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In modern industrial arts courses, there are two kinds of activities carried on, one of which has to do with the manipulation of tools and materials and usually consists of work at a bench or a machine. The other type of activity is of an informational nature and is similar to the seat work of regular academic classes.

In recent years there has been controversy over the proper balance of the class time given to manipulative teaching and to informational teaching. This study was undertaken in an attempt to determine the best time allotment for these two kinds of activity.

The study was made by reviewing the literature of the field to determine what some of the authorities have said about the problem, and by means of a questionnaire sent to industrial arts teachers, principally in the western part of the United States. Seventy-two per cent of the questionnaires distributed were returned.

In reviewing the writings of industrial arts leaders, it was found that it is only in recent years that much has been said about the importance of informational teaching in industrial arts classes. Formerly the courses were almost entirely of a manipulative nature; but, because of the values derived from informational content, the leaders have been successful in establishing it in the various courses as a definite part of the work. Only a few of the writers make any statement concerning the time allotment for teaching the informational content, but the majority of those who do mention it seem to feel that from twenty to twenty-five per cent of the class time should be devoted to informational teaching.

Because of the great number of courses taught under the heading of industrial arts, it was impossible to study all of them. Therefore, the following major elementary industrial arts courses were selected for the questionnaire study:

Woodwork, drawing, architectural drawing, general metal, art metal, electricity, and printing.

In the study, the teachers were asked to indicate the percentage of class time which they recommended be used for teaching information and also the percentage of class time which they actually used for that purpose. They were asked to answer both of the questions so that it could be seen whether or not there was any great difference between what they did and what they thought should be done.

Following are the numbers of teachers who reported on each subject:

Woodwork	120
Drawing	116
Architectural Drawing	60
General Metal	81
Art Metal	63
Electricity	72
Printing	64

The means were calculated for both recommended time and actual time in each subject, and it was found that in every case the recommended time was greater by approximately five per cent than the actual time. By testing the differences statistically, it was shown that the recommended time was significantly higher than the actual time in the subjects of woodwork, drawing, and art metal, and that there were at least 99.5 chances in 100 that the recommended means were significantly higher in the other four subjects.

The means for recommended time are as follows:

Woodwork	22.8%
Drawing	22.3%
Architectural Drawing	24.6%
General Metal	22.2%
Art Metal	20.6%
Electricity	29.0%
Printing	24.9%

The means for actual time used are as follows:

Woodwork	18.6%
Drawing	18.2%
Architectural Drawing	19.6%
General Metal	17.9%
Art Metal	15.1%
Electricity	23.2%
Printing	19.0%

The questionnaires were divided into groups representing junior high schools, senior high schools, four-year high schools, junior-senior high schools, unit shops, and general shops. The means were calculated in each subject for these groups, and, when compared with the means of the entire group,

it was shown that there was not a single case in which the difference between the means was really significant, although there were a few cases that closely approached significance.

The means for the various groups were really remarkably close, and because of this agreement it was felt that in the lack of experimental or other evidence, the recommended perdentages of time would be the best time allotment guide for a teacher in determining the informational content of his courses. The recommended percentages were selected in preference to the actual percentages because they more nearly represent the true feelings of the teachers in regard to the time that should be used to teach industrial arts information.

The study also indicated that there is need for further study in regard to : methods of teaching the information, the actual content of the information, and the best method of distributing the time allotment determined in this study.

A STUDY OF THE TIME ALLOTMENT FOR TEACHING THE INFORMATIONAL CONTENT OF THE MAJOR INDUSTRIAL ARTS SUBJECTS

by

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CHAPTER I

INTRODUCTION

Industrial Arts as a school subject has grown rapidly during the last quarter of a century, until it now occupies a place of importance in the curriculum of the modern school. During the period of this growth there has been considerable change in emphasis, and from a purely formal manipulative type of activity, the courses have become rich and broad in nature, including many different types of activities. The proportion of class time devoted to the direct teaching of information in contrast to that taught simulataneously with manipulation, has long been an issue in industrial arts. The informational content is now considered by authorities to be an important part of each course. A study of modern objectives of industrial arts indicates clearly that it is impossible to meet these objectives without spending considerable time in the teaching of information, and that attention must be given to this phase of the work.

It is the added emphasis upon the informational content

that has helped bring about some of the growth and popularity of modern industrial arts. It is believed that more and more teachers are devoting a greater proportion of the class time to this aspect of the work in realization of its value. In spite of the importance and the value of industrial arts information, it must be remembered that anything can be overdone. It must also be remembered that the greatest appeal which industrial arts has made has been through its manipulative activities. Without manipulation, industrial arts is just about so much "dead wood". Without information, it accomplishes only part of its purpose. Obviously, over-emphasis on either part of the work will probably cause one or the other to be done inadequately. Both parts of the work are important, and somehow the time must be divided so that proper emphasis is given to both manipulation and information. What, then, is the proper or best division of time for these two parts of the industrial arts program? It is the purpose of this thesis to attempt to answer that question.

Unless a teacher has a rather definite idea as to about how much time should be spent in the activities pertaining to the teaching of information, it is difficult to plan an effective course. There is so much material which can be included that unless great care is used in selecting what is to be taught, there is danger of overdoing the informational part of the work. Also, because

of the immense amount of material available, a teacher may feel that the task of selecting the proper amount and kind to be used is too great. As a result the informational content may be almost entirely left out, thereby weakening the course to a great extent and losing an opportunity to do some really fine teaching.

The industrial arts information with which this thesis is concerned is of three kinds. The first is that which a student must know in order to carry on his work satisfactorily and may be known as technical information. The second is that which is nice to know, although not essential to the performance of a given task. It deals with information about tools and materials, their sources and manufacture, and with other items of interesting knowledge. It is sometimes known as related information. The third is that which deals with the occupations. Here, information is given about the various occupational fields, the nature of the work, the training required, the personal requirements, and the opportunities and possibilites which an individual may have in an occupation. This kind of information is often referred to as guidance information.

If effective teaching is to be done with these three kinds of information and a proper balance maintained with manipulative work, there must certainly be some careful selecting done. Whole courses can easily be organized

in the informational phase of the work alone; but the teacher in the field must spend the major portion of the class time in manipulative activities. Thus he is faced with a real problem in trying to decide just how to balance these two distinctly different parts of his work. If a teacher knew what constituted an acceptable distribution of time between manipulation and information it would help him in selecting the material to be used.

The writer, who is an industrial arts teacher, has long felt the need of having something definite on which to base his judgment concerning this matter. It was also felt that other teachers in the field might be interested in having some light thrown upon the problem and that some good might come from such a study.

Because of the great number of courses that are taught under the name of industrial arts, and because of the fact that many of them are of only minor importance, it is impossible to include many of them in this study. Certain of the courses, however, represent broad industrial fields and are of major importance in the curricula of many schools. As far as the writer has been able to determine, the major industrial arts courses in our schools today are the following: woodwork, drawing, metal work, electricity, and printing. There are many different types of courses (about a hundred different course titles)

being taught in the name of industrial arts, and obviously all cannot be included. Therefore, for the purpose of this study, the following major elementary courses have been selected: elementary woodwork, elementary drawing, elementary architectural drawing, elementary general metal, elementary art metal, elementary electricity, and elementary printing. It will be noted that in every case the elementary course is included for this study. This is done because there seems to be greater uniformity in the course content of the elementary courses than there is in the more advanced courses and in general, where industrial arts is taught, students are required to take the elementary courses. Also, there is greater opportunity for teaching a more standardized course where all students are on about the same level of achievement than there is in the courses where students are more widely separated in their degree of achievement. These elementary courses were considered sufficient for this study. An effort has been made to determine what proportion of the class time in each of these courses should be devoted to teaching information.

Knowing that much has been written about this problem by many of the leaders in the field of industrial arts teaching, an extensive study of these writings has been made in an effort to help bring about a solution. A brief review of the findings will be presented in a later

chapter.

Believing that there was no single group better qualified to help solve this problem than the industrial arts teachers themselves, it was decided to obtain their opinion and to survey their actual practices. The study was made by means of a questionnaire sent to teachers so that the opinions and practices of at least forty or fifty individuals were obtained for each of the subjects being studied.

The chief aim of this study is to show the importance of the informational content in industrial arts courses and to discover, if possible, the most generally accepted time allotment for the teaching of this information. The study is limited to grades seven to twelve, and principally to those schools organized into junior and senior high schools. Emphasis may be placed on the lower secondary school level because it is here that the elementary courses are most highly concentrated.

CHAPTER II

INDUSTRIAL ARTS IN THE MODERN SCHOOL

In order for any school to function properly its program must be built upon a philosophy. That philosophy does not necessarily need to be an exact duplicate of any particular one that may be predominant at any given time, but in a democracy such as the American democracy, it must conform to democratic ideals. Different philosophies are found today which are in harmony with the ideals of democracy, and yet show many variations in some of the concepts involved. At present, education in this country seems to be largely influenced by two basic philosophies. The one is built on the assumption that the school is the agency of society, and as such should provide those experiences and activities that will best fit an individual to take his place in that society. The second philosophy maintains that the school is the pioneer of society and as such must assume a large share of the responsibility for developing a society that will provide the greatest amount of good for all and will produce members of society who are willing to work toward such an end.

These two philosophies are better explained and further discussed in the following quotation from N. Wm. Newsom (28:1-2):

Educators who adhere to the first school of philosophy believe that it is the business of the school to help the pupil to become adjusted to that mode of living which society has found most acceptable, and also to develop in him the capacity for readjustment to those social changes he will most likely meet in maturity. In order to accomplish these ends, of course, adult standards must automatically be imposed upon the behavior of youth. Herein lies danger of an indoctrination, of which dictators or vested interests of any sort may be quick to take advantage. On the other hand, this philosophy offers less opportunity for a type of educative practice which goes everywhere and gets nowhere.

Advocates of this philosophy usually maintain that society can best be served when each of its members is contributing his best efforts, and that an individual's efficiency increases in direct proportion to his interest in and his ability to carry forward an activity. Such a premise as this automatically places upon the secondary school the responsibility for developing the natural abilities, aptitudes, and interests of each individual in harmony with the society which supports that school.

The second philosophy is the basic doctrine of the more extreme progressive educators. Proponents of this philosophy are interested not primarily in transmitting the social heritage as a means of interpreting the present social order, but in conditioning the mind toward the construction of a new social order which they feel is already evolving. With this ultimate goal in view, they maintain that the pupil should determine his own activities in the light of his immediate interests and needs, and that the teacher's function should be largely that of an interested participant. In support of this premise, they contend that the experience gained in acquiring knowledge is of paramount importance and not the acquisition of the knowledge itself.

The principle of freedom dominates the

> whole philosophy of this second school of educational thought. Its members are definitely opposed to the imposition of adult standards upon the pupil and they believe that each pupil should be free to develop both his individuality and his personality through his own self-initiated and largely self-directed activities. They also maintain that the individual should evaluate his efforts in the light of his own standards rather than according to any commonly accepted set of standards.

The Educational Policies Commission (8:50-72-90-108) in one of its recent publications, gives a lengthy discussion of the objectives of education. This discussion shows the trend of modern day thinking and reflects the philosophy behind the current practices. The commission lists a variety of items under four main divisions, as follows:

I. The objectives of self-realization
   1. The inquiring mind
   2. Speech
   3. Reading
   4. Writing
   5. Number
   6. Sight and hearing
   7. Health knowledge
   8. Health habits
   9. Public health
   10. Recreation
   11. Intellectual interests
   12. Esthetic interests
   13. Character

II. The Objectives of human relationship
   1. Respect for humanity
   2. Friendships
   3. Co-operation
   4. Courtesy
   5. Appreciation of the home

6. Conservation of the home
7. Homemaking
8. Democracy in the home

III. The objectives of economic efficiency
1. Occupational information
2. Occupational choice
3. Occupational efficiency
4. Occupational appreciation
5. Occupational adjustment
6. Personal economics
7. Consumer judgment
8. Efficiency in buying
9. Consumer protection

IV. The objectives of civic responsibility
1. Social justice
2. Social activity
3. Social understanding
4. Critical judgment
5. Tolerance
6. Conservation
7. Social applications of science
8. World citizenship
9. Law observance
10. Economic literacy
11. Political citizenship
12. Devotion to democracy

It is not the purpose here to discuss these items, but only to present them in order to make clear both the philosophy and the thinking which largely determine educational practices. Lists of objectives and statements of philosophy could be continued at great length, but to no great purpose, because those presented should be sufficient to explain the function of education. One of the most impressive characteristics of all the thinking in education is the importance of the adherance to democratic ideals and an interpretation of all school activities in terms of

these ideals.

Modern industrial arts is flexible enough that it can be adapted to fit well into any type of modern school. A specific school may be operating under the philosophy that the school is the agency of society, or it may believe that the school is the peoneer of society, ir it may partake of some of the elements of both philosophies. Regardless of what the philosophy is, industrial arts can function well in any type of school. It helps in the attainment of the objectives of general education; but, in addition, it has some objectives specifically its own.

Industrial arts has not always been considered a part of general education because when it first began to take its place in American education, during the last quarter of the nineteenth century and under the name of manual training its aims and purposes were of a so-called practical nature; and it was supposed to give vocational training. The work was almost entirely manipulative in nature, and great emphasis was laid on the acquisition of a high degree of skill. The courses were well organized, with definite exercises to be performed and models to be constructed. There was little or no opportunity for individual initiative, as students were held rigidly to the outlined courses. In the beginning woodwork was practically the only course given, although some drawing was given; and

later some forging and other types of metal work were added.

Manual training received its great impetus in this country as a result of the exhibit shown by Victor Della Vos at the Centennial Exposition held in Philadelphia in 1876. This exhibit consisted of work done at the Imperial Technical School of Moscow, Russia, and was made up chiefly of exercise work in wood and metal. Through the efforts of John Runkle of the Massachusetts Institute of Technology and of Calvin M. Woodward of St. Louis, manual training became rather widespread in this country. The controlling assumption back of the work seemed to be that the few skills mastered would have direct vocational significance. The idea probably grew out of the principles of formal discipline which were receiving great stress in the education of the times. The whole assumption was soon proved to be false, and it was not long until other principles replaced it.

In the latter part of the 1880's, the teachers of manual training were beginning to see a need for something to add interest to their work, yet still to maintain the educative value of the exercise. There was, of course, great interest in handwork in and of itself, but this was proving to be insufficient. In the search for something to stimulate interest, attention was directed to

"sloyd work", which had become popular in the schools of the Scandinavian countries, particularly in Sweden.

Sloyd actually had its beginnings in the homes of the Scandinavian countries. It had been common practice since early times to spend evenings constructing useful articles that might serve a worthy purpose around the home or farm. As the years went by, the people began to sell some of their products, and quite an industry was built up. With the advent of power machinery, the profit was taken out of this domestic manufacture of articles, and handicraft almost disappeared. It was then thought wise to put a similar type of craftwork into the schools. The sloyd schools that grew up were very much the same as home sloyd, and articles were made that could be sold, regardless of their educational value.

Otto Salomon saw a need for making the work more educational, and he developed his "Educational Sloyd". This is the work that attracted so much attention, not only in Europe, but in America. It was in 1888, when Gustaf Larsson came to the schools of Boston, that sloyd really began to influence American practices.

Although the Swedish program had grown to include various materials, it was wood-sloyd that was almost invariably given in this country. The work was more interesting than that done under the Russian system of

shopwork because of the uses to which the models could be put after completion. It was not long, however, until many of the original models were changed so that they would fit better the conditions in this country. As they lost their original characteristics, and new models came in, it led to the making of projects rather than of just practice models, and here is seen the birth of one of the important parts of our modern system of industrial arts.

About this same time the Arts and Crafts movement was making an effort to bring about better design in manufactured products. Poor artistic taste characterized almost everything made during the last half of the century, and there was a need for making things more beautiful. This was seen both in industry and in the school. As a result, great effort was made to have the products of the manual training shops not only useful but well designed. One finds also, that it was in this period that the name Manual Arts was applied to this work.

During the last few years of the nineteenth century and continuing into the twentieth, there was much confusion concerning educational practices. The manual training program was being attacked from all sides, but particularly for its claim of achieving vocational training.

Renewed emphasis was placed on the vocational aspects of manual arts, and attention was directed toward industry itself with many so-called factory methods being brought into the shops. In spite of this, the demand for vocational training in the trades and industries did not diminish, and societies were formed to promote this training. They also set about thoroughly to discredit manual training in the eyes of the American people. Many teachers became discouraged, and some schools discontinued the work. On the other hand, the propaganda also served to call to the defense of the work many strong advocates and leaders in the field. Worthwhile discussion resulted, and many teachers began to examine the work and to restate its aims and purposes. Freed of the necessity of showing specific vocational values, but still holding to its claim of general educational value, a wholesome period of renewed growth was brought about.

Thus was brought into being the third stage in the evolution of the present day program, or that period called industrial arts.

As industrial arts grew out of the old manual training and manual arts programs, it attempted to keep the best parts of both of them, and in addition to extend the program to include other activities which were vital in the lives of young people. Some of these activities were

reading, writing, experimenting, and investigating.

Educational changes come about slowly, so that it is not surprising to find that the industrial arts philosophy was not accepted suddenly. Since its inception, in about 1906, it has shown continual growth, although at times the progress has been slow. At other times the growth has been more rapid, particularly in the past fifteen or twenty years, since the advent of the junior high school movement. Industrial arts has developed rapidly in this type of school because it is so well suited to its aims and philosophies. It has grown upward into the senior high schools, continuing to hold, or even to improve, its position in the junior high school. It has grown and developed also in the elementary schools, but not to the same degree as it has on the secondary level.

