of the research studies of doctoral students, however, reflect a lack of maturity and do not demonstrate the best that the profession is able to produce.

It is anticipated that research in industrial arts will improve due to three principle developments:

1. Industrial arts faculty will begin research studies which integrate their own teaching problems, problems of the profession, and unanswered questions about industrial arts. Since these studies will be conducted by faculty members who have profited by writing a dissertation and are no longer working under this pressure, the results should more closely reflect the research abilities within industrial arts.
2. Industrial arts research will continue to turn away from mailed surveys and opinionnaires and toward more valid forms of research used in the behavorial sciences. This is a logical change since professional education involves the behavorial sciences. Experimental research will become a more common method for gaining answers to basic questions, trying out new educational concepts, and gaining general information about children engaged in industrial arts activ-

ities. In addition, other types of research will need to be utilized as industrial arts develops a more thorough understanding of the students being served, their actions within a program, and the types of programs best suited for public education.

3. Doctoral dissertations will improve as advisors gain additional experiences and faculty members begin engaging in research using accepted procedures. These activities will be reflected in problem selection and research methods selected by graduate students.

Research holds the key to the future of industrial arts. Thorough research programs can provide answers to the many problems and questions confronting industrial arts. There will probably be at least two new problems uncovered by every one answered, but the program will have profited by both solving one and recognizing others.

Research also holds the key to public relations and recognition. Well publicized research in journals read by all educators and articles in the popular journals will develop understanding and respect and strengthen the position of industrial arts in American public education.

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