One of the problems confronting the small high school, especially in the industrial-arts field, is determining what it can and should do in offering industrial arts to its students so it will keep pace with the majority of other schools in similar circumstances in the State of Oregon.

The purpose of this study is: (1) to learn of any existing similarity in the areas of industrial-arts offerings in a selected group of schools; (2) from the findings, and in light of recent trends in the industrial-arts education field, to briefly outline some of the areas of industrial arts which seem most common and desirable for a limited program in a small high school.

Looking into the background for the present study, it is seen that organized handwork instruction in the United States, both vocational and general, has gradually changed from a function and responsibility of the parent to an obligation of the schools. Formal handwork instruction was offered through a number of educational institutions before being accepted into the curriculum of the public high school on a general-education basis. Some of these institutions were the apprenticeship system, vocational-type instruction in the academies, industrial schools, and vocational-professional instruction in the land-grant colleges. Although these forms of instruction filled definite needs they failed to provide a period of exploration in the various areas of industry so the student better understood the industrial products which surrounded him in his daily activities.

Industrial-arts education in the public schools today is gradually changing. To note change in any movement it is necessary to establish check points. This study is an attempt to find the present "status quo" of industrial arts in a segment of the smaller high schools of Oregon.
Of the 223 Oregon standard high schools, 78 are in the "small" category -- established for this study as those high schools with not less than four nor more than 11 teachers. When analyzed and compiled, data in the 90 percent response from these 78 schools indicate the following:

1. Seventy-eight, or 35 percent, of the public high schools in Oregon have from five to 11 teachers, inclusive.

2. Industrial arts is offered in 53 of these 78 high schools. (69 percent)

3. Of the number and types of industrial-arts subjects given, these five subjects constitute 89 percent of the total industrial-arts classes in the small high schools of Oregon: beginning woodwork (31 percent), advanced woodwork (23 percent), general shop (18 percent), general drafting (ten percent), and advanced general woodwork (seven percent).

4. Industrial arts is offered on less than a full-time basis in 42 of the 50 schools which give industrial arts and contributed information to this study.

Although a number of leading authorities recommend (and the recent national trend is toward) a general-shop organization for industrial arts in the small high school, this study indicates the "general shop" subject is third in frequency -- with the unit-type shop in the woodworking area most common in the small schools of Oregon.

With the limited facilities and monetary means of the small schools in mind, the writer recommends a general-shop organization to give a wider scope of industrial activities for pupil experiences in manipulative work for self-expression and exploratory values. In the latter category -- exploratory values -- the general-shop program will permit variety contacts with the materials, products, and employment opportunities of industry more consistent with the objectives of educational guidance and counselling, and with all the other services of the secondary schools.
AN INDUSTRIAL-ARTS PROGRAM
FOR A SMALL HIGH SCHOOL

by

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AN INDUSTRIAL-ARTS PROGRAM
FOR A SMALL HIGH SCHOOL

CHAPTER I

INTRODUCTION

This study is to give consideration to the problem of the small high school trying to carry on a program of activities in industrial arts. For a number of years there has been a gradual increase in the scope of industrial arts until, at the present time, it is often difficult for even the larger high schools to offer a comprehensive industrial-arts program. With this broadening of the program, the administrator of the small high school may tend to dismiss quickly the possibilities of trying to give any industrial arts whatsoever. An administrator who may have had some contact with the many facets of industrial arts may think of the program only in its broad aspects and its correspondingly higher costs -- thus passing over the possibilities of introducing a limited industrial-arts program in the smaller school.

Statement of the Problem

One of the curriculum problems confronting the small high schools is to determine what, specifically, any particular school can and should do to offer its students a
recognized industrial-arts program in light of the accepted objectives, and within the capabilities of the personnel, the available monetary resources and the physical facilities of the local school district.

Need for the Study

The situation of several very small school districts in close proximity, each struggling to give the bare minimums required of a standard high school, is more rapidly giving way to consolidated and union high school organizations. Many high schools which formerly employed fewer than five or six teachers, through consolidation now use from 15 to 25 teachers. These schools are of adequate size that they may offer a fairly well-rounded industrial-arts program, using one to two full-time industrial-arts teachers.

In spite of the many advantages, a number of the smaller high schools have not yet consolidated. It may well be a number of years before the majority of these schools have actually accomplished a physical consolidation. It is for the strengthening of the industrial-arts programs in these smaller high schools that this study is undertaken.

What industrial-arts offerings are there in the small schools? Do the students in these schools have any
opportunity for a basic understanding of industry and our industrial way of life? Is there a significant number of these smaller high schools in Oregon? What kind of a part-time approach can be made for industrial arts with limited facilities? If a limited approach is necessary, what type of program would best accomplish the purposes and objectives of industrial arts in the smaller high school?

These and innumerable similar questions indicate a need for a study of the industrial-arts programs in the small high schools.

Purpose of the Study

The purpose of this study is: (1) to learn what is done in the industrial-arts classes in a selected group of small Oregon high schools to see if there is some similarity in the types of industrial-arts offerings; and (2) from the findings, to outline some of the areas of industrial arts that seem most common and most desirable for a limited or part-time program in a small high school.

A school with one or two industrial-arts classes per day may wish to expand its existing program to better fulfill the objectives of the school. What area or subject of industrial arts should it introduce? What are other small schools in Oregon doing in like circumstances? Where can a
teacher or administrator go for recent information concerning industrial-arts offerings in the small high schools of Oregon?

The small school, with its more limited facilities and resources, will want to study the problem of getting the most from its allowable investment in whatever expansion it makes. Several studies have been made and articles published concerning the medium-sized and larger schools in regard to complete and well-equipped areas of industrial arts. Those studies are valuable and serve a worthy purpose; but they seldom consider the needs and problems of the teacher or administrator of the small school.

The administrator of a small school giving two industrial-arts classes may desire a third class added the next year. What should he offer as a third industrial-arts subject? Can a new area be introduced? If so, what would best fulfill the desired objectives? How could the new work be instigated and coordinated with the existing facilities -- space, equipment, and resources? What is offered by other schools working under similar circumstances?

The purpose of this study is to determine, if possible, a desirable industrial-arts program for the small high school -- a school small enough that it is restricted to a part-time approach to industrial arts.
Plan of the Study

The plan of the study is to investigate the present industrial-arts offerings in various small high schools; to compare these offerings with the State Course of Study of Industrial Arts for Oregon Secondary Schools, and the Industrial Arts Handbook for Oregon's Secondary Schools; to further compare these findings with recent trends in industrial-arts education as observed and reported by leading authorities in this field; and then to develop an outline for a limited program of industrial-arts activities for a small high school with one teacher devoting less than full-time to industrial-arts classes.