It is interesting to see how tenaciously some of the old ideas clung and how long it was before they were abandoned for the newer philosophy. A few selected quotations will illustrate this point. The first is from an editorial by E. J. Lake and S. J. Vaughn, (20:28-29):

> There seems to be an impression among some that when we speak of modernizing and liberalizing manual training that we have in mind the total destruction of all organization, all system, all discipline, and all pedagogy. When it is proposed to substitute something vitally needed and something interesting from the boy's point of view for the cut-and-dried models, there is a genuine fear on the part of a few that the sacred and inherited prin-

ciples of pedagogy are endangered.

> The suggestions for modernizing manual training by making it expressive of the life and conditions of the times is in line with the best thought and practice, not only in manual training but in the academic fields as well.

Further on in the same editorial:

> One of the chief difficulties in discussions affecting the manual and industrial arts work is the lack of uniformity of understanding with reference to the purposes and aims of the various lines of work. Let us repeat that the acquirement of skill is not the primary aim in the ordinary manual training work of the grammar and high school classes. Such an aim would materially modify both the method and the content of the instruction. So long as manual training is given as part of general education or for purposes of appreciation, the primary aim will never be the accumulation of manipulative skill, although that will be an important subordinate item.
>
> The modern movement is toward the investment of manual training with thought content; the working out of problems that have a real bearing on life interests; the using of the tools of industry because there is an important job to be done, not the doing of a useless job because there are important tools to be used.

In March of the same year, another editorial makes a similar expression (18:120):

> The coat hanger is still with us, we hear! In some considerable cities we understand that a coat hanger is a required "model" of each seventh or eighth grade boy.
>
> To add dismay to surprise, the story comes that the coat hangers must be made exactly to specifications as to size and form. In one case reported, the length was to be sixteen inches. The boy asked per-

mission to make the article longer for his father's coat, and was refused. At the next visit to the shop, the boy reported that he had measured his father's coat and that the hanger would have to be at least 20 inches long to serve the purposes for which it was being made. Whereupon, the teacher upbraided the boy for presuming to suggest a change in the teacher's plans. Which leads us to remark again that there are things going on in manual training now that pass the comprehension of man.

In 1923, the following (19:434):

> There are evidences in every convention exhibit that the old fashioned manual training is still struggling to survive. One can still see rows of sleeve boards, coat hangers, book racks, and foot stools of exactly the same dimensions and designs that we of the older generation used as "models" twenty five or thirty years ago.
>
> They are not necessarily bad in themselves, if they serve the present purposes well. But the absolute uniformity lays them open to the suspicion that the old, discarded theory of manual training prompted their construction rather than any purpose to meet a definite need or to furnish some industrial information.
>
> It was this defect that drove manual training into the background and brought industrial arts courses into the public schools. Other aims in addition to skill have come to be recognized in the shop work. Individual initiative, industrial information, knowledge of materials, methods of production, means of distribution, and numerous other considerations have now found places in the industrial arts courses. Thus enriched, such courses have met the criticism of the opponents of practical shop work in the public schools. It is well for a teacher to carry over all that is good in the old manual training into the enriched and vitalized field of industrial arts work.

As well as showing how the old ideas hung on, these

quotations also hint at the new philosophy. Such things as individual initiative, industrial information, knowledge of materials, and methods of production are fundamental in the new philosophy of industrial arts. The fact that skill is no longer the most important consideration represents a great change and is an important factor.

Some additional quotations at this point will assist in explaining the new philosophy. Maris M. Proffitt (29:234) says:

> It may be categorically stated that industrial arts work is to be regarded as an essential in the modern school curriculum because:
>
> 1. It represents a large field of human activities.
> 2. It relates to fundamental types of human experiences that are universal, and consequently make an appeal to all pupils.
> 3. It is based upon the natural tendency to manipulate material things.
> 4. It provides opportunities for self expression in "concrete media". Opportunity for self expression is an essential in the learning process. Industrial arts provides this opportunity through the media of construction materials and tools. The pupil deals with spatial relations, which is one of the most fundamental facts of consciousness; he works with three-dimensional materials; and he develops his aesthetic feelings through the use made of the principles of design and color.

In conclusion, attention is called to the fact that every civilization has had its dominant element. In Greece the dominant element was art and language. In these activities the Athenian citizen worked assiduously. In Rome

it was the law and government, and the free Roman citizen perfected himself in these social-civic functions. The dominant element in our civilization is industry, in which the machine, together with the use of power which operates it, is conspicuous. Industry and the machine are largely determining our social order. No one can claim to be cultured in his civilization who neglects to study its dominant element, with its resulting social pattern. Attitudes of mind and forms of behavior that may be realized through proper provisions in industrial arts are essential not only for developmental experiences related directly to activities in industrial life, but for a claim to culture.

Deyo B. Fox (12:373) has this to say:

A change in the name of educational progress has taught us that instead of teaching skills alone as we once did, we should stress technical, social, and economic information along with the construction of a project. If the practical arts are to be worth while and indispensable experiences for youth, they must, first of all, provide an interpretation of our industrial civilization.

Paul E. Klein (17:337) says:

...The industries are fundamental in modern life. They are the most essential of man's present day activities. There is a great volume of common industrial knowledge with which all children should become familiar as a part of their general education. This is part of a movement in education toward a closer relationship between the schools and the daily life of the people about them. This work, being for the purpose of developing a sympathetic understanding and appreciation of modern industry, should be treated more as a science than as an art. Hence shopwork should form but one part of the students' activities--observation, reading, and class-work being equally important. The development of industrial intelligence, not technical efficiency, should determine the content,

organization, and method of presentation of this study.

In her foreword to Industrial Arts, Its Interpretation in American Schools, Bess Goodykoontz (14:v) makes this statement:

> This is essentially an industrial age; modern civilization is dependent largely upon science, invention, and skill. The manufacturing industries are important among the activities which make for the material well-being of the people. They should be exemplified in the facilities provided by public education. The general education of every public-school pupil--his cultural development--is incomplete without concepts, understandings, and appreciations regarding manufacturing and its hosts of workers. Industrial arts as an educational field makes this desired contribution to the pupil's development. It concerns itself with the aesthetic and economic values of materials, with basic processes of manufacture, and with many problems of the workers.

Arthur B. Mays (21:36) makes this statement:

> ...The writer has frequently been required in recent years to present a convincing statement to school and university authorities concerning the basic values and purposes of industrial arts as a phase of contemporaneous education. It has been found that the following statement is almost invariably accepted as fully satisfactory.
>
> The fundamental purpose, in final analysis, of all secondary education is to enable youth to understand and to deal effectively with his environment. Chemistry is taught in the high school not to make chemists, but to enable those who study it to understand the chemical aspects of their environment and to deal effectively with them for their own safety and comfort, and the welfare of others. Mathematics is

> taught not to make mathematicians, but to enable youth to understand and to deal effectively with the number aspects of modern life. In like manner, each of the high school subjects of study is taught not to make specialists, but to make youth intelligent about, and the masters of, their environment, both for their own and the social good.
>
> But what is the most obtrusive and the most nearly ubiquitous factor in the contemporaneous environment? Quite obviously it is industry, its products, materials, processes, and problems. As one sits in a room, it usually may be said of him that everything in the room except his body, his personality, and the air he breathes are in some degree modified by industry. Therefore, it seems abusrd to attempt to enable modern youth to understand and deal effectively with his environment unless a large place is given in the curriculum to a study of modern industry, its processes, its materials, its products, and problems. Such a study constitutes the subject matter of industrial arts. Rarely does such a statement fail fully to satisfy the query of a modern educator.

Similar quotations could be given at length, but these should suffice for the purpose of this study.

Lists of objectives of industrial arts are also helpful in clarifying the philosophy. Therefore, a few selected lists will be given. Emanuel E. Ericson (9:291) writes:

I. General Educational Objectives:

- a. To satisfy that desire in every boy to express himself through the medium of tools and materials.
- b. To develop 'handy man' abilities through repair and construction work for home, shop and office use.

c. To assist in better choice and use of industrial products and services.
d. To gain a sympathetic attitude toward the laboring man, with an appreciation of the importance of his work.
e. To give the boy an avocation or hobby.
f. To develop habits of neatness, orderliness, accuracy, cleanliness, and the like.

II. Exploratory Objectives:

a. To try out individual inclinations and abilities for industrial pursuits through typical experiences of the various occupations.
b. To make reliable studies of conditions, demands, and opportunities in related occupations.
c. To appreciate economic production by first-hand experience in productive work.

III. Pre-vocational Objectives:

a. To extend the try-out activity to meet the preparatory vocational needs of the pupil who expects to enter a vocational school or who finds it necessary to leave school with the minimum of preparation.
b. To provide for individual needs of pupils who would not remain in school for academic education alone.

Arthur B. Mays (22:67) writes:

> As a matter of fact, the purposes of industrial arts at the junior-high-school level are not, primarily, either common education or vocational training, but they lie, for the most part, between these extremes. They may be stated as these: (1) to give to children, who soon will be engaged both in production and utilization of industrial products, a practical understanding of the methods, character, and social importance of modern industry;

> (2) to develop occupationally desirable habits of achievement through directed experiences in school shops and drawing rooms; (3) to build up in the minds and emotions of children desirable ideals of workmanship, accomplishment, and social behavior, through carefully supervised activities in the shops and drawing rooms dealing with inherently interesting projects, which bring into play the native impulses of invention, construction, decoration, emulation, and cooperative achievement; (4) to train children to use intelligently the products of modern industry; (5) to give information to children about the occupations of industry, which will be useful to them and their parents in considering their future vocations; and (6) to give useful skill in dealing with tools and processes in which most people have to engage, from time to time, in the 'unspecialized activities' of home and work life.

One of the most often quoted and most generally accepted lists of objectives is that of the American Vocational Association Committee on Standards of Attainments in Industrial Arts Teaching (1:12):

Summary of the Objectives

1. To develop in each pupil an active interest in industrial life and in the methods of production and distribution.
2. To develop in each pupil the ability to select wisely, care for, and use properly the things he buys or uses.
3. To develop in each pupil an appreciation of good workmanship and good design.
4. To develop in each pupil an attitude of pride or interest in his ability to do useful things.
5. To develop in each pupil a feeling of self-reliance and confidence in his

ability to deal with people and to care for himself in an unusual or unfamiliar situation.

6. To develop in each pupil the habit of an orderly method of procedure in the performance of any task.
7. To develop in each pupil the habit of self-discipline which requires one to do a thing when it should be done, whether it is a pleasant task or not.
8. To develop in each pupil the habit of careful, thoughtful work without loitering or wasting time (industry).
9. To develop in each pupil an attitude of readiness to assist others when they need help and to join in group undertakings (cooperation).
10. To develop in each pupil a thoughtful attitude in the matter of making things easy and pleasant for others.
11. To develop in each pupil a knowledge and understanding of mechanical drawing, the interpretation of the conventions in drawings and working diagrams, and the ability to express his ideas by means of a drawing.
12. To develop in each pupil elementary skills in the use of the more common tools and machines in modifying and handling materials, and an understanding of some of the more common construction problems.

A recent list of objectives which expresses the latest trend in industrial arts thinking is given by C. K. Lush. The list is found in an unpublished mimeographed leaflet of the Minneapolis Public Schools entitled "Functions of Industrial Arts." To quote:

Summary of Functions

1. Development of personality, character, and desirable attitudes.
2. The fostering of democratic principles and social ideals.

3. The interpretation of industrial processes for a general understanding of the material surroundings; and for guidance purposes, both vocational and avocational.
4. The development of hand and machine skills.
5. The fulfillment of the natural desire for self expression through creative effort.
6. The contribution of information and experiences of value to future consumers and to those who enjoy maintaining and improving the home.
7. The accumulation of respect for the aesthetic; for craftsmanship; and for the problems of all related occupations.
8. The attainment of a consciousness of conservation and safety.

In reading these lists of objectives it will be noted that a similar type of thinking is expressed in all of them. It is true that there are differences in wording and sentence construction, but the same essential points are stressed. Such values as handy-man abilities, consumer knowledge and appreciation, exploration, guidance, industrial information, manipulation of tools and materials, and an appreciation of labor and its problems are mentioned by all; the same would be true in almost any list that might be selected out of the hundreds that have been written.

If it is the purpose of the school to help the individual to adjust to the social order and to enable him to make changes as they become necessary, and if industry is as important in our social order as the

quotations given above would indicate, certainly industrial arts philosophy is in conformity with the philosophy of general education, and is a vitally important part of that education. It is equally true that if industry is instrumental in conditioning the social order and may even be bringing about a new order, then industrial arts also can fit well into this type of philosophy and is equally important here. The fact that educators have seen these possibilities and the fact that industrial arts educators have been trying to do something about them have been responsible for much of the growth which industrial arts has had, as well as for its place in the school as an important curriculum area.

CHAPTER III

INDUSTRIAL ARTS INFORMATION

If industrial arts is to accomplish its purposes and is to be as important in the lives of young people as is claimed by authorities quoted in the preceding chapter, it is obvious that there must be something in the courses besides the manipulation of tools and materials. The definition of industrial arts as given by F. G. Bonser (4:5) shows this to be true.

He defines industrial arts as follows:

> The industrial arts are those occupations by which changes are made in the forms of materials to increase their values for human usage. As a subject for educative purposes, industrial arts is a study of the changes made by man in the form of materials to increase their values, and of the problems of life related to these changes.

If one accepts this definition, and it seems to be quite generally accepted and is often quoted, he at once obligates himself to accept the informational phase of the work. The fact that the earlier manual training did not accept it as part of its work was one of its greatest weaknesses. Bonser (4:29) says of this:

> It is only since about 1910 that there has been any definite attempt in schools to study the industries as they are carried on in the most modern ways. The earlier manual

> training made no attempt to study industry as it is. One might become quite proficient in the use of hand-working tools in a school, and be able to make quite creditable pieces of furniture without learning anything of the way in which most furniture of the present time is made in factories. None of the values we have pointed as dominant were included directly as aims. The old forms of the work represented a subject without a subject matter other than that of mere hand technique. It was a system of manipulative activities for the development of either skill or self-expression, and it had no body of thought or appreciative content.

In contrast to this type of work is found the modern industrial arts program with its varied activities and rich informational content. The addition of this information to the industrial arts courses is one of the greatest factors responsible for its present place in the modern school. Concerning this, Homer J. Smith (33:3) says:

> Industrial arts owes its easy, quiet acceptance and respect by the general public more to the increase in the information imparted than to the perfection of its process-and-product work. Pupils and parents will go with us further in this splendid phase of our duty. Teachers need not fear to increase the information time as they prepare themselves and their classrooms for a better use of such time.

There are three kinds of information that must be considered in any industrial arts course. The first is known as technical information. It is information which the student must know in order to perform his manipulative

work properly. It consists of such informative items as: kinds and uses of tools, reading of drawings, kinds of joints, and sharpening of tools. Although this type of information has not always been adequately taught, it has probably received greater emphasis than either of the other two types.

The second kind of information may be known as supplementary, related, or general information. It is not necessary for the student to have this type of information in order to carry on his work, but it adds interest to and enriches the work. It is not necessary, for example, for a drafting student to know how paper is made, but it makes the work more interesting. Such other informational details as the kinds of abrasives on what is commonly called sandpaper and how they are manufactured into abrasive papers and cloths, the properties of materials, steelmaking processes, history of tools, sources of materials, and how finishes are made, are all valuable items in their realm. For young people this kind of information has real value, not only in stimulating interest, but also in extending the horizon of vocational possibilities.

The third type of information is called guidance, or occupational information. It is the teacher's responsibility here to impart some information about the

working fields represented by his subject. Obviously, an extended and detailed discussion of the occupations cannot be given, and often there are other school departments better able to do this, but information about occupations, the types of people employed, and the opportunities for obtaining employment can well be given in the industrial arts department. If the objectives of exploration is to be realized and certain wrong impressions obtained from the school shops are to be systematically corrected, this type of information must be given.

Although the teaching of information has not always been a part of the work, there have been individuals who have seen the value of having thought content along with manipulation. Rousseau (31:70-73) shows this in his chapter "Estimate of the Value of the Manual Arts in Education", from Emilius and Sophia:

> Confine not your observation here, reader, to the corproeal exercise, and manual dexterity of the pupil; but consider the proper methods we take to gratify his childish curiosity; remark the effects of his good sense, his genius for invention, his foresight and other intellectual abilities. In whatever he sees, or is employed in, he wants to know the reason of everything; tracing back one instrument from another, till he arrives at the first and most simple. He takes nothing upon supposition as truth, but refuses even to learn anything that requires a previous knowledge of which he is not possessed. If he sees, for instance, a file, or a spring he immediately recurs to the method of working

> up the material from the ore. If he sees the sides of a chest fitted together, he must know the methods of felling the timber and sawing it into planks. If he be, himself, at work, he never fails to reflect on every new tool he makes use of, and to consider how he might have constructed such an implement, or have made shift without it.

In 1902, Arthur W. Richards (30:62-63) made this statement:

> Hand-tool work alone is not enough, and alone it has played no large part in human progress, but associated with real mental stress and intellectual desires it has worked wonders in the life of man. It is the thought, the informational, the objective side of our manual training which needs adjustment--perhaps reconstruction.
>
> The organization of manual work for information and investigation is quite as important as its organization for motor training, if it is to contribute anything of great ethical and social value in life.

It is probably true that leaders in any field can see what should be done, but the thinking of these individuals is usually years ahead of general practice. Industrial arts literature prior to 1920 contains very little reference to the value of teaching information, and that which is found is largely that of the leaders of the time who were trying to formulate the new philosophy. They could see the importance of this phase of the work and were trying to get others to agree.