What is the industrial-arts subject or experience area of work most frequently taught in the small school? When more than one subject or experience area is included, what is most often the second subject introduced? Is there some relation between the specific industrial-arts subjects taught and the number of industrial-arts classes per day? If some relation or tendency toward a normal relation does exist, the primary objective of this study is to find what that tendency is, what it seems to indicate concerning the dominant practices, and the probable pattern for adding other industrial-arts subjects as the program is enlarged.
The plan is also to include an outline of a proposed program of studies, to show the framework of subjects most desirable as an industrial-arts offering in the small high school.

Scope and Delimitation

The scope of this study is to include data from all the public high schools of Oregon with five to 11 teachers, inclusive. The principal is not counted as a teacher in this study, although it is often a common practice in the smaller schools for the principal to teach one or more classes. Actually, the number of classes taught by the principal generally increases as the number of teachers decreases.

This study does not include high schools with 12 and more teachers. It is believed that circumstances and characteristics of those schools are sufficiently different to warrant separate consideration. This may be readily understood when it is noted in the Oregon School Directory 1951-1952 that often schools with 12 to 19 teachers will have at least a full-time industrial-arts teacher, while those with 20 to 30 teachers will have two or three full-time teachers.
In this study there was no differentiation in the handling of data from the four-year high school and the six-year high school, so long as the particular school met the factor of size according to the number of teachers on the staff. This was determined by the fact that the industrial-arts program in some of the smaller high schools often includes some work with eighth-grade students, when the elementary school is near enough to accomplish such a program, even though the eighth grade may not be a part of a six-year high school organization. Thus the industrial-arts program of a four-year high school in a small community may or may not serve the eighth grade, depending on the local circumstances in that particular community and school district.

This study does not include data from vocational schools, private and independent high schools, or special schools, even though some may exist within the size limits of the schools with which this study is concerned.

In the chapter on recommendations it is not intended that all of the areas of industrial arts are to be outlined; instead, the study will cover only those areas or parts of areas which are indicated to be most desirable under the restricted conditions of the "average" small high school offering a part-time program in industrial arts.
Sources of Data

The basic data for the first phase of this study -- that of finding the existing status of industrial arts in the small high schools -- was obtained from two primary sources.

1. Information from ten percent of the selected schools was obtained through personal interview with the industrial-arts teachers.

2. The remaining schools of the selected group were contacted through the use of a questionnaire devised for the purpose.

Information for the second phase of the study -- briefly outlining a proposed group of industrial arts subjects which are most commonly used in the small high school -- was obtained through a careful study of books and magazine articles by recognized leaders in the field of industrial arts.

Additional sources of information are as follows: Industrial Arts for Oregon Secondary Schools; Industrial Arts Handbook for Oregon's Secondary Schools; published speeches by recognized leaders in industrial arts; the Oregon School Directory 1951-1952; visitations and personal
consultations with some of the teachers of industrial arts in the small high schools of Oregon.

Terminology

The names of the various types of industrial-arts shops used in this study will be consistent, wherein possible, with those used in the Industrial Arts Handbook for Oregon's Secondary Schools.

TYPES OF SHOPS

Although the appearance of industrial-arts classes is extremely varied, they may be grouped in three major classifications based on the craft areas taught:

unit shop

A shop in which one phase of a craft area is taught by one instructor at any given time. Examples are printing, auto mechanics, cabinet making.

general-area shop

A shop in which three or more phases of a craft area are taught by an instructor at any given time. Examples are bench metalwork, machine metalwork, and metal casting within the general craft area of metalworking.

general shop

A shop in which three or more craft areas are taught by an instructor at any given time. Examples are an area of metalwork, one of electrical work, and one of bench woodwork. (22, p.3)
In addition to the definitions of the various types of shops as given in the Industrial Arts Handbook for Oregon's Secondary Schools, which seems to consider the teacher as either giving one phase of a craft or at least three phases of a craft, it is necessary to consider the instances wherein a teacher has his program arranged for teaching two areas of industrial arts. In the case of two areas of a craft being taught in the shop simultaneously by one teacher, it is also considered a "general shop" for purposes of this study, as indicated by Wilber when he says, "A general shop is distinguished from a unit shop by the fact that activities in two or more industrial areas are carried on simultaneously." (32, p.108)

The term "small" when applied to a high school in this study will refer to a high school (or group of high schools in Oregon) which employs not less than five nor more than 11 teachers. When it is necessary to refer to the high schools with less than five teachers, the text will so indicate, instead of referring to such schools as "small" high schools.

For the purpose of a required degree of uniformity the various industrial-arts subject titles mentioned in the returned questionnaires were necessarily grouped into divisions according to the primary course content and emphasis as indicated on the response forms. Therefore,
for the purpose of this study, the industrial-arts subjects referred to in the following chapters will be defined, so far as concerns their major course-content emphasis, as follows:

**Beginning woodwork.** The proper use and care of hand woodworking tools, and their application to such products of the lumbering and lumber-using industries and occupations as may be appropriate. The fundamentals of reading and making working drawings to a degree that is necessary to carry forth intelligent work with the tools and materials available.

**Advanced woodwork.** In addition to carrying the learning situations of beginning woodwork on to a higher, broader, and more advanced degree, this class has for its primary emphasis that of proper use and care of the common woodworking machines. The tangible products of this type of class are in the forms of more complicated and generally larger pieces of furniture, cabinets, and similar projects.

**General drafting.** The course content of general drafting includes a well-rounded selection of the basic fundamentals of orthographic projection, thumbnail sketching of objects, cabinet and perspective drawing principles, isometric drawing, machine drawing, auxiliary views, and lettering technique. The course may also include such areas as posterwork, sign lettering with brush and poster
paints; introductory architectural drawings of plans, elevations and details; map drawing, electrical drawing, graphs, charts, and other utilitarian types of drawing.

**General shop.** Besides Wilber's definition as previously stated, Newkirk agrees that, "Shops that are planned and equipped to teach two or more distinct types of shop work at the same time under one teacher are general shops." (19, p.15) A common example, as indicated on some of the response forms, is woodwork, leathercraft, and plastics. Another is woodwork and sheetmetal.

**Advanced general woodwork.** There is of necessity a fairly close, yet flexible, line between this class and the previously described advanced woodwork class. Although the classes are closely related and the line between the two at times seems to be somewhat indefinite, as a general rule the following criteria are established for this study.