Since about 1920, however, the literature is crowded with statements about information and its place in the

industrial arts courses. Many articles dealing with objectives and philosophy, with teaching content, or with the place of industrial arts in the modern school, stress the importance of the informational content. The quotations to follow are typical of the many that can be found in recent writings. Smith (28:4) says:

> Our job as industrial arts teachers is largely an informational one. We are not obligated to duplicate the processes of factories and other work places, but merely to sample them and explain them. We are not attempting to produce craftsmen. We are hoping, rather, to give boys those experiences and informations that are useful in average living and in any calling.

Bennett (3:33) makes this statement:

> The master teacher is sure to make use of another means of teaching industrial arts--through "related information." He will give orally, or through the printed page, or better by a combination of the two, such information as will enrich, but not take the place of the instruction given through the manual work.

And the following from Harry S. Ganders (13:223):

> Experience in cabinet making, forging and sheet metal in a number of secondary schools of the country has demonstrated the utter barrenness of the training received. What does the pupil learn of the wood, glues, stains and varnishes, iron, copper, and brass which go into the making of chairs, andirons, and torchiers? The entire emphasis is restricted to making things.

Writers such as Homer J. Smith, Verne C. Fryklund, Arthur B. Mays, F. T. Struck, Roy G. Fales, and many

others, have for many years shown by their writings that they advocate the inclusion of information as a definite part of industrial arts work.

The writers who mention anything pertaining to the amount of class time to be devoted to the teaching of information are relatively few, but there are some who state the percentage of class time they are using, or what time they think should be used. The following quotations make some mention of time allotment.

In 1923, H. J. McEuen (26:307) said:

> After any group of boys has entered the shop and attended to all preliminary details such as disposal of coats in lockers, securing of keys, checking of tools, and standing at attention while attendance is being taken, they are called together for class discussion. At least fifteen minutes a day is given to each class for this phase of the work. Often much more time is necessary and surely worth while.

In 1929, F. T. Struck (35:45) made this statement:

> The amount of time that may well be devoted to shop talks or lectures will vary with the maturity of pupils, their previous training, objectives and content of the course, etc....A rough estimate may be placed at five per cent of the time devoted to instructing shop work.

In a section entitled, "Suggested Related Information," in their book, Instructional Units in Hand Woodwork, Brown and Tustison (36:foreword) said:

> A recent unpublished study by the authors discloses a tendency to increase the related

informational content in industrial arts courses. In this text, space does not allow the inclusion of the wealth of related information that might be used to advantage in a course in woodwork. It is believed that definite time should be set aside for study and discussion of related topics.

In referring to this study made by Brown and Tustison, A. C. Newell (27:449-451) made this comment:

> Three types of information should be given in teaching manual or industrial arts, either in the junior or senior high school. These types are generally known as, (1) technical information, (2) related information, and (3) occupational information. Brown and Tustison in their investigation found that each of these types of information should be emphasized in the junior high school and that each of them should occupy about one eighth of the time given in industrial arts, and the other five eights being given to manipulative operations. In the senior high school, which usually gives double periods to industrial arts work, the teacher ought to spend at least three out of the ten periods on the various types of information.

Later in the same article Newell says:

> As a matter of fact, the amount of time that can be taken away from manipulative work in shop courses for information must be limited. Demonstrations and informational teaching should not occupy more than three tenths of the time, and they should stimulate thinking in connection with manipulative work.

In 1932, Earl L. Bedell (2:207) said:

> During a study of any of these units, teachers are asked to observe the following approximate time distribution: The time given to each unit may be divided into two

parts, one taking 80 per cent of the pupil's time to be devoted to the various jobs with tools. The rest of the time--about 20 per cent--will be spent in demonstrations, study of reference material, and class discussion.

In 1939, James W. Crowe (5:29) wrote:

> Related information, demonstrations, project planning, and research should be carried out in rooms suitably arranged for the comfort of the student. The average shop has no facilities for comfortably and efficiently seating students, nor for the conducting of efficient demonstrations. The maximum time given to this type of work should not exceed twenty per cent of the time available for shop work.

In 1937, Arthur A. Dick (7:83-84) made this report:

> ... Related-subject matter is industrial information which the boy should know, but which is not necessary in the making of a project. Technical information, on the other hand, is information that is necessary for the boy to know in the making and utilization of a project. Naturally, there is much overlapping between related-subject matter and technical information. ... Related-subject matter is taught in a routine order, while technical information is given as the occasion demands.
>
> At the present time, an average of about 25 per cent of the time is taken for related subjects.

In describing the Laboratory of Arts and Industries Program of the Chicago High Schools, Superintendent William H. Johnson (16:84) said:

> At least 75 per cent of the boys' time is spent in active learning involving the

> use of materials, tools, and machines. A fourth of the time is devoted to related activities which include well-planned trips to industry, motion pictures, reference reading, demonstrations of tools and materials, planning discussions, related reading, and making drawings for construction activities.

In 1923, in an article by Arthur B. Mays (23:132-133), reference is made to a study which he conducted about the percentage of time being used in teaching information. He said:

> ... In a study recently made by the writer, it was found that in 221 high schools, the median amount of time devoted to class reports, shop talks, essays and references, was 13.7 per cent of the shop time; the percentage of time most often reported was ten per cent of the shop time. Clearly the schools reporting are not giving enough emphasis to the technical and occupational information needed by manual arts students.

Later in the same article he suggests for a one year course in carpentry, "Not less than one-third nor more than one-half of the shop time given to class talks, class discussions, and reports on observations, with references and essays, requiring a minimum of two hours per week outside work."

In 1937, Roy G. Fales (10:151), in referring to the general educational value of industrial arts other than manipulation, said:

> As a rule, teachers find that twenty to twenty five per cent of the class time can be

> devoted to instruction without detrimental effects. With it, the shop-work is general education. Without it, shopwork becomes "busy-work", or manual training, or possibly a creative type of work without the broad rich contacts which grow out of a study of the industry and its influence on our lives.

Prior to this time, Fales (11:186-187) wrote an article entitled "Industrial Arts Teaching Content," in which he makes a strong plea for the informational content in industrial arts despite the fact that it may encroach somewhat upon other subjects, and that at times instruction may be spread out rather thin because of time limitations and too much available material. He advocated a maximum of twenty five per cent of the class time for this type of work. To quote at length from his article:

> Among the things that a pupil should do is to master new operations and processes and to construct certain types of articles like furniture, patterns, boats, and airplanes, for their self-finding and guidance values. The teacher should be held responsible for teaching certain groups of thought content organized in the form of lesson-topics. Before he does this, he should determine the amount of time to be made available for the work, including the number of periods to be given to it and their length. Unless this is done, it will be impossible to form an estimate of the amount of material which can be taught and the number of lessons to be devoted to the work. Both points are essential in order to develop a well balanced course.

APPLYING THE TIME BUDGET

> Let us consider a course in general woodworking which, for its completion, requires boys of a given grade level to report for class

and shopwork, 180 periods of 45 minutes each. Ten minutes of each class period, or about one fourth of the total time, may be allowed for discussion. Assuming that a large majority of the pupils have had the same shop courses in industrial arts, it would be necessary for the teacher to set up approximately 180 lesson topics, each with sufficient content to justify the use of a ten-minute lesson-period. Inasmuch as shopwork has but little sequence, so far as manipulative work is concerned, and advancement is based on the acquisition of skill rather than upon a definite order of doing things, we may assume that each lesson-topic will be taught at the most opportune time. In two classes in the same subject, meeting in the same shop in successive periods, the lesson-topics might be entirely different on any given day, and yet total the same number, and present the same kinds of related content for the year. Such flexibility is desirable.

On a 180 period basis of ten minutes for each period, the related content might be organized into lesson-topics according to the following schedule:

Distribution of lesson-periods by topics

1.	Demonstration of operations, processes, jobs	90
2.	Blueprint reading	5
3.	Shop sketching	5
4.	Structural and esthetic design	5
5.	Geography	5
6.	Sociology	5
7.	Economics	5
8.	Occupational information	15
9.	Mathematics	10
10.	History	5
11.	Science	10
12.	Products of industry (consumer values)	20
	Total number of 10-minute lesson periods	180

Each of the above divisions of related content can be considered at greater length,

> together with the operations to be performed in woodwork, metalwork, printing, and electricity.

From this point, he continues with suggested items for discussion in each of the twelve topics quoted above. Obviously they cannot all be included here; therefore the reader is referred to the original article for a discussion of the items. Fales concludes his article with the following paragraph:

> Additional lesson topics should be organized, touching on typical pupil interests relating to boats, flying model airplanes, archery, birds and bird-houses, traps, fishing-tackle, kites, electric trains, and a host of other things. These are real pupil interests. We may, therefore, conclude that they are entitled to the privilege of constructing and studying such products. All industrial-arts courses should be molded to the needs of the pupil in interest, needs, thought content, and life values. These are the four points of the compass for a teacher to steer by.

F. T. Struck (34:469) seems to accept Fales' ideas and comments on them in the following manner:

> The time allocation is for content other than that which comes through manipulative work. The time that is contemplated for manipulative work is approximately three times as great, or as 75 per cent is to 25 per cent.
>
> Each of the topics mentioned by Fales deserves to be emphasized in industrial arts education. It is not contemplated that each be taught as a separate unit, but, rather, that all instruction shall be integrated so that the learner will see each part in its relationship to the other parts.

> When tools, materials, or processes are discussed, a bit of mathemathics, history, science, or geography can be interwoven so that the instruction will be richer and more meaningful than it would otherwise be. When practical problems are studied, the social and economic implications of the work can be examined. It is well known that the development of the physical sciences and of technical knowledge has far outstripped our social controls.

In another place in his book Struck (34:102) makes this statement:

> In some school systems teachers are advised not to use the lecture method for more than fifteen minutes at a time, if at all, and to devote at least 85 per cent of the shop time to manipulative activities. The actual proportion should, no doubt, be governed largely by the nature of the instructional content.

In January, 1939, the Industrial Education Magazine published an article by Homer J. Smith entitled "Industrial Arts Information." In this article Smith makes a strong plea for the informational content of industrial arts courses. He emphasizes many of the values which are derived from teaching information and shows how this information can be used in the class. The article is written in a convincing manner and probably should be read by all industrial arts teachers, even though some may feel that the informational content of the various courses is not important. In one part of the article

Smith says (33:2):

> ... Industrial arts, at its best, in informative, inspiring, exploratory, and foundational. It is basic to continued understanding of the mechanical and artistic in our surroundings. It is interpretive of home, school, community, and more distant places and groups. It is about the world and its people more than of industry in the large, in all its physical and human ramifications. It advances a boy or a girl, a man or a woman at leisure, toward discerning and competent citizenship.
>
> These objectives and dozens like them are unattainable except where a considerable part of the instruction time be given to topics of information. The percentage of time is a matter for the teacher's suggestion and for the administrator's decision. These are both modified by school precedents, student feelings, and parent concepts, right or wrong.

In another place he makes the following suggestions about arranging the time for teaching the informational items (33:3):

> Two concepts regarding informative items may well be kept in mind by all teachers. First, that definite times should be set aside when functioning materials will be certain to be covered under schedule. Secondly, that often the best effect is to be had by the offering of some materials incidentally as the opportunities arise. The teacher who plans in an ordered way and strives to make his course function as to timing and completeness deserves commendation. The teacher who takes advantage of student interest and forsakes his plan for brief periods, for a heightened return under chance conditions, is superior, and considerably so.

He also says that the number of informational items covered in a course is not as significant as the number

of types of material from which they are drawn, and that the spread of items employed is more significant than the intensity of their coverage. From this point he gives examples of the types of things to be used as informational items. The items are arranged into nine principal groups. The following example is part of one group (33:4):

> About the materials in use and the field in general.
>
> > Trees, growth, cutting, transportation, market, dimensions, seasoning, stains, paints, varnishes, oils, glues, waxes, abrasives, prices. History of drafting, orders of architecture, color, rhythm, papers, inks, instruments, handbooks, mechanical forms, landscaping, blueprints, construction processes. Early knowledge of metals, natural states, properties, heat treatment, fuels, weights, fluxes, shrinkage, finish, grades, values, weights, new uses.

In regard to methods and devices for teaching this information he makes the following suggestions (33:5):

> There are named following, in two sets, the usual ways by which teachers present a desirable amount of information. No instructor would use all of these means and no single situation could justify them all. Which to use is a matter of individual or school acceptance, and it is hoped that readers may find in the lists some suggestions in keeping with their own working circumstances.
>
> Some formal means
>
> > Lecture, demonstration, recitation, instruction sheets, application charts, texts, references, visual presentation, shop trips,

home assignments, conferences, workbooks, notebooks, student reports, theme writing

Informal opportunities

Bulletin boards, scrapbooks, visitor demonstrations and talks, blackboard work, sketching, open-shelf brousing, scout work, clubs, camps, exhibits, changing displays, collections, modelmaking, hobby fairs, contests, home workshop, pupil personnel plans, problem solving, posters, programs, journals, catalogues, handbooks, manuals, aptitude and progress, assembly talks, stagecraft, trips to museums, samples.

Verne C. Fryklund (13:111-112), in an article published in 1927, warns of the danger of overemphasizing the informational content of industrial arts courses. This is about the only article that was found which in any way indicated that teachers are using a too great percentage of time in teaching information. He does admit, though, that some information must be taught, but that the greatest danger lies in taking too much time from manipulation. The following quotation gives the essential points of his criticism:

> For several years, there have been among us persons who have urged an emphasis upon information to the exclusion of manipulative skills. This has come to be an enigma for those who would put this into practice. It is true that certain kinds of technical information are necessary in forming judgments in shop activities, and certain kinds of related or broadening information are desirable, but these are not fundamental to manipulative work. Manipulative work is fundamental to them, and therefore should not be subordinated.

> There is danger, in stressing information, of embracing responsibilities of instruction which belong to the social sciences and general science. We should do well to consult our colleagues in these areas and share responsibility with them because they are exceedingly well prepared and do teach many of the topics of information which we may feel obligated to include in our courses. Indeed that they are now doing so is evidenced in many courses in print. There will remain an abundance of necessary subject matter of which we may be proud. There will always be a certain amount of technical information that must be taught, and taught well by shop teachers, in order that the manipulative instruction may be effective. Besides this, there will be taught a residue of general information, or elements which, though not technically necessary, enhance the value of our subject.

Many writers in the industrial arts field now emphasize the importance of the informational content of the industrial arts courses. It is only in recent years that it has been done extensively, although early leaders did see some of the values obtained from teaching information. There is still little written about time allotment for teaching the information but a few writers are beginning to make statements concerning their beliefs in the matter. The present study is an attempt to bring together much that has been written and to extend the work by surveying actual present day practices.

CHAPTER IV

A QUESTIONNAIRE STUDY OF INDUSTRIAL ARTS INFORMATION

In order to obtain more information about the problem being studied, questionnaires were sent to industrial arts teachers representing various types and sizes of schools. The essential purpose in doing this was to discover what teachers, located principally in the western part of the United States are actually doing in regard to industrial arts information. Questions were asked about books, magazines, methods of teaching the information, time allotment for teaching the informational content, and other items which seemed pertinent to the study. A copy of the questionnaire is found in Appendix A.

A total of 245 questionnaires were sent out, and approximately 72 per cent, or 177 of them, were returned. There were 173 which contained sufficient information to be usable in this study. Table I shows the size of the schools from which questionnaires were returned and the number of questionnaires which were received from each size, as they are grouped in the table. Column one shows the size of the school on the basis of enrollment and Column two gives the number of questionnaires received within each grouping.

The table shows that seventeen teachers, teaching in schools of over 2000 pupils, returned questionnaires; one teacher from a school having between 1900 and 1999 pupils; eight teachers from schools having between 1800 and 1899 pupils; and so down the list as shown.

TABLE I

The Size of School and the Number of Teachers Who Responded to the Questionnaire

Size of School (No. of Pupils)	Number of Respondents
2000 and over	17
1900 - 1999	1
1800 - 1899	8
1700 - 1799	6
1600 - 1699	4
1500 - 1599	1
1400 - 1499	7
1300 - 1399	6
1200 - 1299	8
1100 - 1199	5
1000 - 1099	10
900 - 999	5
800 - 899	8
700 - 799	9
600 - 699	10
500 - 599	9
400 - 499	15
300 - 399	9
200 - 299	17
100 - 199	13
0 - 99	5
Total	173

Table II shows the distribution of the number of boys who take industrial arts in the schools reporting. From the table it can be seen that eight schools had 1000 or more boys taking industrial arts; that no schools had between 950 and 999 boys; that seven schools had 900 to 949 boys; that thirteen schools had 400 to 449 boys, and that eleven schools had less than 50 boys in industrial arts.

TABLE II

The Number of Boys Enrolled in Industrial Arts in the Schools Reporting

No. of boys in Industrial Arts	No. of Schools Reporting
1000 and over	8
950 - 999	0
900 - 949	7
850 - 899	0
800 - 849	5
750 - 799	3
700 - 749	0
650 - 699	2
600 - 649	5
550 - 599	2
500 - 549	6
450 - 499	7
400 - 449	13
350 - 399	9
300 - 349	9
250 - 299	8
200 - 249	13
150 - 199	18
100 - 149	22
50 - 99	25
0 - 49	11
Total	173

In comparing Tables I and II, some rather interesting items of information can be seen. Assuming that approximately half the enrollment of any school is boys, one can see from the tables that there are quite a number of schools that do not have all the boys enrolled in industrial arts. This is shown by the fact that there are many more schools in the groups from 0 to 249 in Table II than there are in the groups from 0 to 499 in Table I. For example: there are 17 schools having enrollments over 2000 and only 8 with more than 1000 boys in industrial arts. Five schools have 99 or fewer students, but eleven schools have 49 or less in industrial arts. There are 13 schools having between 100 and 199 students enrolled and 25 schools with from 50 to 99 boys in industrial arts. This is a condition, however, which one would expect to find, because it is a well known fact that many schools do not have facilities for taking care of all boys in industrial arts. It is surprising to see how many schools do have nearly all of the boys in industrial arts. Out of the 173 schools reporting, 48 had all or nearly all of the boys in the school enrolled in industrial arts. Most of these, or 30 of the 48, were in the junior high school.