For this class, as well as for advanced woodwork, there is a prerequisite course of beginning woodwork, or a "general shop" where the student spent a part of the time in a beginning woodworking area. Thus the student has had some introduction in the beginning woodworking area; he may have had a limited introduction through a unit of woodwork in a general shop, or he may have had a longer period by taking a year in a beginning woodwork class. In either event, the student, in coming to "advanced general woodwork," is to do
woodworking at an advanced level -- with the instruction and use of the common woodworking machines. Also the advanced general woodwork class will include two or more of these woodworking areas: cabinet making, carpentry, patternmaking, boat building, advanced machine or bench woodworking, and additional phases of crafts that are primarily woodwork, as archery, wood-carving, and others.

Limitations

The results of this study are necessarily limited in accuracy by a number of factors as follows:

1. Possibility of incorrect information returned by misinterpretation of some part of the questionnaire. Although the questionnaire was sent to several industrial-arts teachers on a trial basis, and the final questionnaire form was modified in view of suggestions received from the "trial run," it is difficult to avoid all misunderstandings in the response to printed forms.

2. The fact that industrial-arts classes may be taught in some small schools by persons whose primary interests are not in industrial arts, and who in some cases may not be conversant with all the terms commonly used, may have led to further misunderstanding or have prevented the giving of complete information.
3. There were eight schools from which no reply to the questionnaire was received.
CHAPTER II

BACKGROUND FOR THE STUDY

The industrial-arts program in the public schools of today is the result of a long and gradual but great change in the methods of teaching manipulative handwork, and a struggle to have such work incorporated in the public high school curriculum. In tracing the background of organized handwork instruction in the United States, it will be seen that handwork training, both vocational and general, has gradually changed from a function and responsibility of the parent to an obligation of the schools.

Apprenticeship Training

The apprenticeship system of vocational education came to the United States with the colonists. (5, p.35) The principles of apprenticeship are as old as production in the family home, where the younger generation worked along with the older generation until, through experience and training over a long period of time, the younger men became journeymen, and finally took over the enterprise of the family trade when the older men became unable to continue their work and responsibilities.

The local township officials had the concern of governing the apprenticeship-training programs in the
United States. In England the guilds controlled the apprenticeship-training activities, and probably had some indirect influence on the laws and administration of the programs in the United States through individuals who had come from the guild-controlled systems of England and other parts of Europe.

At first there were only a few general regulations to govern the instruction of apprentices. Later the regulations became so highly formalized they were difficult to follow, and the laws varied greatly from one locality to another. In the colony of New Plymouth the general court passed an act that required the children from poor families be placed with other families where they would receive apprenticeship training. (1, p.268) In 1671 this same colony passed an ordinance that all parents and masters give not only the training for a trade, but would be responsible for the training of the apprentice so he would "at least be able to read the Scriptures, and other profitable Books printed in the English Tongue. . ." (1, p.268) The ordinance also called for the apprentice to have a knowledge of the capital laws, and placed a fine of ten shillings against any parent or master found negligent in obeying the act. (1, pp.268-269)

The apprenticeship system was the primary method of organized trade training until it failed to meet the needs
of the trainee, and did not keep up with the changing times. Several weaknesses developed in the apprenticeship training method. The period of training was long -- seven years for some crafts (5, p.34), occasionally longer. The apprentices often became discontented and lost interest in their work during this long period. The father-and-son relationship dwindled as new horizons in trade and industry opened. No longer did the son invariably follow in his father's footsteps. Many entered new and different fields of endeavor.

Labor-saving devices in mechanized factories and new methods of production were other steps that contributed to the disintegration of the apprenticeship system. With new machinery and methods of manufacturing, the apprentices in the factories often became specialists in only one small phase of a trade. (1, p.270) Thus the apprentices received very little trade training. They learned primarily how to start, stop, and tend a specific machine -- although their ultimate goals were broader and the instruction intended to lead to positions of master mechanics, foremen, or superintendents. When the apprenticeship system failed to fulfill the needs of the normal industrial-training program of that time, some other form of training arose to fill those needs.
Vocational Training in Early Schools

One of the earliest attempts to provide vocational training of applied-arts subjects within a school curriculum was that of the Franciscan schools in 1630, located in what is now New Mexico. (1, pp. 73-75) The children below nine years of age were taught reading, writing, catechism, and music. Above nine years of age, the pupils' work was of an industrial type. Instruction was in tailoring, shoe-making, carpentry, blacksmithing, and similar vocations necessary in a self-sustaining pioneer situation.

Apparently the schools which developed with the colonies on the eastern seaboard were not governed by the same aims and objectives as the Franciscan schools of the Southwest. The Latin-grammar schools made no provision for, nor even acknowledged the need for, vocational instruction. The purpose of the Latin-grammar school was limited to pre-college preparation of ministers, teachers, lawyers and public officials. Its curriculum consisted of Latin, Greek, and religion. (34, p. 111) In the latter part of the eighteenth century there was a gradual recession of the Latin-grammar-school type of instruction as its limited curriculum with exclusively college-preparatory objectives failed to meet the needs of the youth of this country. (5, p. 245) Thus a new educational institution arose to meet the educative needs in a developing American way of life.
The founding of the Philadelphia Academy in 1749, by Benjamin Franklin (33, p.13), was one of the first attempts to establish a secondary school in the United States to help meet the demands of a society which was becoming more and more industrialized. The curriculum of the academies during this early period included English, modern foreign languages, sciences, mathematics, navigation, map-making, surveying, bookkeeping, and applied arts. (33, pp.13-14)

The academy was not particularly a vocational school as we think of it today, but it fitted many of the vocational needs of its day. The academy was a definite step in the direction of organized semi-vocational training as compared with the Latin-grammar-school program. The academy functioned well for some time, but gradually began to cater more exclusively to the people of social standing and influence. The academy's program became too formal and failed to meet the needs of the people for whom it was originally designed. Finally, it catered only to the more select groups possessing money, influence, and social standing. Seemingly then, failure to adhere to its reasons for establishment caused the academy's downfall -- it failed to provide adequate vocational training opportunities for the needs of the common person.
Industrial School Training

The failure of the apprenticeship system, the Latin-grammar schools and the academies to provide trades and industry with skilled workers, resulted in the establishment of special schools by industry itself. In New York City, the Mechanics Institute was set up in 1820 by the General Society of Mechanics and Tradesmen of the City of New York. (1, pp.317-325) Just four years later, Franklin Institute was established in Philadelphia. These institutes provided technical and vocational training for the immediate needs of the working classes and for the specific industries involved.

Land-grant College Vocational Training

Vocational training at the college level was established with the passage of the Morrill Act of 1862. This act was originally proposed in 1859, but vetoed by President Buchanan. It was proposed again in 1862; passed by the Congress and signed by President Lincoln (5, pp.279-280)

The main provision of the Morrill Act was to set aside in each state a grant of 30,000 acres of land for each federal senator and representative, to provide colleges of agriculture and mechanical arts in each state.
The primary purposes:

shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life. (1, p.279)

This was supplemented by the second Morrill Act of 1890. It provided more land and other federal aid for specific technical and vocational training at the college level. But still there was no provision in the public education program at elementary, secondary, or college levels, for a period in which the student had an opportunity to sample a variety of areas in terms of his interests and aptitudes in industry and the industrial occupations of that day. There appeared the need for a period of exploration with an opportunity for some training in each of several trades or industries, as a general back panel and to develop interests, rather than training for a job in one trade prior to the time of a wise and abiding choice of an occupation. This exploratory period was finally to be accomplished in a new type of high school where handwork under the name of "manual training" was at first reluctantly admitted to the public school curriculum as a desirable "partner" with the other subjects of general education.
Modern High School

This new type of school was called the "modern" high school and was established about 1821. (34, p.108) Ultimately there were more and more demands that the high schools should provide training in pre-vocational subjects for those students who did not go on to college. As a result, the segregated high schools began to include departments for the commercial subjects, manual training, and other technical or polytechnical subjects.

One advantage in the segregated high school was the combining of specialized facilities from different schools in the large cities. Instead of establishing commercial, manual arts, and science departments in each high school, special schools were planned for each of these major areas -- schools referred to as "commerce" high, "manual-training" high school, and so on. A manual-training high school would retain its normal curriculum features, plus more fully developed facilities for a large variety of shop work. One of the first schools of this type was the Manual-Training High School of Washington University, St. Louis, Missouri, established in 1879. (2, p.347) The first manual-training high school supported by public expense was opened on March 3, 1884, in the city of Baltimore, Maryland. (2, p.374)
Before manual training was accepted in the public high school curriculum on a general education basis, it had weathered many years of debate and criticism — especially at the National Education Association conventions. One of the paramount expressions of opposition to manual training in public education was the report of the committee on pedagogics presented at the National Education Association convention of 1889. Although the committee's report was almost in complete opposition to manual training in the public schools, its effect seemed directly opposite to its intent.

Selections from the report:

... Your committee understand that any amount of manual training conducted in a school is no equivalent for the school education in letters and science, and ought not be substituted for it. They hold the opinion, moreover, that neither apprenticeship nor the industrial school should be allowed to take possession of the youth until the completion of his twelfth year at least; the fifteenth year is still better. ...

... The work of blacksmithing, for instance, would unfit one for engraving; the work of planing and sawing would diminish the skill of the woodcarver. Work in trades that deal with wood and metal. ... would be disadvantageous to the delicate touch required by the laborer on textile manufactures; ... (17, pp.417-423)

The reception accorded this report is indicated by the program of the National Education Association
convention the very next year when Professor C. M. Woodward opened his address thus:

It seems fitting to say at the outset, that we have reached a stage in history and development of manual training when its general educational values may safely be assumed. . .

(18, p.762)

When the printed proceedings and addresses came off the press, the section for the former "Industrial Department" carried this heading: "Proceedings and Addresses of the Department of Industrial Education and Manual Training."

(18, p.757)

Industrial Arts

The terms "manual training" and "manual arts" have fairly well given way to "industrial arts" for that phase of industrial education now accepted as a part of education in the public high schools. Professor Richards, in an editorial in the "Manual Training Magazine," 1904, presented the case for a change in name from "manual training" to "industrial arts."

We are rapidly leaving behind the purely disciplinary thought of manual training. . . Now we are beginning to see that the scope of this work is nothing short of the elements of the industries fundamental to modern civilization. (2, p.453)
It is recognized that formal education in handwork has been presented in many forms; it has passed through numerous stages of development; and it has been known by various names in coming to its present place in the high school curriculum. The process of change and growth has been slow. By no means should we think of its present stage as its zenith or final form. Industrial-arts education in the public schools today, like all social institutions, is constantly in a state of gradual change which results from the sum of the small changes in all its various parts. To determine changes and directions of travel in any movement, it is necessary to establish check points designed to determine the "status quo" at various times. With this in mind, this present study is an attempt to find the present "status quo" of a segment of industrial arts in the smaller high schools of Oregon.
CHAPTER III

THE STUDY

For the purposes of this study, the high schools in Oregon, 223 in total number (23, p.21), are divided into four groups according to the number of teachers on the faculties. Group 1 consists of 56 schools with less than five teachers each; group 2 is comprised of 78 schools with five to 11 teachers, inclusive; group 3 consists of 43 schools having 12 to 20 teachers; group 4 is made up of the 46 schools with over 20 teachers.

These groupings seemed logical for this study since very few schools with less than five teachers offer industrial arts, and high schools with over 11 teachers are more often in a position wherein they are able to offer an industrial-arts program in which there is at least one full-time teacher. The schools concerned in this study are those of the second group -- the Oregon high schools with not less than five nor more than 11 teachers. As indicated by graph 1, page 28, the number of schools in group 2 is somewhat larger than any of the other groups, and seems a large enough segment of the Oregon high schools to furnish the basis for a valid study of this type. High schools with less than five teachers comprise 25 percent of the standard high schools of Oregon. The 78
schools with five to 11 teachers make up 35 percent of the high schools in Oregon. Schools with 12 to 20 teachers, group 3, constitute 20 percent and the remainder, those with over 20 teachers, accounts for approximately 20 percent of Oregon high schools. Graph 2, page 29, shows the relative size of these four divisions of Oregon high schools on a percentile basis.

In developing this study, the 35 percent segment of Oregon's standard high schools -- those 78 high schools with five to 11 teachers -- is treated as a whole when figuring percentages using the acquired data. Data were gathered from the selected schools by a questionnaire mailed to some schools and the questionnaire form used in a personal interview with the industrial-arts teachers of other schools. The response to the questionnaire was 90 percent, including the cases contacted for personal interview.