In Table III is shown the grades in which the

teachers responding actually teach. The grades are not listed separately but in combinations as reported by the teachers. These combinations are shown in Column one, and the number of teachers in each combination in Column two. Nine teachers teach in grades 7 and 8; forty-six in 7, 8, and 9; four in 7, 8, 9, and 10; sixteen in 7, 8, 9, 10, 11, and 12; ten in 8 and 9; and so on in the various combinations. It will be noted that the largest group is in grades 7, 8, and 9, or what is usually known as the junior high school grades. This condition exists because it is here that the elementary courses in the different industrial arts subjects are most highly concentrated. There are, however, fairly large groups in the 7 to 12 combinations, or the junior-senior high school; the 9 to 12, or four year high school; and the 10 to 12, or senior high school group. It is interesting to note that few teachers teach in a single grade, or even in only two grades, one teacher in the tenth grade being the only case of an instructor teaching in just one grade.

TABLE III

The Grades in Which Respondents Teach

Grades	Number of Teachers
7, 8	9
7, 8, 9	46
7, 8, 9, 10	4
7, 8, 9, 10, 11, 12	16
8, 9	10
8, 9, 10	6
8, 9, 10, 11, 12	2
9, 10	5
9, 10, 11	7
9, 10, 11, 12	33
10	1
10, 11	1
10, 11, 12	28
11, 12	5
Total	173

The teachers were asked to give the number of books in their shop library which were used in imparting information; Table IV is a compilation of the reported facts. Column one shows the number of books in the shop library, Column two shows the number of junior high schools possessing each number of books; Column three the number of senior high schools; Column four the number of four year high schools; Column five the junior-senior high schools; Column six the total, or all schools together; and Column seven the cumulative frequency of all schools, beginning from the low end of the distribution. There

were a few individuals who did not make any report concerning books; therefore the total is only 166 instead of 173.

It can be seen from the table that there is a vast difference in the number of books possessed by different schools. Fourteen schools have less than 5 books in their shop library, while twenty schools have over one hundred, and eight of these twenty have 200 books or more. This means that the maximum is at least 40 times the minimum. In the junior high schools, the median number of books is approximately 22; in the senior high school, 24; in the four year high school, 20; and in the junior-senior high school, about 35. The median for the whole group is about 25 books. Although there is a wide range in the number of books, the big majority of schools have small shop libraries. With the median for the whole group at 25 books, there are fifty per cent of the shops who have this many or fewer books, and seventy-five per cent of the shops have less than 50 books. Eighty-five per cent have fewer than 70 books, and nearly eighty-eight per cent have fewer than 100 books. A few of the schools reporting do have large shop libraries, as shown in the table, about twelve per cent having 100 or more books. The general tendency, though, throughout the whole group is for small shop libraries.

TABLE IV

The Number of Books in the Shop Libraries of the Various Kinds of Schools

Number of Books	Jr. High	Sr. High	4 Yr. High	Jr.Sr. High	All Schools	Cumulative Frequency
100 & over	6	4	8	2	20	166
95-99	2	0	0	0	2	146
90-94	0	0	0	0	0	144
85-89	0	2	0	0	2	144
80-84	1	0	0	0	1	142
75-79	0	0	0	0	0	141
70-74	0	0	0	0	0	141
65-69	0	1	0	0	1	141
60-64	2	0	2	1	5	140
55-59	0	0	0	0	0	135
50-54	5	3	0	3	11	135
45-49	0	0	1	1	2	124
40-44	2	2	1	3	8	122
35-39	3	3	0	1	7	114
30-34	4	4	1	2	11	107
25-29	9	0	3	2	14	96
20-24	4	5	3	3	15	82
15-19	4	5	3	3	15	67
10-14	10	6	11	0	27	52
5- 9	6	3	2	0	11	25
0- 4	10	2	2	0	14	14
				Total	166	

The names of six of the more common magazines of an industrial arts nature were listed, and the teachers were asked to mark those which came regularly to the shop and were used to impart information and also to add the names of other magazines which were not on the list. Table V gives the names of all magazines reported and

the number of teachers in each type of school reporting on each. A majority of the magazines given in the table were listed by only one or two respondents, and the name of the magazine was written on the questionnaire by the respondent. It is highly possible that if the names of all the magazines found in Table V had been placed on the questionnaire before the copies were distributed there would have been a greater number of shops reporting them available for student use.

The Industrial Education Magazine was inadvertently included and actually should have been left out, because its publication was discontinued in December, 1939. A few teachers reported taking it, but most of them stated that they were reporting it because they had access to it until it was no longer published. Results concerning it, therefore, would not be accurate and are of little value to this study. With this exception, the remaining five magazines listed on the questionnaire proved to be the most commonly used. The Inland Printer would be the next in frequency, many printing teachers reporting the use of this magazine. A total of 56 different periodicals were mentioned.

TABLE V

Showing the Magazines Used to Impart Information and the Number of Schools Reporting Each

Name of Magazine	Junior High	Senior High	4 Year High	Jr.Sr. High	Total
Industrial Arts and Vocational Education	46	28	23	16	113
Popular Science	40	20	14	17	91
Popular Mechanics	36	20	16	17	89
Popular Home Craft	28	14	12	10	64
The Home Craftsman	26	14	11	5	56
The Inland Printer	16	8		3	27
Industrial Education	6	4	6	2	18
Graphic Arts	5	4		2	11
American Printer	4	2			6
Pencil Points	2	5	1	2	10
Pacific Printer	4	2			6
Architects Forum		4			4
Architectural Records		2		1	3
Q. S. T.	3				3
American Builder		4			4
Deltagram	2			1	3
Mechanix Illustrated	1			2	3
The Machinist		1			1
Architect and Engineer		1			1
California Arts and Architects		1			1
Architects Digest		1			1
Building Age		1			1
American Pressman		1			1
Printing Industry		1			1
Popular Aviation		1			1
Auto Trades Journal		1			1
Motor		1	1		2
Better Homes and Gardens		1			1
Country Gentleman		1			1
Boy's Life		1			1
Electrical Contractor		1			1

TABLE V

Continued

Name of Magazine	Junior High	Senior High	4 Year High	Jr. Sr. High	Total
Radio News	1				1
Printers Ink Monthly	1				1
Amateur Radio	1				1
Radio and Television		1			1
Radio Craft	1	1			2
The Woodworker	1		1		2
Popular Aviation	1				1
Radio	1				1
Electrical West			1		1
Automobile Digest			1		1
Compco Technical Review			1		1
Chiltons Motor Age			1		1
Oxweld Tips			1		1
Dykes Automotive Journal			1		1
Exhaust			1		1
Popular Aviator			1		1
Highway Patrolman			1		1
Print				1	1
Oxy-Acetelyne Tips				1	1
Modern Mechanic				1	1
Plastics				1	1
National Geographic				1	1
The Informant				1	1
Science and Mechanics				1	1
Electrical West			1		1

Exhaustive research as to methods of teaching information was not considered pertinent to this study, but it was felt that it was important to find out what methods were being used in order to get the necessary

facts regarding the distribution of time. Therefore, the teachers were asked to indicate what methods they were using. It might be difficult to classify all of the answers under the term, methods, but they probably could better be called teaching devices. Table VI is a list of all methods, or devices, as reported by those who answered the questionnaire; the frequency of their occurrence in the four types of schools under consideration; and the total frequency.

It is not clearly understood by the writer just what is meant by some of the methods listed, e.g., "developments" and "diagrams", and there may be a certain amount of over-lapping in some of the methods, but the items in the list are just as they were given by the teachers responding. The results show that the lecture method is the most common, being used by 91.3 per cent of the teachers. The class reading assignment comes next in order and is used by 53.7 per cent of the teachers. Home study, although near the top of the list, is used by only twenty seven teachers, or 15.6 per cent out of the 173. The list, in its entirety, is quite comprehensive and compares favorably with the methods and devices suggested by Smith, and quoted on pages 43 and 44.

TABLE VI

Showing the Methods and Devices Used for Teaching Information and the Number of Teachers Using Each

Method	Junior High	Senior High	4 Year High	Jr.Sr. High	Total
Lecture	69	39	29	21	158
Class reading assignments	49	20	20	14	93
Visits to industrial plants	19	18	15	6	58
Demonstrations	15	4	3	4	26
Films	13	5	6	1	25
Home Study	9	7	6	5	27
Individual Instruction	4	2	1	1	8
Slides	2	1	4	1	8
Class discussions	4		1	1	6
Student reports	2	2	3		7
Bulletin Board	2				2
Information sheets	2		2		4
Note book work	2		1		3
Models	2				2
Display charts	3	1	1		5
Blackboard		1	1		2
Instruction sheets	1		1		2
Interviews with successful tradesmen	2				2
Individual lesson sheets		1			1
Reading assignments with questions		1			1
Interesting articles		1			1
Display panels	1				1
Individual study		1			1
Reference books				1	1
Making drawings			1		1
Pictures at libraries			1		1
Work books			1		1
Individual class study				1	1
Project sheets	1				1
Printed essays	1				1
Developments	1				1
Diagrams	1				1
Library assignments	1				1
Question and answer	1				1
Text books	1				1
Unit or contract plan	1				1
Visit homes being built	1				1

In regard to the time allotment for teaching the informational content in the industrial arts subjects chosen for this study, the teachers were asked to do two things. First, they were to mark on a scale the percentage of time which they recommended be used for teaching information; and second, the percentage of time which they actually devoted to the teaching of information. This two-fold method was chosen because it was felt that it was important to determine whether the teachers thought that too much or too little time was being devoted to the informational content of the various courses. The results were analyzed in a variety of ways. The first calculation was determining the mean percentage of class time which all the teachers recommended be used. Table VII shows this percentage for the various subjects, together with other information. Column one gives the subjects used in this study; Column two the number of teachers recommending for each subject; Column three the mean percentage of class time which is recommended; Column four the range of recommended percentages; and Column five the percentage which was most often recommended. The next calculation was to get that same type of information about what was actually being done. Table VIII gives this information, with the same column headings as Table VII.

TABLE VII

The Per Cent of Class Time Recommended for Teaching Information

Subject	Number Reporting	Mean % of class time	Range	% most often reported
Woodwork	120	22.8	10-80	20
Drawing	116	22.3	5-50	20
Arch. Drawing	60	24.6	5-50	20
General Metal	81	22.2	5-50	20
Art Metal	63	20.6	5-50	20
Electricity	72	29.0	10-60	30
Printing	64	24.9	5-55	30

TABLE VIII

The Per Cent of Class Time Actually Used in Teaching Information

Subject	Number Reporting	Mean % of class time	Range	% most often reported
Woodwork	116	18.7	5-60	20
Drawing	107	18.2	0-50	10
Arch. Drawing	53	18.2	0-50	20
General Metal	68	17.9	0-50	20
Art Metal	51	15.1	0-30	10
Electricity	64	23.2	0-50	30
Printing	58	19.0	0-50	20

It is to be noted that more teachers recommend the percentage of time to be used for each subject than actually teach it. This condition exists because some teachers have had experience teaching certain subjects but are not at present engaged in teaching them. These individuals are qualified to state what percentage of time they think should be used for teaching information but, of course, can not make any report of actual time being used.

A comparison of Tables VII and VIII shows that in every subject there is more time recommended for teaching information than is actually used. In order to see just how this condition came about, the questionnaires were divided into four groups as follows: first, those who recommended the same percentage of time as they used; second, those who recommended more time than they used; third, those who recommended less time than they used; and fourth, those who made only a recommendation. The times specified by these groups were tabulated and the means calculated. Table IX shows the number in each group for the various subjects and the mean of each group for each subject. By reading the table, some rather interesting things may be observed. For example, the group which marked "R" (recommended) greater than "A" (actual) has a higher mean for "R" in all but two

TABLE IX

Showing the Mean Time Allotments as Given by the Different Groups Indicated

Subject	R same as A		R more than A			R less than A			R only	
	Number	% of Time	Number	% R	% A	Number	% R	% A	Number	% R
Woodwork	51	20.1	49	24.9	15.6	9	21.1	32.2	11	21.5
Drawing	53	20.0	45	26.0	16.2	8	18.1	25.0	9	21.6
Arch. Drawing	24	21.9	28	28.0	22.4	1	20.0	30.0	7	22.5
General M Metal	31	20.5	31	22.8	13.6	5	21.0	31.0	13	25.9
Art Metal	25	16.8	25	23.0	13.6	1	10.0	15.0	12	24.2
Electricity	26	29.4	33	28.7	17.1	6	30.8	39.2	7	30.0
Printing	22	24.5	32	24.2	14.7	5	18.0	25.0	4	26.2

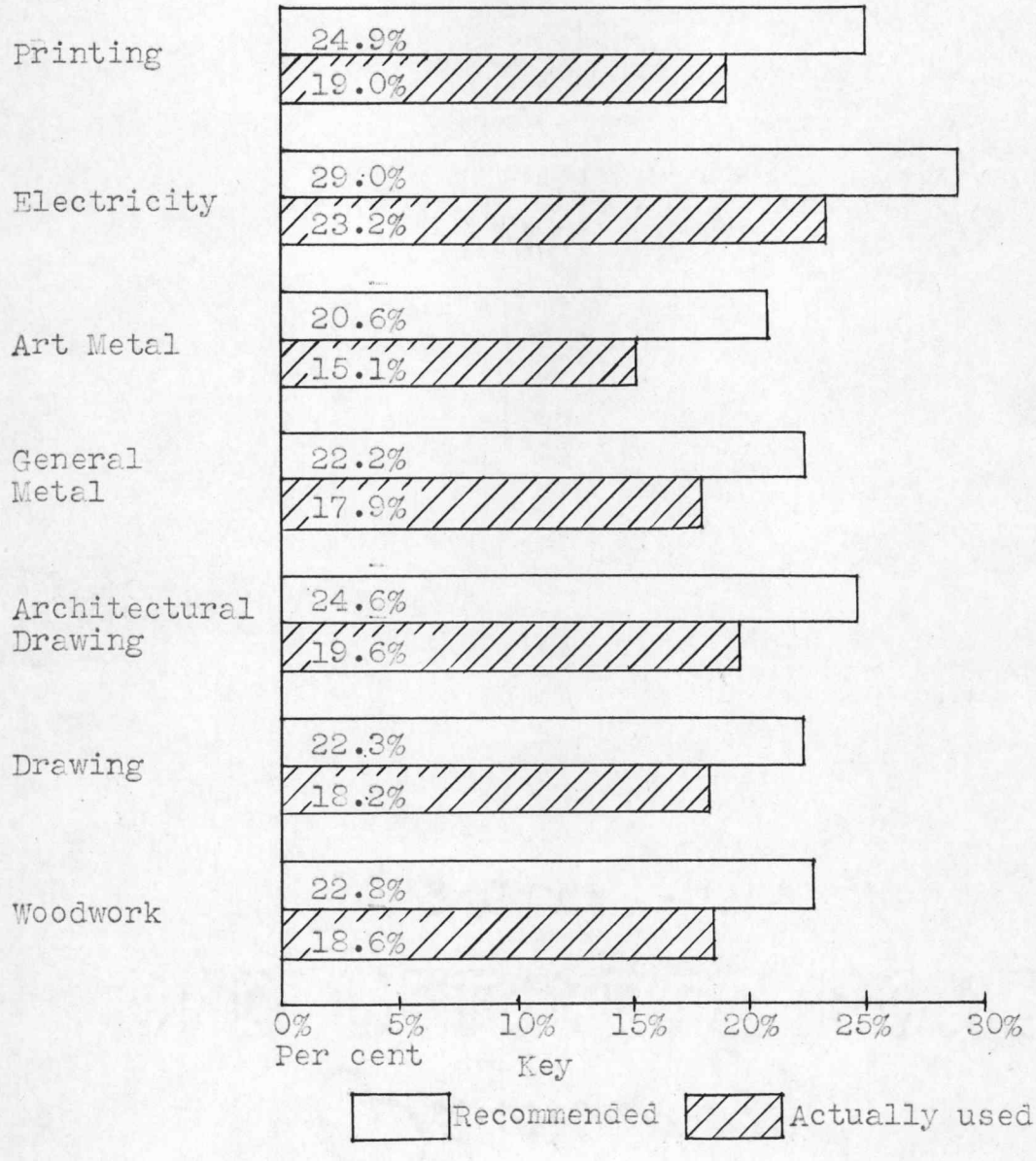

Figure 1

Graph Showing the Comparison of the Time Allotments Recommended and Actually Used for Teaching Information in Each of the Industrial Arts Subjects

subjects and a lower mean for "A" in all but one subject than has the group which marked "R" the same as "A". The group marking "R" more than "A" is just about 10 per cent higher in its mean for what is recommended than it is in the mean for actual time used. Inasmuch as both these groups are approximately equal in number, for each subject taken separately, they would have about equal weights in determining the mean for the entire group. One can see, then, with this data, why the recommended time of the entire group is higher in every case than the actual time. The other two groups shown in the table are both small and would not influence the mean of the entire group greatly. It is surprising, however, to see how near these two small groups are in their means, and how closely they both approach the means of the group which recommends the same time as it uses.

Figure 1, page 63, shows graphically the mean percentages of time recommended and actually used by the entire group for teaching information in each of the subjects. The figure shows readily that the recommended time is greater for every subject than the actual time, and is greater by approximately five per cent.

Inasmuch as the mean percentage of recommended time is higher for every subject than the mean percentage of

actual time used, it becomes necessary to test this condition in some way in order to determine whether or not the recommended time for teaching information is significantly higher than the actual time used. The method used to determine this significance is first to find the reliability of the means by getting the standard error of each mean, then, from these standard errors of the mean, the standard error of the difference can be found. By dividing the difference between the means by the standard error of the difference, a ratio is obtained which, with the use of prepared tables, will determine the degree of significance.

Table X gives the results of these calculations. In woodwork, for example, the teachers recommended a mean of 22.8 per cent of the class time for teaching information. The standard deviation is 10, and the standard error of the mean is .91. The same group reported that there was actually used a mean of 18.6 per cent of the class time. The standard deviation here is 8.1 and the standard error of the mean is .75. There is a difference of 4.2 between the two means and a standard error of 1.18. The difference divided by the standard error of the difference gives a ratio of 3.5, and there are 100 chances in 100 that the difference is significant, since a ratio of 3 is generally

TABLE X

COMPARISON OF THE MEANS OF THE ENTIRE GROUP FOR RECOMMENDED TIME AND ACTUAL TIME: AND THE DEGREE OF SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEANS

Subject	Recommended			Actual			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is signficant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10	.91	18.6	8.1	.75	4.2	1.18	3.56	100
Drawing	22.3	9.5	.88	18.2	8.83	.86	4.1	1.23	3.3	100
Arch. Drawing	24.6	10.6	1.37	19.6	9.8	1.34	5.0	1.92	2.6	99.5
General Metal	22.2	9.2	1.02	17.9	9.16	1.11	4.29	1.51	2.84	99.74
Art Metal	20.6	10.5	1.32	15.1	6.8	.95	5.45	1.63	3.36	100
Electricity	29.0	10.7	1.26	23.2	11.8	1.48	5.8	1.94	2.99	99.9
Printing	24.9	11.8	1.48	19.0	10.7	1.41	5.9	2.04	2.92	99.8

accepted as virtual certainty.

A further examination of the table reveals the fact that in every case the ratio of the difference to the standard error of the difference is very nearly 3, or more. Even in the lowest one, that of architectural drawing, there are 99.5 chances in 100 that the difference between the recommended time and the actual time is significant.

Referring again to Tables VII and VIII, one can see that, with the exception of electricity, practically the same amount of time is recommended for teaching the informational content of the other six subjects. Woodwork, drawing, architectural drawing, general metal, art metal, and printing all receive recommendations of 20 to 25 per cent. Electricity is about 5 per cent higher, being nearly 30. The actual time used is, in all cases, about 5 per cent less than the recommended time. The actual time in electricity is between 20 and 25 per cent, and in the others, it is between 15 and 20 per cent. By testing statistically the differences between the means for the various subjects, it can be shown that electricity is significantly higher than all except architectural drawing and printing, and that the difference here approaches significance, there being 99 chances in 100 that there is a real difference.

Leaving out electricity, there is no real difference between the means of the six other subjects. However, between the highest and the lowest of these six subjects, printing being the highest and art metal the lowest, the difference is almost significant, as there are 98 chances in 100 that there is a real difference. The above statements are true for both the recommended time and actual time.

The ranges for the different subjects in Table VII show again the great similarity of the groups. In woodwork one individual recommended 80 per cent, and one recommended 60 per cent. If these two are not considered the range is essentially the same as it is for the other subjects. In Table VIII there is a little more variety, but not much. In most cases they are from 5 to 10 per cent lower than Table VII. The percentage most often reported is identical in Table VII for five subjects, being 20 per cent, and is 10 per cent higher for electricity and printing, the other two subjects. In Table VIII, however, there is more variety, two subjects having 10 per cent, four having 20 per cent, and only one having 30 per cent.

The results shown in these two tables, VII and VIII, compare favorably with the recommendations made by many of the writers referred to in Chapter III. There is

also some increase shown over what Mays found in 1923, but the results of this study do not show percentages as high as those suggested by Brown and Tustison.

In order to see whether there might be any great difference in the amount of time which different groups either recommended or used, the questionnaires were divided into various groups, and the results were tabulated. The first grouping was by kinds of schools into four groups as follows: (1) junior high schools, (2) senior high schools, (3) four-year high schools, (4) junior-senior high schools. Table XI shows for each subject the number reporting for each kind of school and also the mean per cent of time which is recommended by each kind of school. Table XII gives the same information for the time that is actually used. A study of the tables shows that there are some differences, but that the mean percentages are surprisingly close for each subject.

By comparing the mean for each kind of school in each subject with the mean of the entire group, it is found that in most cases there is not a significant difference. The same method as used before is used here to make the comparison, and in order to see these comparisons more easily the results are put into tabular form. Table XIII gives the comparison of the junior high school

TABLE XI

The Mean Per Cent of Class Time Recommended by the Various Kinds of Schools for Teaching Information

Subject	Junior High		Senior High		Four Year High		Jr. Sr. High	
	Number Reporting	Mean %	Number Reporting	Mean %	Number Reporting	Mean %	Number Reporting	Mean %
Woodwork	46	23.7	28	26.6	26	19.2	19	21.0
Drawing	47	23.9	30	20.5	25	20.4	18	19.2
Arch. Drawing	19	23.1	19	26.3	13	24.6	9	17.8
General Metal	24	24.8	17	21.2	25	20.0	15	19.0
Art Metal	24	21.8	15	19.3	12	18.8	11	18.2
Electricity	37	28.1	16	28.8	13	28.4	9	32.8
Printing	39	23.2	12	30.0	8	22.5	7	21.4

TABLE XII

The Mean Per Cent of Class Time Actually Used by the Various Kinds of Schools for Teaching Information

Subject	Junior High		Senior High		Four Year High		Jr. Sr. High	
	Number Reporting	Mean %	Number Reporting	Mean %	Number Reporting	Mean %	Number Reporting	Mean %
Woodwork	40	19.8	29	19.6	27	16.3	19	15.5
Drawing	38	20.0	28	17.5	22	16.8	15	15.7
Arch. Drawing	17	18.9	18	19.7	9	23.3	9	13.3
General Metal	22	18.9	14	16.8	21	17.1	14	15.4
Art Metal	20	15.0	13	16.2	9	15.6	9	13.9
Electricity	34	22.8	14	28.6	10	20.5	9	23.3
Printing	35	19.3	12	20.4	6	16.7	7	17.1

group with that of the entire group for the recommended time in each subject, and Table XIV gives it for the actual time used. It will be noted in these two tables that there is not one case of a significant difference. The nearest approach is in the case of drawing, in Table XIV, where the ratio of difference to the standard error of the difference is 1.07, and there are 85 chances in 100 that the difference is significant. This is still short of the necessary ratio of 3 to show real significance.

Table XV gives the comparison of the senior high school group with the entire group for time recommended, and Table XVI for actual time used. Here again, there is not a case of significant difference. The closest approach to a significant difference is in electricity, in Table XVI, where the ratio is 1.81, and the chances are 96 in 100 that the difference is real.

In Tables XVII and XVIII are found the comparisons of the four-year high school group with the entire group. Table XVII shows the recommended time, and Table XVIII shows the actual time. In Table XVII, there is one case that comes very close to being significant. That is in the case of woodwork. The ratio here is 2.95, and there are 99.85 chances in 100 that there is a real difference in the means of these two groups. It is interesting to

TABLE XIII

Comparison of the Means of the Junior High School Group with the Means of the Entire Group in Regard to the Recommended Time for Teaching Information

Subject	Entire Group			Junior High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_0}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10.0	.91	23.7	9.2	1.36	.9	1.64	.55	71
Drawing	22.3	9.5	.88	23.9	11.1	1.62	1.6	1.84	.87	80
Arch. Drawing	24.6	10.6	1.37	23.1	11.7	2.55	1.5	2.89	.52	70
General Metal	22.2	9.2	1.02	24.8	11.4	2.38	2.6	2.59	1.00	84
Art Metal	20.6	10.5	1.32	21.8	12.1	2.53	1.2	2.85	.42	66
Electricity	29.0	10.7	1.26	28.1	11.6	1.92	.9	2.28	.40	65
Printing	24.9	11.8	1.48	23.2	11.7	1.87	1.7	2.38	.71	76

TABLE XIV

Comparison of the Means of the Junior High School Groups with the Means of the Entire Group in Regard to the Actual Time Used in Teaching Information

Subject	Entire Group			Junior High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	18.6	8.1	.75	19.8	7.6	1.16	1.2	1.38	.87	81
Drawing	18.2	8.8	.86	20.0	8.9	1.44	1.8	1.68	1.07	85
Arch. Drawing	19.6	9.8	1.34	18.9	11.4	2.76	.7	3.07	.23	59
General Metal	17.9	9.2	1.11	18.9	10.2	2.21	1.0	2.47	.40	65
Art Metal	15.1	6.8	.95	15.0	7.9	1.82	.1	2.05	.05	52
Electricity	23.2	11.8	1.48	22.8	13.6	2.34	.4	2.76	.15	56
Printing	19.0	10.7	1.41	19.3	11.0	1.86	.3	2.35	.13	55

TABLE XV

Comparison of the Means of the Senior High School Group With the Means of the Entire Group in Regard to the Recommended Time for Teaching Information

Subject	Entire Group			Senior High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10.0	.91	26.6	15.4	2.96	3.8	3.09	1.23	89
Drawing	22.3	9.5	.88	20.5	8.2	1.52	1.8	1.75	1.03	85
Arch. Drawing	24.6	10.6	1.37	26.3	9.7	2.29	1.7	2.66	.64	74
General Metal	22.2	9.2	1.02	21.2	9.0	2.25	1.0	2.47	.40	65
Art Metal	20.6	10.5	1.32	19.3	8.7	2.33	1.3	2.67	.48	69
Electricity	29.0	10.7	1.26	28.8	9.8	2.52	.2	2.82	.07	53
Printing	24.9	11.8	1.48	30.0	12.4	3.73	5.1	4.01	1.27	89

TABLE XVI

Comparison of the Means of the Senior High School Group with the Means of the Entire Group in Regard to the Actual Time Used in Teaching Information

Subject	Entire Group			Senior High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	18.6	8.1	.75	19.6	10.9	2.06	1.0	2.19	.45	67
Drawing	18.2	8.8	.86	17.5	7.7	1.48	.7	1.71	.41	65
Arch. Drawing	19.6	9.8	1.34	19.7	8.1	1.96	.1	2.37	.04	52
General Metal	17.9	9.2	1.11	16.8	8.6	2.38	1.1	2.62	.42	65
Art Metal	15.1	6.8	.95	16.2	6.2	1.8	1.1	2.03	.54	71
Electricity	23.2	11.8	1.48	28.6	9.3	2.59	5.4	2.98	1.81	96
Printing	19.0	10.7	1.41	20.4	10.7	3.22	1.4	3.51	.4	65

TABLE XVII

Comparison of the Means of the Four Year High School Group with the Means of the Entire Group in Regard to the Recommended Time for Teaching Information

Subject	Entire Group			Four Year High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10.0	.91	19.2	4.1	.82	3.6	1.22	2.95	99.85
Drawing	22.3	9.5	.88	20.4	9.0	1.84	1.9	2.04	.93	83
Arch. Drawing	24.6	10.6	1.37	24.6	11.5	3.32	0.0	3.59	0	50
General Metal	22.2	9.2	1.02	20.0	7.1	1.44	2.2	1.76	1.25	89
Art Metal	20.6	10.5	1.32	18.8	6.8	2.05	1.8	2.43	.74	77
Electricity	29.0	10.7	1.26	28.4	9.3	2.68	.6	2.96	.20	58
Printing	24.9	11.8	1.48	22.5	9.4	3.53	2.4	3.83	.63	73.5

TABLE XVIII

Comparison of the Means of the Four Year High School Group with the Means of the Entire Group in Regard to the Actual Time Used in Teaching Information

Subject	Entire Group			Four Year High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_0}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	18.6	8.1	.75	16.3	7.0	1.37	2.3	1.56	1.47	93
Drawing	18.2	8.8	.86	16.8	7.8	1.69	1.4	1.89	.74	77
Arch. Drawing	19.6	9.8	1.34	23.3	9.4	3.30	3.7	3.56	1.04	85
General Metal	17.9	9.2	1.11	17.1	8.5	1.91	.8	2.21	.36	64
Art Metal	15.1	6.8	.95	15.6	5.0	1.75	.5	1.99	.25	60
Electricity	23.2	11.8	1.48	20.5	11.3	3.76	2.7	4.04	.67	75
Printing	19.0	10.7	1.41	16.7	5.5	2.47	2.3	2.84	.81	79

see how this four-year high school group arranged itself in its recommendations for woodwork. There were twenty six individuals who marked the questionnaire, and of these twenty six, there were twenty who recommended 20 per cent. This accounts for the small standard deviation of 4.1 and the low standard error of the mean with such a small group. As a result, the small difference of 3.6 between means almost becomes significant. The group is not the same in regard to the actual time used, as it can be seen in Table XVIII that there is not a significant difference between these means.

In Tables XIX and XX, which give the comparison of the junior-senior high school group with the entire group, there is another case that approaches significance. In architectural drawing, this group not only recommends less time, but actually uses less time in teaching than does the entire group. There are respectively 99.5 and 99.7 chances in 100 that there is a real difference in the means of these two groups, both in what they recommend and what they do.

The next questionnaire grouping was into unit shops and general shops, and the same kind of comparisons were made here as were made with the kinds of schools. Table XXI shows the number reporting and the mean percentage

TABLE XIX

Comparison of the Means of the Junior-Senior High School Group with the Means of the Entire Group in Regard to the Recommended Time for Teaching Information

Subject	Entire Group			Jr. Sr. High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10.0	.91	21.0	5.8	1.36	1.8	1.64	1.1	86
Drawing	22.3	9.5	.88	19.2	8.5	2.06	3.1	2.24	1.38	92
Arch. Drawing	24.6	10.6	1.37	17.8	6.3	2.21	6.8	2.60	2.62	99.5
General Metal	22.2	9.2	1.02	19.0	6.1	1.63	3.2	1.92	1.66	95
Art Metal	20.6	10.5	1.32	18.2	7.2	2.36	2.4	2.62	.92	82
Electricity	29.0	10.7	1.26	32.8	12.7	4.48	3.8	4.65	.82	79
Printing	24.9	11.8	1.48	21.4	8.3	3.40	3.5	3.71	.94	83

TABLE XX

Comparison of the Means of the Junior-Senior High School Group with the Means of the Entire Group in Regard to the Actual Time used in Teaching Information

Subject	Entire Group			Jr. Sr. High			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_D}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	18.6	8.1	.75	15.5	5.1	1.2	3.1	1.41	2.2	99
Drawing	18.2	8.8	.86	15.7	7.5	2.0	2.5	2.18	1.15	87
Arch. Drawing	19.6	9.8	1.34	13.3	5.3	1.86	6.3	2.29	2.75	99.7
General Metal	17.9	9.2	1.11	15.4	7.7	2.13	2.5	2.4	1.04	85
Art Metal	15.1	6.8	.95	13.9	7.1	2.68	1.2	2.84	.42	66
Electricity	23.2	11.8	1.48	23.3	11.5	4.08	0.1	4.34	.023	51
Printing	19.0	10.7	1.41	17.1	7.0	2.85	1.9	3.18	.60	73

of class time recommended for teaching information in each subject for both general and unit shops. Table XXII gives the same information for the actual time consumed. It will be noted here, again, that recommended percentages for both groups are surprisingly close, as are also the actual percentages.

Comparing the means from the unit shop group with those of the entire group gives the results found in Tables XXIII and XXIV. Neither in the recommended time, nor in the actual time, is there a significant difference between the means of the unit shop teachers and the entire group of teachers reporting. Tables XXV and XXVI show the same condition to exist regarding the general shop teachers. In other words, the percentage of time recommended and used for teaching information in the various industrial arts subjects, by the unit shop teachers and by the general shop teachers, conforms very closely to the suggestions and practices of all of the teachers reporting in this study.