Tabulation of the returns shows 50 of the 78 schools offer at least one industrial-arts class. The Oregon School Directory 1951-1952 indicates three additional schools (of the eight not responding) also teach some industrial arts. Thus 53 of the 78 small high schools offer some industrial-arts work. The number of small high schools including industrial-arts subjects in their programs, therefore, constitutes 69 percent of the total
Graph 1

High schools of Oregon as divided into four groups, according to number of teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>56</td>
</tr>
<tr>
<td>2</td>
<td>78</td>
</tr>
<tr>
<td>3</td>
<td>43</td>
</tr>
<tr>
<td>4</td>
<td>46</td>
</tr>
</tbody>
</table>

Group 1. Number of schools with less than five teachers.
Group 2. Number of schools with five to 11 teachers.
Group 3. Number of schools with 12 to 20 teachers.
Group 4. Number of schools with over 20 teachers.
Graph 2

Percent of Oregon high schools in each group, according to number of teachers

- **20%**
  - Group 4: over 20 teachers

- **25%**
  - Group 1: 1 to 4 teachers

- **35%**
  - Group 2: 5 to 11 teachers

- **20%**
  - Group 3: 12 to 20 teachers
number of small schools covered by this study. This includes the three additional schools not responding to the questionnaire, but reported by the Oregon School Directory 1951-1952 as "offering" industrial arts in some form. Graph 3, page 31, includes these three schools, but they are not included in any of the other tabulations. Direct responses were received from 70 schools, 50 of which offered industrial arts. Information was compiled from these 50 schools from which it was determined that: the "average" number of industrial-arts classes per day is three. Nine schools have one class per day; eight schools offer two classes per day; 15 schools have three classes per day; ten schools list four classes; six schools offer five classes; and two schools conduct industrial-arts classes seven periods each day. Graph 4, page 32, presents in chart form the number of schools reporting one-through-seven industrial-arts classes per day. Three classes per day is notably the largest uniformity.

The data was further analyzed to learn what industrial-arts subjects are most frequently offered in these small high schools. Graph 5, page 33, lists the individual subjects offered by the 50 schools reporting data concerning their industrial-arts programs. A total of 154 classes were reported by these 50 schools. The subject listed most frequently was "beginning woodwork," which
Graph 3

Percentage of group 2 schools giving industrial-arts classes

31% give no industrial-arts classes

69% give one or more industrial-arts class

Seventy-eight schools in group 2
Graph 4

Schools grouped indicating number of industrial-arts classes per day

Concerning the number of industrial-arts classes per day, the graph reads:

Nine schools have one class.
Eight schools have two classes.
Fifteen schools have three classes.
Ten schools have four classes.
Six schools have five classes.
No schools have six classes.
Two schools have seven classes.
Graph 5

Compilation of the 154 industrial-arts classes given by the 50 high schools reported in this study

<table>
<thead>
<tr>
<th>Name of industrial-arts class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>beginning woodwork</td>
<td></td>
</tr>
<tr>
<td>advanced woodwork</td>
<td></td>
</tr>
<tr>
<td>general shop</td>
<td></td>
</tr>
<tr>
<td>general drafting</td>
<td></td>
</tr>
<tr>
<td>adv. gen. woodwork</td>
<td></td>
</tr>
<tr>
<td>crafts</td>
<td></td>
</tr>
<tr>
<td>girls home mechanics</td>
<td></td>
</tr>
<tr>
<td>auto mechanics</td>
<td></td>
</tr>
<tr>
<td>driver education</td>
<td></td>
</tr>
<tr>
<td>production shop</td>
<td></td>
</tr>
<tr>
<td>general mechanics</td>
<td></td>
</tr>
<tr>
<td>carpentry</td>
<td></td>
</tr>
</tbody>
</table>
appeared 48 times in 154 listings; this accounted for 31 percent of the industrial-arts subjects offered by the 50 schools. The second most frequent subject was "advanced woodwork," which accounted for 35 of the 154 classes, or 23 percent of the total. The third subject in frequency was the "general shop." This "subject" listing, which in reality is a group of subject areas in one shop class, accounted for 28 of the subjects for a total of 18 percent of the 154 classes. To be tabulated in the "general shop" category of this study, a subject or class group must have been indicated by that title (general shop) or the respondent must have indicated a general shop type of activity as part of the course content in that portion of the questionnaire labeled "Main I. A. areas in class." "General drafting" was offered in 15 of the 154 classes, comprising ten percent of the total for the next most commonly offered industrial-arts subject. As indicated by graph 5, these subjects rank in the following order to complete the rest of the industrial-arts offerings: advanced general woodwork, 11 classes (seven percent); crafts, six classes (four percent); girls home mechanics, three classes (two percent); auto mechanics, three classes, (two percent); driver education, two classes (one percent); production shop, one class (0.5 percent); general mechanics, one class (0.5 percent); carpentry, one class (0.5 percent).
In glancing over graph 5 as a whole, it is noted that woodworking classes, general shop, and drafting occupy the top five places. This perhaps indicates those subjects are predominant in the industrial-arts programs of the small high schools. Possibly this is a normal situation expected when one is familiar with the average course contents of the subjects listed in the lower portion of the graph, considering the facilities required and the specific course objectives desired, as compared with the woodworking, general-shop and drafting subjects in the upper portion of the graph. Also it should be kept in mind that these data come from the smaller high schools of America's greatest lumber-producing state and whose second largest means of livelihood is the lumbering and related industries. Agriculture is claimed as the basic industry of Oregon according to the Oregon Blue Book 1951-1952. (20, p.194)

From graph 5, we find the order in which certain industrial-arts subjects are given most often for the schools of this study as a whole, but does this necessarily signify that a school which can offer only one industrial-arts class per day should give "beginning woodwork" as that one subject? Does the current "most frequent" offering indicate the optimum contribution? By the same token does it mean the second industrial-arts subject added to a high
school curriculum needs be advanced woodwork? The third subject added should be the "general shop," and the fourth, general drafting? To learn more concerning these particular questions and to study the problem further, the data is re-examined.

The following graphs (6 through 11) show the industrial-arts subjects given by the schools concerned, grouped according to the number of industrial-arts classes offered each day. In graph 6, the nine schools which each offer one industrial-arts class per day indicate three of the nine classes are beginning woodwork, and three are general shop. One class each of advanced general woodwork, drafting, and girls home mechanics completes the nine classes. For a school which offers only one industrial-arts class, the "advanced" general woodwork listing may seem a little confusing unless it is understood that often, in the smaller schools, it is necessary to alternate subject areas from year to year. The enrollment is not large enough to support the repetition of each subject every year. This arrangement gives an opportunity for the students in such schools to continue industrial arts for more than one year, although only one class is given each year -- "beginning" work in "odd" years, "advanced" in "even" years.
Graph 6

Nine schools listing one industrial-arts class per day

<table>
<thead>
<tr>
<th>Name of class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>beginning woodwork</td>
<td>2</td>
</tr>
<tr>
<td>adv. gen. woodwork</td>
<td>2</td>
</tr>
<tr>
<td>general shop</td>
<td>4</td>
</tr>
<tr>
<td>drafting</td>
<td>2</td>
</tr>
<tr>
<td>girls home mechanics</td>
<td>2</td>
</tr>
</tbody>
</table>
Graph 7 presents information from the eight schools each of which offer two industrial-arts classes each day. Beginning woodwork is the subject in six of the 16 industrial-arts classes at these eight high schools. Advanced woodwork constitutes five of the 16 classes, general shop accounts for three classes, and drafting is given for the remaining two.