The questionnaires were divided in other ways, also, but the results obtained were so similar to those already presented that no further value for the purposes of this study could be derived by their use. Hence they are not made a part of this study. The groups that were chosen are as follows:

TABLE XXI

The Mean Per Cent of Class Time Recommended by Teachers in Unit Shops and General Shops for Teaching Information

Subject	Unit Shops		General Shops	
	Number Reporting	Mean %	Number Reporting	Mean %
Woodwork	64	22.4	56	23.5
Drawing	65	21.4	47	23.3
Arch. Drawing	35	23.4	28	25.2
General Metal	42	20.0	38	23.7
Art Metal	34	17.6	27	23.0
Electricity	40	29.5	32	27.7
Printing	50	23.6	12	29.2

TABLE XXII

The Mean Per Cent of Class Time Actually Used by Teachers in Unit Shops and General Shops for Teaching Information

Subject	Unit Shops		General Shops	
	Number Reporting	Mean %	Number Reporting	Mean %
Woodwork	56	17.5	52	18.8
Drawing	60	17.7	47	19.4
Arch. Drawing	33	18.9	23	19.8
General Metal	34	18.5	33	16.2
Art Metal	27	14.4	23	17.2
Electricity	37	23.5	29	23.6
Printing	46	19.2	10	19.5

TABLE XXIII

Comparison of the Means of the Unit Shops With the Means of the Entire Group in Regard to the Recommended Time for Teaching Information

Subject	Entire Group			Unit Shops			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_o}$	Chances in 100 that Diff. is Significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10.0	.91	22.4	7.6	.94	.4	1.31	.30	62
Drawing	22.3	9.5	.88	21.4	5.8	.72	.9	1.13	.80	79
Arch. Drawing	24.6	10.6	1.37	23.4	8.5	1.44	1.2	1.98	.60	73
General Metal	22.2	9.2	1.02	21.0	8.8	1.35	1.2	1.69	.71	76
Art Metal	20.6	10.5	1.32	17.6	6.9	1.19	3.0	1.77	1.70	96
Electricity	29.0	10.7	1.26	28.5	9.6	1.52	.5	1.97	.25	60
Printing	24.9	11.8	1.48	23.6	11.8	1.67	1.3	2.23	.58	72

TABLE XXIV

Comparison of the Means of the Unit Shops With the Means of the Entire Group in Regard to the Actual Time Used in Teaching Information

Subject	Entire Group			Unit Shops			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_0}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	18.6	8.1	.75	17.5	7.8	1.05	1.1	1.29	.85	80
Drawing	18.2	8.8	.86	17.7	8.0	1.04	.5	1.35	.37	64
Arch. Drawing	19.6	9.8	1.34	18.9	10.1	1.76	.7	2.21	.32	63
General Metal	17.9	8.2	1.11	18.5	9.3	1.6	.6	1.94	.31	62
Art Metal	15.1	6.8	.95	14.4	6.1	1.2	.7	1.53	.45	67
Electricity	23.2	11.8	1.48	23.5	13.1	2.15	.3	2.61	.11	54
Printing	19.0	10.7	1.41	19.2	10.9	1.60	.2	2.13	.09	53

TABLE XXV

Comparison of the Means of the General Shops with the Means of the Entire Group in Regard to the Recommended Time for Teaching Information

Subject	Entire Group			General Shops			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_0}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	22.8	10.0	.91	23.5	9.5	1.27	.7	1.56	.45	67
Drawing	22.3	9.5	.88	23.3	10.6	1.55	1.0	1.78	.56	71
Arch. Drawing	24.6	10.6	1.37	25.2	11.5	2.18	.6	2.57	.23	59
General Metal	22.2	9.2	1.02	23.7	9.5	1.58	1.5	1.88	.80	79
Art Metal	20.6	10.5	1.32	23.0	10.8	2.08	2.4	2.46	.975	83.5
Electricity	29.0	10.7	1.26	27.7	11.2	2.02	1.3	2.38	.55	71
Printing	24.9	11.8	1.48	29.2	11.7	3.38	4.3	3.69	1.16	87

TABLE XXVI

Comparison of the Means of the General Shops With the Means of the Entire Group in Regard to the Actual Time Used in Teaching Information

Subject	Entire Group			General Shops			Diff. in Means	S.E. of Diff.	$\frac{D}{\sigma_0}$	Chances in 100 that diff. is significant
	Mean	S.D.	S.E. of Mean	Mean	S.D.	S.E. of Mean				
Woodwork	18.6	8.1	.75	18.8	9.54	1.32	.2	1.52	.13	55
Drawing	18.2	8.8	.86	19.4	9.9	1.44	1.2	1.67	.72	76
Arch. Drawing	19.6	9.8	1.34	19.8	10.2	2.12	.2	2.51	.08	53
General Metal	17.9	9.2	1.11	16.2	8.5	1.48	1.7	1.85	.92	82
Art Metal	15.1	6.8	.95	17.2	8.7	1.85	2.1	2.08	1.01	84
Electricity	23.2	11.8	1.48	23.6	12.6	2.38	.4	2.80	.14	56
Printing	19.0	10.7	1.41	19.5	10.6	3.34	.5	3.63	.13	56

1. By size of school

    a. 500 and under
    b. Between 500 and 1000
    c. Over 1000

2. By number of books in the library

    a. 1 to 10
    b. 11 to 20
    c. 21 to 40
    d. 41 and over.

3. By States
    a. California
    b. Utah
    c. All others

The number reporting and the means for each group are shown in tables in Appendix B.

Another method of showing the similarity of the various groups in the time recommended and used for teaching information is by means of comparative bar graphs. Figure 2 gives the comparison of all teachers, junior high school teachers, junior-senior high school teachers, senior high school teachers, four year high school teachers, unit shop teachers, and general shop teachers for recommended time in elementary woodwork. Figure 3 gives the comparison of the same groups for actual time used in woodwork. Figures 4 and 5 give the same comparison for elementary drawing; Figures 6 and 7 for elementary architectural drawing; Figures 8 and 9 for general metal work; Figures 10 and 11 for art metal;

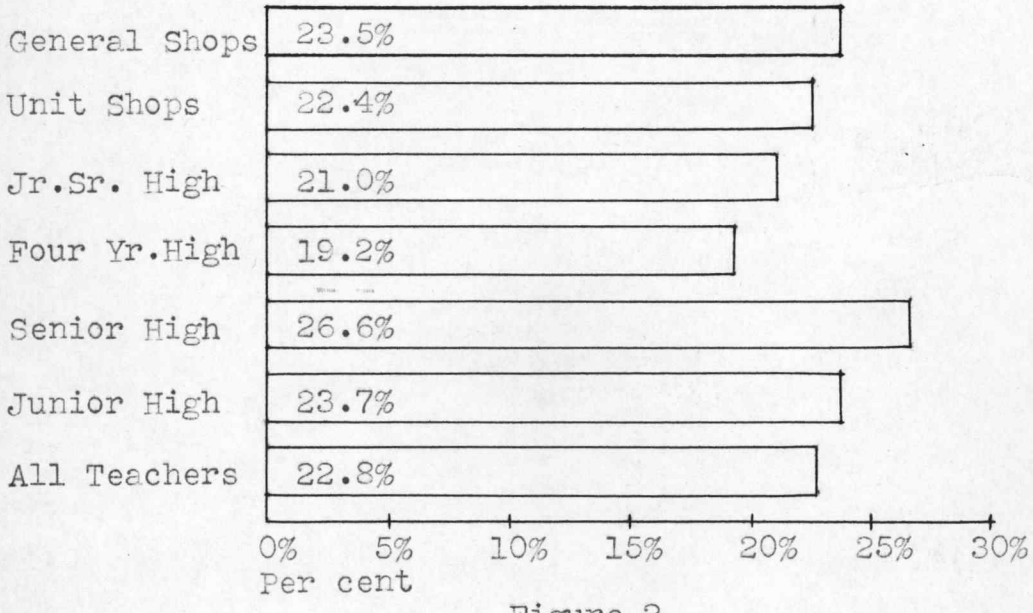

Figure 2

Comparison of Recommended Percentages for Teaching Information in Elementary Woodwork

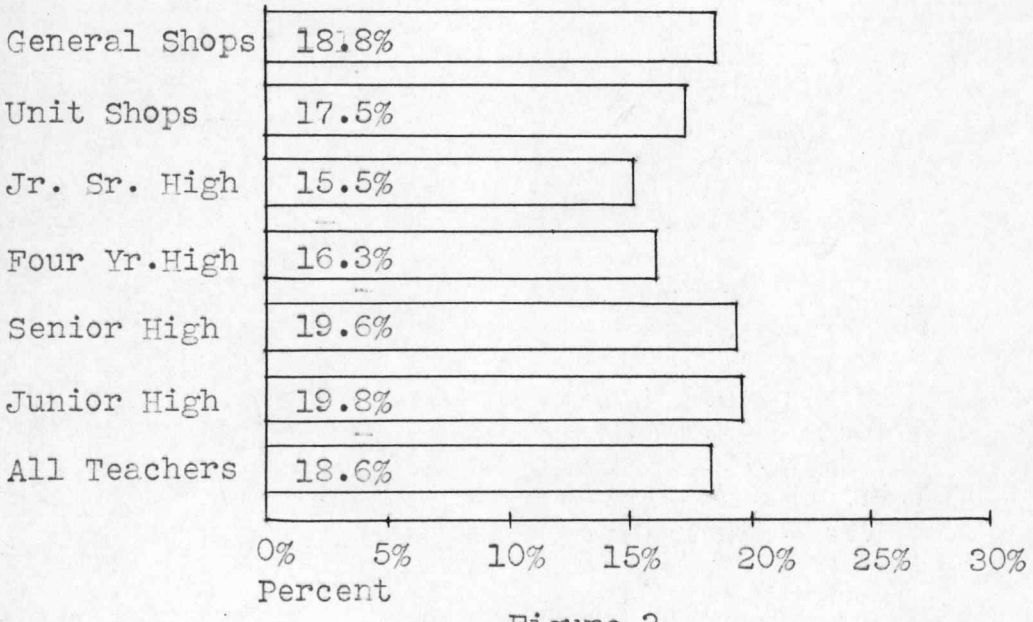

Figure 3

Comparison of Actual Percentages Used in Teaching Information in Elementary Woodwork

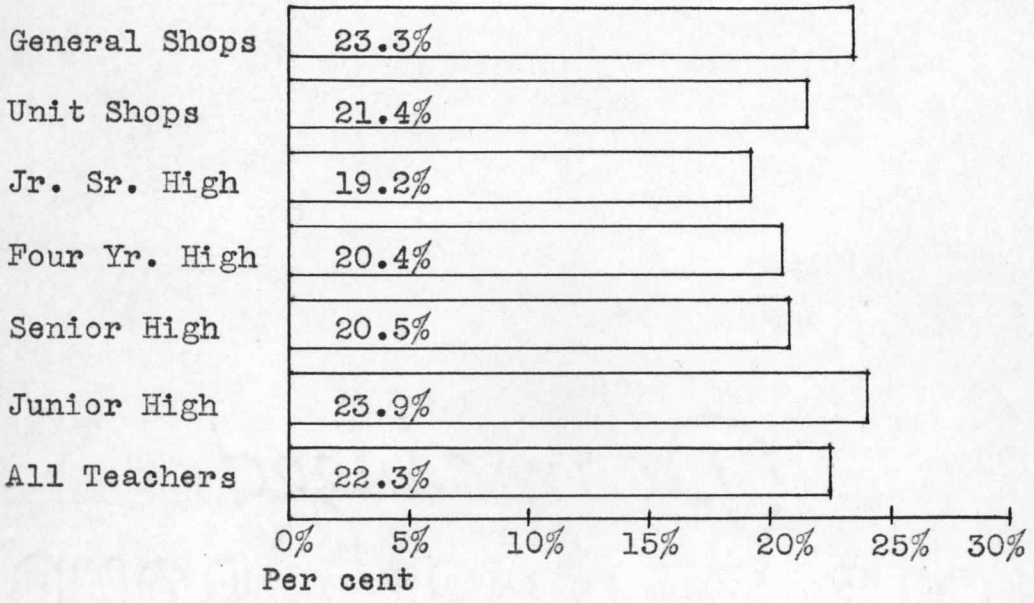

Figure 4

Comparison of Recommended Percentages for Teaching Information in Elementary Drawing

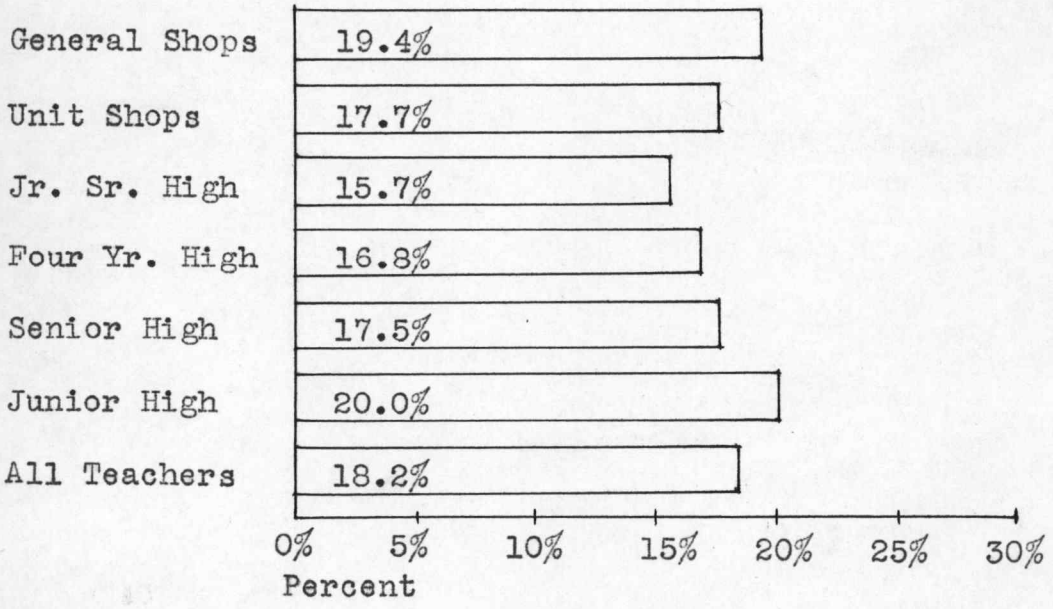

Figure 5

Comparison of Actual Percentages Used in Teaching Information in Elementary Drawing

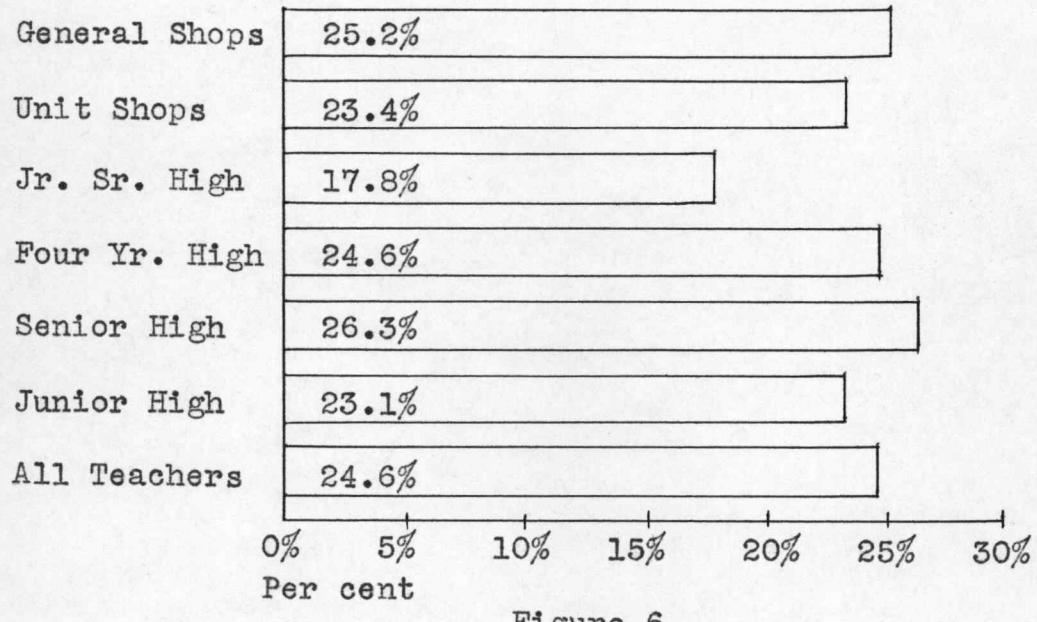

Figure 6

Comparison of Recommended Percentages for Teaching Information in Elementary Architectural Drawing

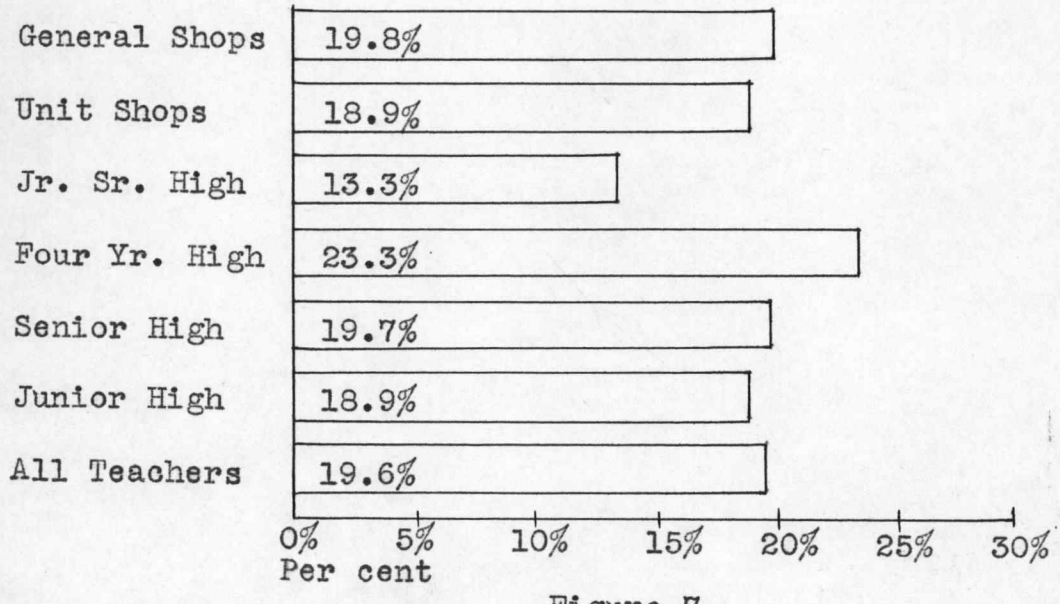

Figure 7

Comparison of Actual Percentages Used in Teaching Information in Elementary Architectural Drawing

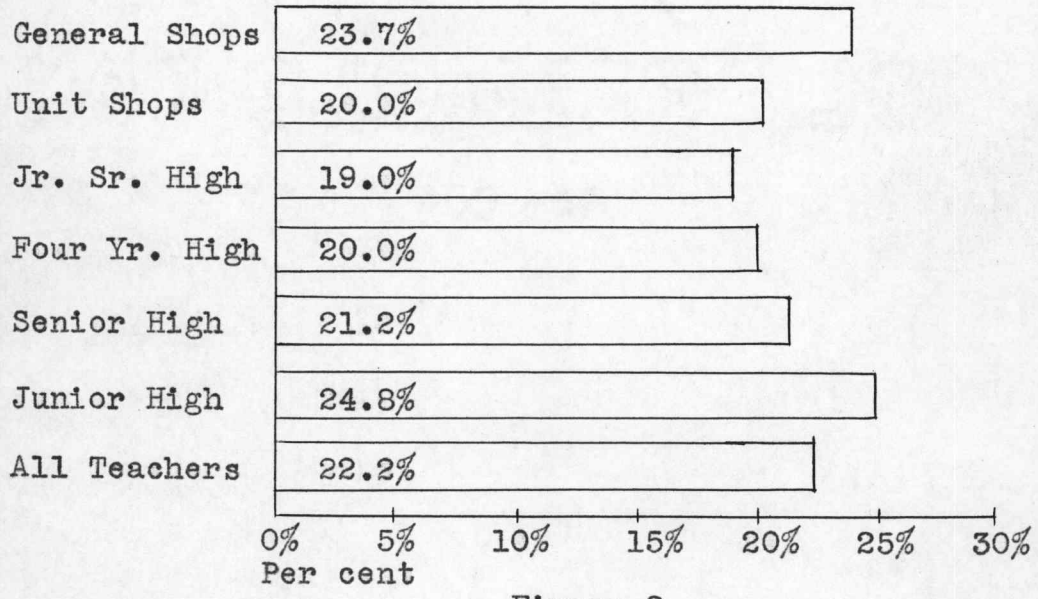

Figure 8

Comparison of Recommended Percentages for Teaching Information in Elementary General Metal

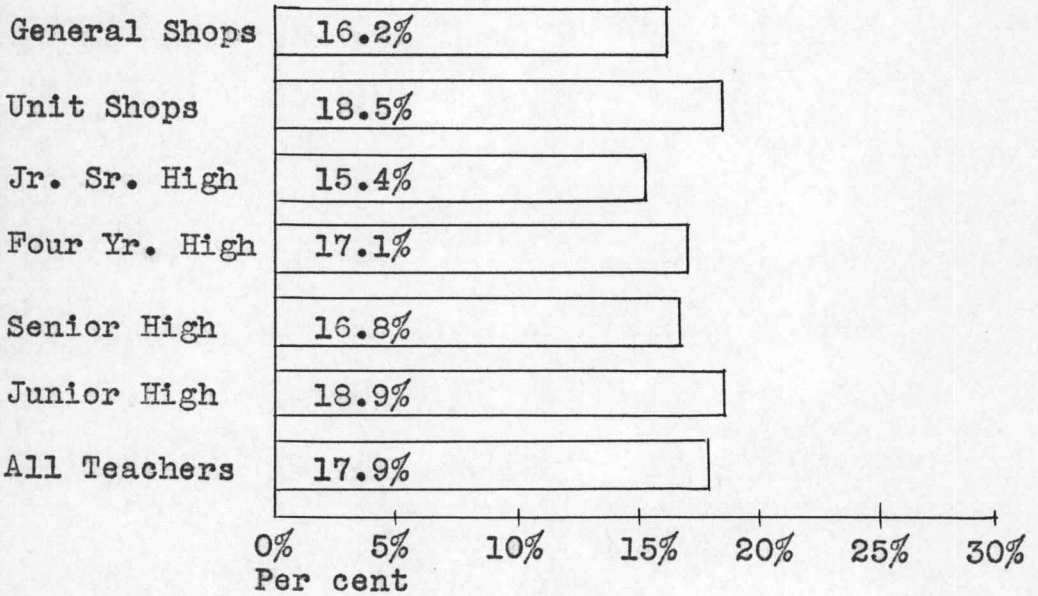

Figure 9

Comparison of Actual Percentages Used in Teaching Information in Elementary General Metal

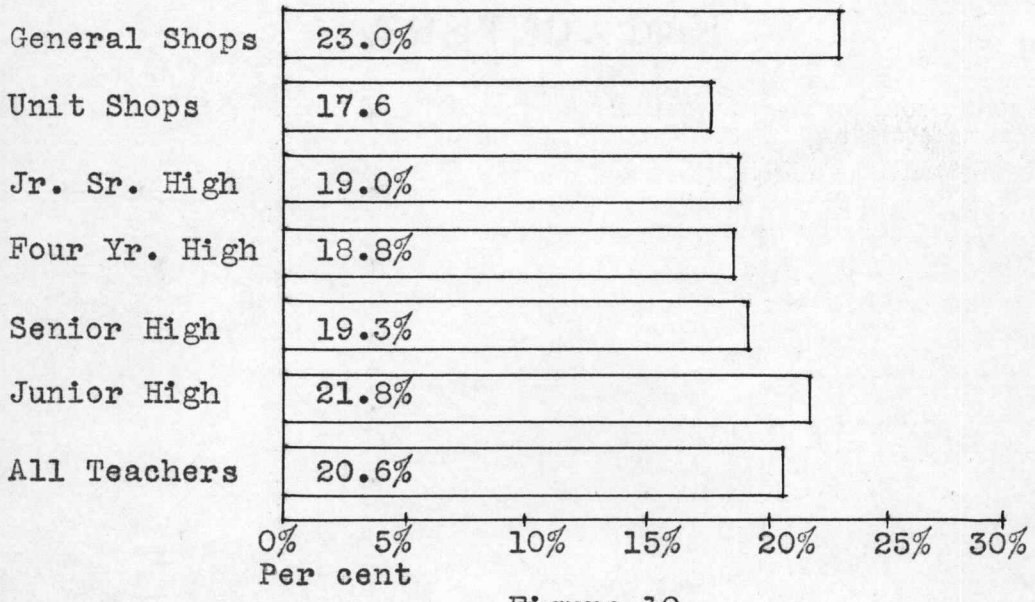

Figure 10

Comparison of Recommended Percentages for Teaching Information in Elementary Art Metal

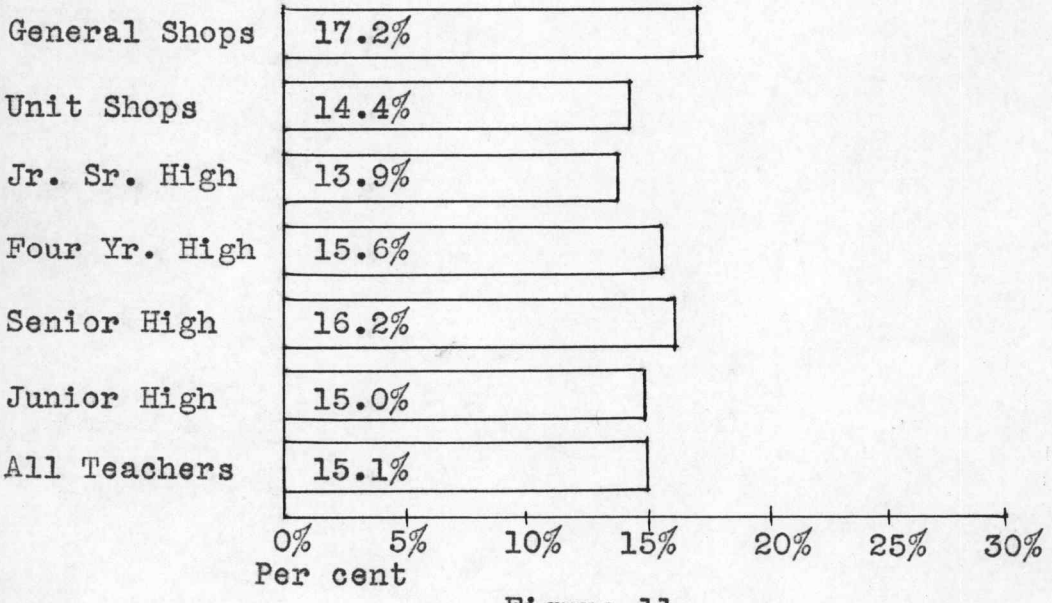

Figure 11

Comparison of Actual Percentages Used in Teaching Information in Elementary Art Metal

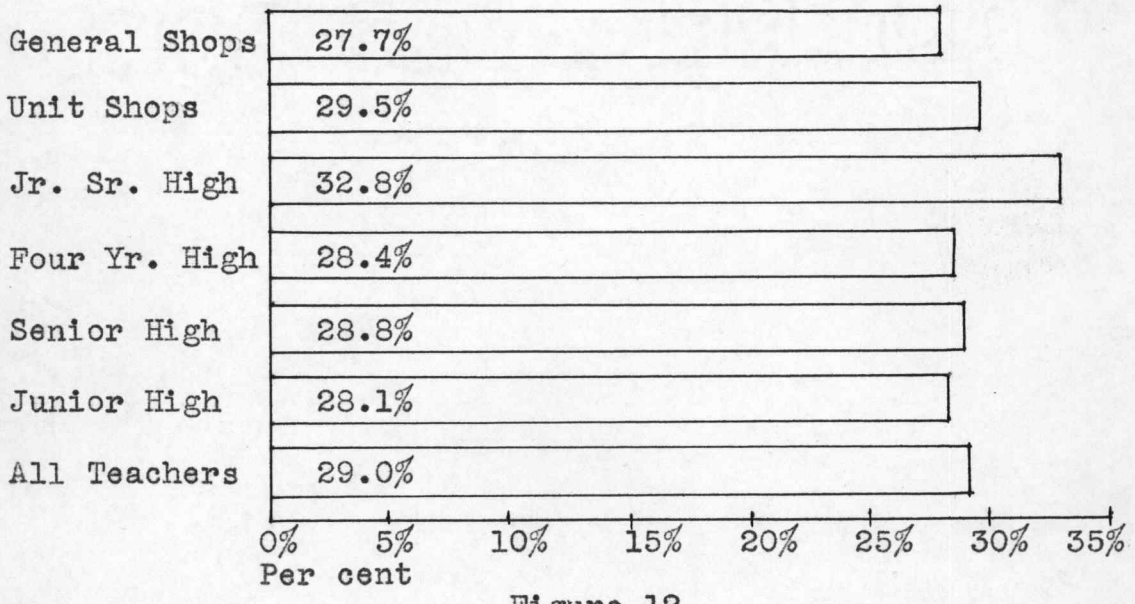

Figure 12

Comparison of Recommended Percentages for Teaching Information in Elementary Electricity

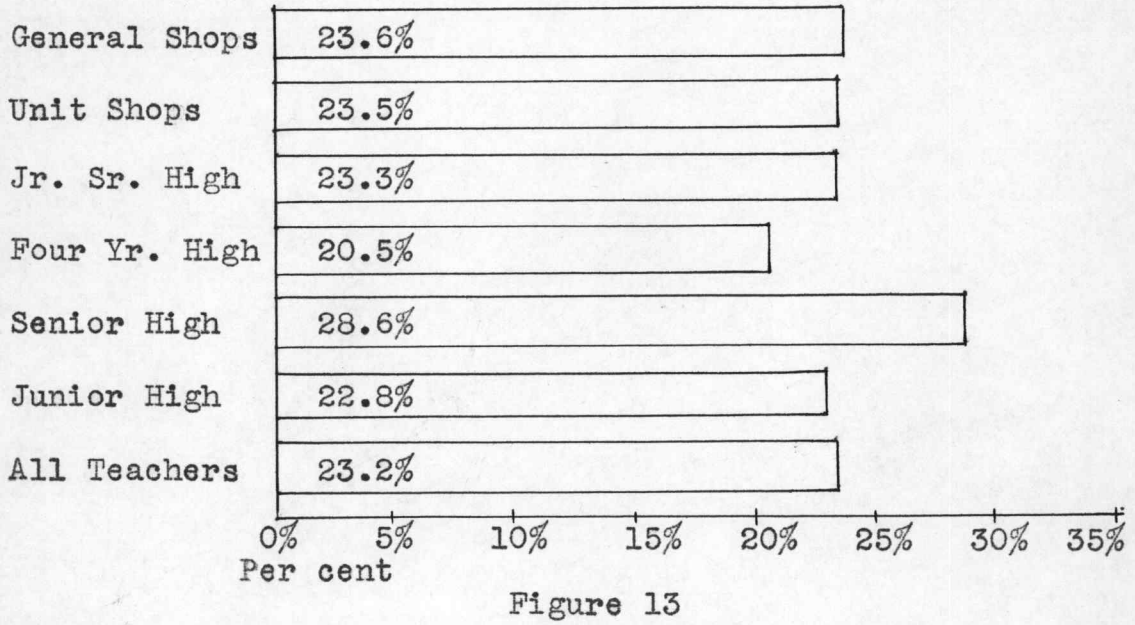

Figure 13

Comparison of Actual Percentages Used in Teaching Information in Elementary Electricity

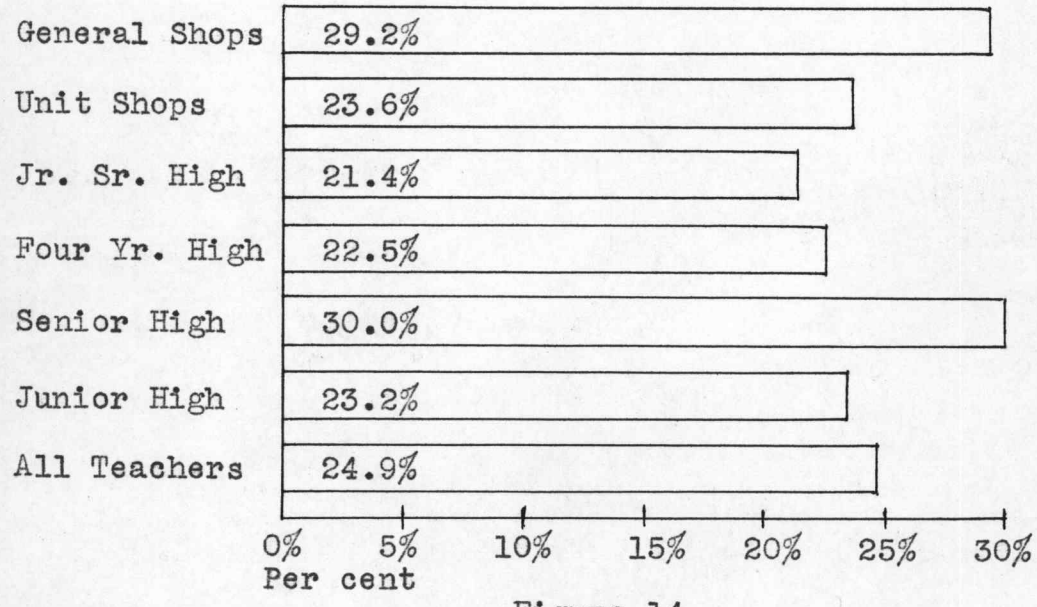

Figure 14

Comparison of Recommended Percentages for Teaching Information in Elementary Printing

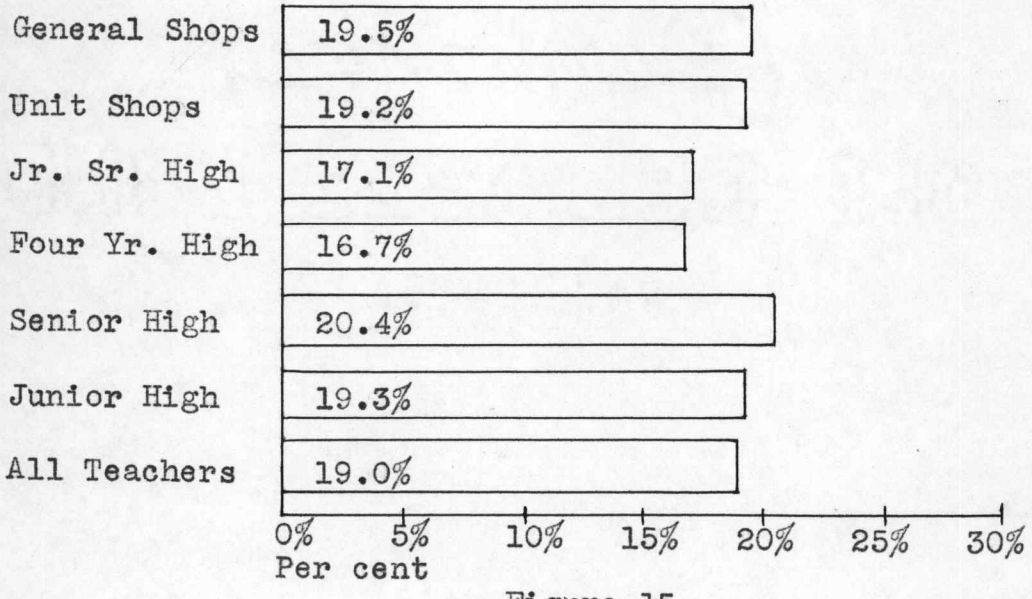

Figure 15

Comparison of Actual Percentages Used in Teaching Information in Elementary Printing

Figures 12 and 13 for electricity; and Figures 14 and 15 for printing.

The graphs show readily where the greatest differences lie and indicate in some cases that there is considerable difference in the percentage of time either recommended or used by different groups, but that when compared with the percentage of all teachers, the differences become relatively small.