In graph 8, data are shown from the 15 schools in which each gives three classes of industrial arts per day. Beginning woodwork is the subject in 14 of the 45 classes. Advanced woodwork is second with 11 classes; general shop is given in eight classes; drafting in four classes; and advanced general woodwork shows five classes. It should be remembered here that although "advanced woodwork" and "advanced general woodwork" are similar in name and somewhat related in content, the advanced general woodwork subject carries a broader course content in that two or more phases of the general woodworking areas are presented and the primary work of the group is carried at an advanced level. The remaining classes from these 15 schools, as indicated by the lower portion of graph 8, are one class each in crafts, girls home mechanics, and general mechanics.

Graph 9 lists the industrial-arts subjects of the ten schools each of which offer four classes of industrial-arts
Graph 7

Eight schools listing two industrial-arts classes per day

<table>
<thead>
<tr>
<th>Name of class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>beginning woodwork</td>
<td></td>
</tr>
<tr>
<td>advanced woodwork</td>
<td>4</td>
</tr>
<tr>
<td>general shop</td>
<td>6</td>
</tr>
<tr>
<td>drafting</td>
<td></td>
</tr>
</tbody>
</table>
Graph 8

Fifteen schools listing three industrial-arts classes per day

<table>
<thead>
<tr>
<th>Name of class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>beginning woodwork</td>
<td>14</td>
</tr>
<tr>
<td>advanced woodwork</td>
<td>12</td>
</tr>
<tr>
<td>general shop</td>
<td>10</td>
</tr>
<tr>
<td>drafting</td>
<td>8</td>
</tr>
<tr>
<td>adv. gen. woodwork</td>
<td>6</td>
</tr>
<tr>
<td>crafts</td>
<td>4</td>
</tr>
<tr>
<td>girls home mechanics</td>
<td>2</td>
</tr>
<tr>
<td>general mechanics</td>
<td>2</td>
</tr>
</tbody>
</table>
Graph 9

Ten schools listing four industrial-arts classes per day

<table>
<thead>
<tr>
<th>Name of class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>beginning woodwork</td>
<td></td>
</tr>
<tr>
<td>advanced woodwork</td>
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<tr>
<td>general shop</td>
<td></td>
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<tr>
<td>drafting</td>
<td></td>
</tr>
<tr>
<td>adv. gen. woodwork</td>
<td></td>
</tr>
<tr>
<td>crafts</td>
<td></td>
</tr>
<tr>
<td>driver education</td>
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</tbody>
</table>


work per day. Beginning woodwork accounts for ten of the 40 classes; advanced woodwork is given in 11 classes; general shop constitutes seven of the classes; and drafting is offered in five classes to complete the four most commonly offered subjects in this group. The remaining seven of the 40 classes are divided among three subjects: three classes of advanced general woodwork; three classes of crafts; and one class in driver education.

Graph 10 indicates the same trend is continuing for the group of six schools which offer five classes each in their industrial-arts program each day. Beginning woodwork leads with 12 of the 30 classes. Advanced woodwork is next with eight classes; general shop and drafting are even with three classes each. There is one class each of the following: advanced general woodwork, crafts, auto mechanics, and carpentry.

Graph 11 shows the two schools offering seven industrial-arts classes each day. Beginning woodwork constitutes three of the 14 classes; general shop is given in four classes; auto mechanics is offered in two classes and there is one class in each of the following: advanced general woodwork, crafts, girls home mechanics, driver education, and production shop.

Looking back over graphs 6 through 11, the order is noted in which the industrial-arts subjects are most
Graph 10

Six schools listing five industrial-arts classes per day

<table>
<thead>
<tr>
<th>Name of class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>beginning woodwork</td>
<td></td>
</tr>
<tr>
<td>advanced woodwork</td>
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<tr>
<td>general shop</td>
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<tr>
<td>drafting</td>
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<tr>
<td>adv. gen. woodwork</td>
<td></td>
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<tr>
<td>crafts</td>
<td></td>
</tr>
<tr>
<td>auto mechanics</td>
<td></td>
</tr>
<tr>
<td>carpentry</td>
<td></td>
</tr>
</tbody>
</table>
Graph 11

Two schools listing seven industrial-arts classes per day

<table>
<thead>
<tr>
<th>Name of class</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>beginning woodwork</td>
<td>2</td>
</tr>
<tr>
<td>general shop</td>
<td>4</td>
</tr>
<tr>
<td>adv. gen. woodwork</td>
<td></td>
</tr>
<tr>
<td>crafts</td>
<td></td>
</tr>
<tr>
<td>girls home mechanics</td>
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<tr>
<td>auto mechanics</td>
<td></td>
</tr>
<tr>
<td>driver education</td>
<td></td>
</tr>
<tr>
<td>production shop</td>
<td></td>
</tr>
</tbody>
</table>
frequently offered; and this relation remains fairly consistent through all the graphs. The consistency shows the subjects to be in the following order: first, beginning woodwork; second, advanced woodwork; third, general shop; fourth, general drafting; and fifth, advanced general woodwork. This order or rank is also indicated by the top five classes on graph 5, page 33.

Another item of interest which appears in the data from the 50 schools of this study concerns the number of part-time industrial-arts teachers as compared with the number of full-time industrial-arts teachers in the small high schools of Oregon. Of the ten schools contacted by personal interview (with the industrial-arts teachers), all but one were operating on a six-period school day. With six periods per day considered a full-time program in a particular subject, it is found that only two of the 50 schools offer industrial arts six or more periods per day. If five classes of industrial arts per day are considered a full-time program, since industrial-arts teachers should have one of the six periods for maintenance of tools and equipment and for the development of the shop facilities, or possibly be assigned to supervise a study hall as noted in some of the interview cases -- the data indicate only eight of the 50 schools support full-time industrial-arts programs. This leaves 42, or 84 percent, of the 50 schools
offering four and fewer classes of industrial arts per day which indicates a significant proportion of the schools of group 2 offer industrial arts on a part-time basis. 
(graph 12, page 47)

Summary

In summarizing the data presented in this chapter it is reiterated that:

1. Seventy-eight, or 35 percent, of the public high schools in Oregon have from five to 11 teachers, inclusive.

2. Industrial arts is offered in 53 of these 78 high schools (69 percent).

3. Of the number and types of industrial-arts subjects given, these five subjects constitute 89 percent of the total industrial-arts classes in the small high schools of Oregon:

   - beginning woodwork (31 percent)
   - advanced woodwork (23 percent)
   - general shop (18 percent)
   - general drafting (ten percent)
   - advanced general woodwork (seven percent)

4. Industrial arts is offered on less than a full-time basis in 42 of the 50 schools which contributed information to this study.
Graph 12

Percentage of fifty schools maintaining part-time industrial-arts programs

84%

Schools with less than five industrial-arts classes per day

16%

*Schools with five or more industrial-arts classes per day
CHAPTER IV

RECOMMENDATIONS

In the first part, the purpose of this study is to collect, assemble, and analyze data concerning industrial-arts offerings in the small high schools of Oregon and to present the results in a useful form. In the second part, the purpose of this study is to compare these findings with recent trends in industrial-arts education as observed and reported by various leading authorities from the industrial-arts field; and then to recommend in brief outline form certain areas which seem desirable as a part-time industrial-arts program for a small high school.

From the study it is evident the majority of small schools contacted conduct industrial-arts classes in a "unit" type shop, equipped primarily for bench-woodworking; yet from the Biennial Survey of Education in the United States-1948-50, we find at the national level the "general-shop" type of organization has become the most prominent industrial-arts subject area, with the largest attendance.

Nonvocational industrial arts enrolls 25 percent of all pupils in all types of schools. . .

Among the industrial arts subjects the largest enrollments are found in general shop, woodworking, and mechanical drawing, in that order. The three subjects accounted for three-fourths of the enrollment in the industrial arts field. Next in order of frequency of
mention is metal work, which enrolls 2.8 percent of all pupils, and printing, which enrolls 1.2 percent. All other subjects listed report an enrollment of less than 1 percent of the total secondary school enrollment. (30, p.18)

It is desirable at this point to refer to several authorities and policy sources in the field of industrial arts to help point the way for the recommendation of a general-shop type of program which follows.

As early as 1937 the trend toward a general shop for the small high school was recognized and encouraged by the committee which prepared the state course of study in *Industrial Arts for the Secondary Schools of Oregon*, which states:

The Multiple-unit or "General" Shop

While a group of single-unit shops is ideally suited to the industrial arts program of a large junior or senior high school, the smaller schools usually have neither the enrollment nor the funds to support more than one shop. The objectives of industrial arts are just as valid for the small school as for the large. There is as much reason for exploration in industrial activities, as a background for guidance, in the one case as is the other.

This being the case, the small school cannot reach the diversified objectives of industrial arts with a single-unit shop of specialized nature. Instead, the smaller schools have turned to the "multiple-unit" shop, now commonly known as the "general" shop. A
general shop is one in which the equipment is planned to afford opportunity for diversified instruction in several selected industrial activities. A general shop in a small high school might include equipment for drawing, woodworking, general metal work, and elementary electrical work, each organized as a separate "unit" in a single shop, under the instruction of a single teacher. (21, p.11)

In 1940, Proffitt reported the trend toward a rapid growth of the general-shop type of organization for teaching industrial arts, as follows:

3. A Trend Toward a General Shop Form of Organization.

If a single outstanding trend of the present were to be used to predict the future of industrial arts work, it would most certainly be the trend toward the organization of pupil experiences for instructional purposes around the central idea of the general shop. Probably nothing in industrial arts work has shown the growth on a country-wide basis as has the general shop -- especially for the junior high school level. That this will continue seems to be beyond the shadow of a doubt. The reasons for this are obvious. The general shop form of organization: (a) Provides for a variety of media and, consequently, of activities for pupil experiences in manipulative work for self-expression and exploratory values; (b) provides an excellent opportunity for acquiring, in a realistic way, information about industry and our industrial society; (c) offers a large variety of activities that make it more nearly possible to provide pupils with experiences in accordance with their interest and developmental levels than does the unit shop; (d) accords well with the educational objectives and principles underlying the
organization of the junior high school, in which industrial arts work is now generally required in the first two years; and (e) makes it administratively possible -- due to the form or organization and the content of instruction that characterizes the general shop -- to offer industrial arts in a larger number of communities than would otherwise be possible. (24, p.12)

In 1948 Wilber contributed to the field of those encouraging the use of the general shop and helped define its characteristics when he said:

A general shop is distinguished from a unit shop by the fact that activities in two or more industrial areas are carried on simultaneously. Many variations occur within this general pattern. . . The number and variety of activities may range all the way from a traditional wood shop, which offers a little drawing, to an organization which includes experiences in six or eight entirely distinct areas. Similar wide variation may be noted in the fields of organization and method. There are certain characteristics, however, which seem to be common to most true general shops. These include:

1. Activities in two or more industrial areas are evident.
2. A large number of industrial materials are used.
3. The teacher is versatile in many areas.
4. Equipment is diversified, rather than specialized.
5. Breadth of experiences is considered more important than depth in any particular field. (32, p.108)

In 1951 a state-wide committee responsible for a revision of the state course of study, Industrial Arts for
Oregon Secondary Schools, offered further support for the general shop in the small high school as follows:

CHARACTERISTICS OF INDUSTRIAL ARTS IN DIFFERENT SCHOOLS

small high school

A general shop program is recommended in the small high school common in rural and suburban communities. Usually the students come from eight-year elementary schools and have had little training in industrial arts. The general shop offers the best opportunity to secure a broad understanding and acquaintance with the subject. Advanced students may be permitted to specialize in areas of their preferences. (22, p.3)

The principles of a general-shop organization afford a means for the smaller high school to offer a more adequate and vital industrial-arts program at a minimum cost. It is not feasible in a small school to provide 20 individual work stations in metalwork; 20 other working places for woodwork; and still an additional 20 stations for some other areas as crafts, electricity, and so on. Rather, it is a definite advantage in over-all cost and space requirements if multi-purpose work stations are provided.

Still further consolidation of working facilities may be accomplished through the general-shop procedure in which students work in two or more areas of industrial arts within each class period. For example, in one class period one-third of the pupils engage in woodworking,
one-third in drafting, and the remaining one-third work in crafts -- or whatever area is offered. Tools and equipment required in any one area are reduced to approximately that which is necessary for only one-third of the group. Thus it may be possible for a small school to present more adequate and extensive industrial-arts opportunities at a minimum cost of equipment, tools and certain other facilities. Possibly the cost may be even less than extensively equipping a shop which would be suitable in only one area of industrial arts.