Inasmuch as a few teachers recommended a very high percentage of time for teaching information, it was thought that it would be interesting to know why they felt that so much time was necessary. Letters were sent to those who reported a percentage which seemed far greater than that of the whole group. Five letters were sent out, and four replies were received. One individual confessed to having marked the wrong end of the scale; his ratings were changed. The following are excerpts taken from the other three letters:

> The sixty per cent of time used, or recommended, for teaching of information is necessary for a number of reasons. (1) The amount of materials available for class experimentation is limited. (2) The number of basic experiments which help to put across the information may well be limited and in many cases demonstrated by a lecture demonstration. (3) In elementary electricity I try to give the boys a broad view of a great field open before them and just a few spots as foot holds from which to view that

field. If they are interested they have an opportunity to further their information by experimentation in the shop. I find, however, that there are few who care to do that.

Perhaps my language or your language did not quite coincide when I said that sixty per cent. That, in my terminology, includes lecture demonstration as well as factual information found by reading books, etc.

From the second letter:

In my print shop, I have to supervise (or do) all the printing for the high school. This keeps me so busy that I have practically no time to lecture to my beginning students on printing information; thus I estimate that I actually use about five per cent of the time for imparting information. However, I have made a series of thirty lessons which contain questions on information that must be filled out or answered after the students have studied this material in the text book. So, in reality, the student himself spends perhaps fifty per cent of his time on informational material. I took your question to mean, How much time do I actually spend in imparting information?

From the third letter:

As to how much time should be given to teaching information in the industrial arts classes, you state that I did recommend eighty per cent and actually used forty per cent. It could be very possible that I put down such allotments...This large amount of time I mentioned, which doubtless is over estimated, is all the information I may give to them, individually as well as class time spent in giving such. I can see that if a class was large this would be a lower figure,

but in my classes the groups are small, in fact, ten and seventeen.

The data presented in this chapter gives a general picture of current practices in the schools selected for this study in regard to industrial arts information. Mention is made of the use of books and magazines in imparting information and of the amount of these reference materials available for student use. Emphasis is given to the time allotment for teaching the informational content, and material is presented to show the amount of time that is actually being used to teach the information and also the amount of time teachers recommend be used. With these facts available, it is possible to draw certain conclusions and to make recommendations for the use of data revealed in this study.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Industrial arts has grown to be an important subject in the modern school curriculum, and in the process of that growth it has gone through several different stages of development and has operated under as many different philosophies. From a subject with specific vocational aims and with the emphasis placed upon the acquisition of a high degree of manipulative skill, it has changed to one in which skill becomes secondary, and the aim is general education. Under the present philosophy, the chief purpose of industrial arts is to interpret to modern youth the industrial world of today, together with its industrial society. The objectives of the work are planned so that this purpose can be attained in the best way possible.

Realizing that it was impossible to attain this goal with a purely manipulative course, leaders advocated the inclusion of a certain amount of informational content. The problem of getting teachers to make this information a definite part of their courses has not been an easy one, and it has taken the better part of a quarter of a century to accomplish it. The enrichment

of the whole industrial arts field by the addition of this information, and also by the intorduction of many new courses and subjects, have together been responsible for the rapid growth and development which industrial arts has made during the last two or three decades. Many writers, especially in recent years, have stressed the value and importance of the informational content in every industrial arts course. Not many of them have said much about a definite time allotment for teaching this information, but most of those who have suggest about twenty to twenty-five per cent of the class time.

This study brings out some rather interesting and vital problems in connection with industrial arts work and one of the most striking is the small number of books in many of the shop libraries. When one considers that half of the teachers reporting have twenty-five or fewer different books in their shop library a serious problem is presented. Text books and reference books are valuable aids in imparting the kinds of information needed in industrial arts classes and should be available in adequate quantities. Perhaps the small size of the shop libraries accounts for the fact that only 93 teachers out of the 173 reporting use class reading assignments as a method for imparting information. Some schools seem to be adequately supplied with books, but

in general it would appear that many schools need more books in the shop library.

In regard to magazines, it would appear, again, that some schools are well supplied, but that many may be seriously handicapped in their work by not having sufficient recourse to current literature in the field. There are certainly many magazines reported and also many kinds of magazines. Most of them, aside from those printed on the questionnaire, were reported by only a very few teachers; and it is doubtful if the information given here represents a true picture. It is interesting to see that 113 out of 173 teachers, or 65 per cent of them, have the magazine, Industrial Arts and Vocational Education come regularly to their schools. This magazine has been strong in its efforts to bring about the present plan of industrial arts and should be available to every industrial arts instructor.

The manner in which the time allotment for teaching the informational content of the industrial arts subjects used in this study has evolved has been extremely interesting to the writer. Probably the most impressive thing is the great similarity of all the groups in what they seem to feel is the correct amount of time to use for teaching information. As the original data were tabulated and the means calculated,

one could not help but be impressed by the general agreement of all the groups. It is true that there is greater variation in the amount of time that is actually being used than in what is recommended, but the fact that the recommended percentages of the various groups are so close seems to be important.

When the questionnaires are divided into the various groups, the number reporting for any particular subject sometimes becomes rather small. It is surprising, however, that even with these small groups, there is close agreement in what they think is the correct amount of time to use for teaching information. The fact that there was not a single instance in which the comparison of the means for these separate groups with the entire group showed a really significant difference, is important. Such a condition would be interpreted to mean that most teachers know what they should be doing in regard to the teaching of information, although they may not all be doing it.

The results of the study show the following time allotments to be the mean percentages for what is actually being done in the elementary courses used in this study: in woodwork, 18.6 per cent of the class time for teaching information; in drawing, 18.2 per cent; in architectural drawing, 19.6 per cent; in general metal,

17.9 per cent; in art metal, 15.1 per cent; in electricity, 23.2 per cent; and in printing, 19.0 per cent. The time allotments which are recommended for teaching information are generally about five per cent higher and are as follows: woodwork, 22.8 per cent; drawing, 22.3 per cent; architectural drawing, 24.6 per cent; general metal, 22.2 per cent; art metal, 20.6 per cent; electricity, 29.0 per cent; and printing, 24.9 per cent.

This study did not reveal any reasons why the recommended time is greater than the actual time. There are, however, several factors that may be responsible for the difference. Inadequate seating facilities might cause a teacher to take less time in teaching information than he would do if the students could all be seated comfortably. Lack of informational material could also influence a teacher's practice. If the policy of administrators was in opposition to the objectives of industrial arts, which require informational teaching for their attainments, a teacher would naturally reduce the time spent in teaching information. It is probably true, also, that there are still many administrators who insist upon shop classes being purely manipulative.

These factors, together with others not enumerated,

could easily cause the difference between actual time and recommended time, and probably do influence general practice in this respect.

Inasmuch as the recommended time is greater in every case than the actual time, and because of the fact that the recommended time represents the true feelings of the group in regard to what time ought to be spent in teaching information, it seems that in the absence of experimental or other evidence, this is the correct percentage to accept as the best time allotment for teaching the informational content of the subjects used in this study. On this basis, then, a teacher should spend between twenty and twenty-five per cent of the class time teaching information in the elementary industrial arts subjects of woodwork, drawing, architectural drawing, general metal, art metal, and printing. In electricity about thirty per cent of the class time should be used for that same purpose.

The following points have no direct bearing upon this study, but are merely interesting items that have shown up as the work has progressed. The first sixty-three questionnaires returned were received from teachers who were in attendance at the Oregon State College during the summer session of 1940. Of these teachers, fifty-three were teaching woodwork; fifty, drawing;

twenty-seven, architectural drawing; thirty-three, general metal; twenty-two, art metal; twenty-three, electricity; and ten, printing. In the opinion of the writer, this represents rather closely the relative popularity of these courses on the west coast, as nearly all of these teachers were from California, Oregon, and Washington.

Most of the subjects used in this study seem to be taught about equally in general shops and unit shops, with the exception of printing. Printing is taught in many general shops other than those studied, but at present it seems to be much more popular as a unit shop subject.

There is a feeling among many industrial arts teachers and school administrators that if a large percentage of class time is spent in teaching information, students will be driven away from the classes, especially in senior high schools where industrial arts classes are usually elective. Believing that it would be interesting to see whether or not the present study revealed any such tendency, a correlation was made between the per cent of boys enrolled in industrial arts and the per cent of class time actually used in teaching information. Among the senior high schools reporting in this study there were twenty-six who offered woodwork on an elective

basis. These twenty-six schools were ranked for the per cent of boys enrolled in industrial arts and for the per cent of class time used in teaching information, and the correlation coefficient was calculated by the rank difference method. The result shows the coefficient of correlation to be only .17, which is very low. With only twenty-six cases and such a low correlation the probable error is relatively high, being .13. The indications are, then, that in the few schools studied that the amount of information taught has little or nothing to do with the per cent of boys who elect the elementary woodworking course.

There were not sufficient cases to carry on this correlation in the other subjects of this study, but indications are that similar results would be obtained. It might be interesting and beneficial, however, as a further study, to extend the investigation into a large number of schools where industrial arts courses are elective and determine, if possible, if there is a point at which the informational content becomes burdensome and drives students away from the classes.

As the work has proceded on this study, other problems have presented themselves that seem worthy of further study and consideration. One of these is to determine whether or not the time allotments suggested

here would hold true for other industrial arts subjects, especially in some of the newer ones just coming in.

Another problem which seems even more important has to do with method. The present study has given some idea of the methods being used, but the methods used have not been given major consideration here. Teachers who have responded to the questionnaire have asked questions about how the work is being done and how other teachers go about the problem so that their teaching will be effective. There seems to be a genuine problem here and one which merits some real attempt at solution.

Closely allied with the problem of method is the problem of how to distribute the time allotment determined in this study so that the teaching will be the most effective. Should a small part of each class period be taken to teach the information, should approximately one period each week be used, or shall enough consecutive days be used at one time to make up the correct percentage? An answer to these questions would be a valuable contribution.

Still another problem concerns itself with the nature of the informational content. Obviously, one cannot include much of the vast reservoir of material available in twenty to twenty-five per cent of the class time, and the task of selecting the best for the purpose

is a real problem. Fales has made some splendid suggestions, but the work could well be extended far beyond what he has done, so that teachers would know for each subject about what should be selected in order to include the three types of information referred to in Chapter III.

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APPENDIX A

OREGON STATE COLLEGE
SCHOOL OF EDUCATION
CORVALLIS, OREGON

Department of
Industrial Education

Corvallis, Oregon
July 22, 1940

Dear Sir:

Knowing of your interest in industrial arts and of your desire to see the program advance at all time, you have been selected to pass judgment on a few problems that are of interest at the present time.

In addition to providing manipulative activities in industrial arts courses most teachers have devoted some time to the teaching of information. In fact, it is assumed by nearly all that teachers better meet the objectives when the necessary related information is included. This information may be of a technical nature--something the student must know in order to do the job; it may be of a general nature--something that is "nice to know" although not essential to the performance of a task; or it may be of an occupational or guidance nature--having to do with opportunities and requirements in a particular field of work. Many teachers have found that the best practice is to include all three kinds.

It is my desire to obtain your opinion on what proportion of class time should be devoted to teaching this information in the elementary industrial arts courses.

Only about five or six minutes of your time are required to answer the questions. An extra copy of the questionnaire is enclosed for your files, and I shall be glad to inform you of the results of the study as soon as it is completed.

Thank you very much for your cooperation and prompt response.

Very truly yours,

/S/ William E. Mortimer

CHECK LIST ON TEACHING INFORMATION IN INDUSTRIAL ARTS

The questions below should be self-explanatory. Kindly go through them and record the data called for as accurately as possible.

(Average time to fill out--5 minutes)

1. Name_____ 2. School_____

3. City and State_____

4. Please underline the type of school in which you teach (Jr. High) (Sr. High) (4 Yr. High) (Jr.-Sr. High) (8 grade elem.)

5. What is the approximate enrollment of your school?

6. Approximately how many boys take industrial arts?(___)

7. Please underline the type of shop organization you use for the major elementary courses. (Unit shops) (General shop) Other_____

8. Are your elementary classes taught on the "general shop" plan? (___) (i.e., is instruction given in several activities--woodwork, metalwork, drawing, electricity--simultaneously)

9. In what grades do you teach industrial arts?(_____)

10. Approximately how many different class references or textbooks do you have in your shop library? (_____)

11. Please underline the magazines that come regularly to your shop which you use to impart information: (Popular Science Monthly) (Industrial Arts and Vocational Education) (Industrial Education) (Popular Homecraft) (Popular Mechanics) (The Home Craftsman)

Others_____

12. Please underline the method or methods that you use to teach the informational part of your courses: (Lecture) (Home study) (Class reading assignments) (Visits to industrial plants) Others_____

13. Mark with an "R" on the scale below the per cent of class time which you <u>recommend</u> be used for teaching information.

<u>MARK ONLY THOSE SUBJECTS WHICH YOU HAVE TAUGHT</u>

Elementary woodwork
0 10 20 30 40 50 60 70 80 90 100
Per cent

Elementary drawing
0 10 20 30 40 50 60 70 80 90 100
Per cent

Elementary arch. drawing
0 10 20 30 40 50 60 70 80 90 100
Per cent

Elementary general metal
0 10 20 30 40 50 60 70 80 90 100
Per cent

Elementary art metal
0 10 20 30 40 50 60 70 80 90 100
Per cent

Elementary electricity
0 10 20 30 40 50 60 70 80 90 100
Per cent

Elementary printing
0 10 20 30 40 50 60 70 80 90 100
Per cent

14. Now will you please go back and mark with an "A" on the same scale the per cent of time you actually devote to such instruction.

15. Do you desire a summary of the results of this study? (_____).

APPENDIX B

THE MEAN PER CENT OF CLASS TIME RECOMMENDED FOR TEACHING INFORMATION BY TEACHERS IN SCHOOL OF VARIOUS SIZES

Subject	Over 1000		500 to 1000		500 and under	
	No.	%	No.	%	No.	%
Woodwork	27	21.3	32	22.3	63	23.9
Drawing	24	20.4	32	22.5	58	22.9
Arch. Drawing	16	27.2	14	29.6	30	21.3
General Metal	20	22.3	20	23.8	41	21.8
Art Metal	12	20.0	16	24.1	35	18.6
Electricity	18	28.1	17	33.9	32	28.1
Printing	38	24.5	20	28.3	14	20.7

THE MEAN PER CENT OF CLASS TIME ACTUALLY USED FOR TEACHING INFORMATION BY TEACHERS IN SCHOOLS OF VARIOUS SIZES

Subject	Over 1000		500 to 1000		500 and under	
	No.	%	No.	%	No.	%
Woodwork	24	17.5	32	19.4	64	19.7
Drawing	18	15.6	33	17.4	56	18.5
Arch. Drawing	14	20.7	11	19.1	28	17.9
General Metal	14	18.6	18	19.2	37	17.0
Art Metal	8	16.3	13	16.3	32	14.4
Electricity	15	23.3	19	28.7	30	22.2
Printing	28	17.3	17	24.1	12	14.6

THE MEAN PER CENT OF CLASS TIME RECOMMENDED FOR TEACHING INFORMATION BY TEACHERS HAVING SHOP LIBRARIES OF VARIOUS SIZES

Subject	Over 41 Books		21 to 40 Books		11 to 20 Books		1 to 10 Books	
	No.	%	No.	%	No.	%	No.	%
Woodwork	37	22.7	27	20.4	30	24.3	22	27.5
Drawing	34	24.0	27	18.5	22	23.4	21	27.1
Arch. Drawing	25	24.6	13	20.4	7	28.6	10	30.5
Gen. Metal	27	23.2	20	18.5	13	22.7	12	30.0
Art Metal	23	17.7	14	17.9	8	26.3	13	27.7
Electricity	23	29.8	19	28.4	13	20.0	11	31.8
Printing	15	24.3	12	25.4	9	25.0	20	25.0

THE MEAN PER CENT OF CLASS TIME ACTUALLY USED FOR TEACHING INFORMATION BY TEACHERS HAVING SHOP LIBRARIES OF VARIOUS SIZES

Subject	Over 41 Books		21 to 40 Books		11 to 20 Books		1 to 10 Books	
	No.	%	No.	%	No.	%	No.	%
Woodwork	30	19.0	26	16.5	28	18.4	20	22.3
Drawing	29	21.4	26	16.5	21	18.6	20	17.5
Arch. Drawing	21	18.3	13	16.5	6	25.0	7	17.1
Gen. Metal	21	20.5	20	15.3	12	17.5	8	21.8
Art Metal	16	15.3	13	11.2	6	18.3	8	17.5
Electricity	19	25.0	19	24.2	12	22.5	10	19.5
Printing	12	22.5	13	17.4	9	18.9	16	17.5

THE MEAN PER CENT OF CLASS TIME RECOMMENDED FOR TEACHING INFORMATION BY TEACHERS IN DIFFERENT STATES

Subject	California		Utah		Others	
	No.	%	No.	%	No.	%
Woodwork	47	21.1	35	23.0	36	25.0
Drawing	54	22.4	30	23.2	32	21.6
Arch. Drawing	30	25.0	8	23.1	32	24.4
General Metal	35	21.6	23	22.6	20	23.5
Art Metal	26	17.5	20	20.3	15	20.7
Electricity	33	26.1	22	32.0	15	33.3
Printing	48	23.7	5	22.0	13	28.5

THE MEAN PER CENT OF CLASS TIME ACTUALLY USED FOR TEACHING INFORMATION BY TEACHERS IN DIFFERENT STATES

Subject	California		Utah		Others	
	No.	%	No.	%	No.	%
Woodwork	43	17.1	33	23.0	34	18.0
Drawing	46	18.0	28	20.2	30	15.7
Arch. Drawing	27	18.9	7	18.6	15	17.7
General Metal	25	16.8	22	21.1	15	16.3
Art Metal	20	16.8	17	15.0	10	14.5
Electricity	28	20.3	22	28.7	12	20.4
Printing	42	18.1	4	28.8	12	21.2