It is with this object in mind -- the widest experience presentation for the minimum cost -- that the writer has undertaken to recommend a general-shop type of program for a small high school. The general shop is a shop which is planned and equipped for the teaching of two or more distinct types of shopwork at the same time.

The program outlined herein is suggested with the knowledge that it should be tried, modified, used in part, or expanded as the limitations, needs and other factors so direct for each particular local situation and teacher. It is not expected that all the items listed should be taught in detail, but from the outline as a guide the teacher may select the units or parts of units -- or add other units if that seems desirable under the existing conditions.
General Woodwork Areas

In general woodwork several areas of the broad woodworking classification should be represented in some manner. This may be accomplished in several ways. If work is not actually performed in all of the areas, shop demonstrations and information units will give the pupils a contact and some experience in otherwise dormant portions of the area, even though somewhat limited.

Following are the major areas in general woodworking:
hand (bench) woodwork, machine woodwork, cabinet-making, carpentry and general construction.

Operation units for hand woodwork.

Planning and executing the layout:
  pencil or bench knife, try-square,
  framing square, dividers, compass,
  rule, marking gage, T-bevel.

Selecting and using hand saws:
  crosscut, rip, coping, compass,
  turning saw.

Sharpening keen edge tools:
  plane bit, knife, chisel, axe,
  gouge, woodturning tools.

Proper use of planes:
  jack, block, jointer, rabbet,
  router.
Choosing clamps and hand-screws:
  bar clamps, C-clamps, hand-screws, vises.
Trim or pare with a chisel.
Proper use of the draw knife and spoke shave.
Use and maintenance of boring tools:
  brace and bits, expansive bit, hand drill, countersink in wood for screws, wood drills.
Driving, drawing, and setting nails.
Applying fastening devices:
  screws, bolts, corrugated fasteners, pinch dogs, table top fasteners, cabinet hardware.
Sandpapering wood surfaces:
  flat surfaces, edges, end grain, curved surfaces.
Applying common finishes:
  stains, fillers, shellac, varnish, lacquer, paint, wax.
Removing old finishes.

Information units for hand woodwork.

Working procedure for a project:
  working drawing, board measure, bill of material.
Common wood joints:
  butt joint, rabbet, dowel joint,
  miter, cross lap, mortise and tenon,
  dove-tail, dado, groove.
Safety:
  in the shop, in the home.
Wood glues:
  animal, fish, vegetable, casein,
  synthetic resins.
Common types of lumber -- where grown, some major uses:
  pine, fir, spruce, oak, alder, birch,
  walnut, mahogany, cedar.
Seasoning of lumber:
  kiln drying, air drying.
Conservation of forests.
Methods of cutting and milling lumber.
Standard dimensions of finished lumber.
Kinds and sizes of nails:
  common, box, finish, brads, specials.
Kinds and sizes of wood-screws:
  flat head, round head, slotted head,
  phillips head, oval head.
Kinds and grades of "sand" paper.
Kinds of finishes -- manufacturing methods and raw materials from which they are made: stain, varnish, lacquer, shellac, filler, paint.

Characteristics of good furniture.

Occupational opportunities in the broad woodworking area.

**Woodworking machines.** Instructions in various operations of power machines are given when students show a readiness. There should be a progressive order in which students are introduced to machines, depending upon the individual's learning readiness, purpose for which a particular machine is used, the learning operations involved, and the general safety factors involved.

The wood lathe, jig saw, band saw, and certain operations on the drill press are preferred for introducing students to power machines. The difficulty of the work on these machines may be progressive in order to determine the student's skill and capabilities before advancing him to other more dangerous machines such as the table saw, jointer, or shaper. Close supervision of the student is essential with any machine in which the likelihood of personal injury is considerable. It is appropriate that each student be referred to definite study material and required to pass a test (primarily on safety) concerning a machine for which he is approaching readiness.
Instruction, demonstration, and operation of machines.

Jig saw:
safety, piercing, outline sawing on thin stock.

Band saw:
safety, straight sawing, curves, re-sawing, special jigs.

Drill press:
safety, drilling holes, attachments and jigs for sanding, shaping, routing, and mortising.

Wood lathe:
safety, centering and mounting stock, using "cutting" tools, using "scraping" tools, using measuring and checking tools, sanding in the lathe, finishing in the lathe, special operations performed on the lathe.

Jointer:
safety, surfacing an edge, surfacing flat side, rabbetting, chamfering, special cuts, removing warp, wind, and bow.
Table saw:
safety, ripping, cross cutting,
grooving, cutting dado, cutting
rabbet, making special set-ups.

Cabinetmaking.

Cabinet frame construction:
  joints, stiles, rails, panels, muntins,
drawer slides and guides, glue blocks,
gluing methods.
Door construction:
  stiles, rails, muntins, panels, joints,
hardware mounting.
Drawer construction:
  joints, sides, back, front, bottom,
tails, stops.

Carpentry.

Planning, layout, foundations, platform,
framing, interior walls, exterior covering,
siding, roofing, windows, doors, trim.

Crafts

The crafts program recommended for a small high
school consists of activities in the areas of plastics,
leather, wood-carving, and metalcraft. These areas were
chosen in light of their importance in everyday life, and also because they may be incorporated into an existing industrial-arts program with relatively little additional facilities and expense. Limiting the craft recommenda-
tions to these four areas in this particular study is not to imply that other craft areas and materials should not also be considered.

The plastics area. In terms of modern living, plastics are probably the most significant of the newer industrial materials used by man. Already plastics are used in the manufacturing of a great many articles in daily use, such as combs, dishes, radio cabinets, upholstery materials, telephones, and house construction materials -- to name only a few. There are many indications these synthetic materials are only in their infancy and that "big things" are yet to come in the field of plastics.

Fundamental operations:

- how to design plastic construction,
- how to cut and "work" plastic materials,
- how to drill and countersink holes,
- how to do inlaying and overlaying,
- how to bend plastics,
- how to finish plastics,
- how to cement plastics,
how to color plastics,
how to attach fittings.

Related information:
what are plastics, how are plastics made,
characteristics of plastics, cost of plastics,
various uses of plastics,
types of tools used in plastic work,
coloring and finishing plastics,
opportunities in the plastics industries.

Suggested projects for plastics:
letter opener, napkin clip, tie clip, shade pulls, key-chain fob, salt and pepper shakers.

Wood-carving area. Although wood-carving is listed with the crafts division in this study, it also is sometimes considered and properly used with the woodworking area.

Fundamental operations:
selection and transfer of designs,
outline carving,
carving in low relief,
carving in high relief,
chip carving, whittling,
maintenance of carving tools.

The leatherworking area. Plastics materials are rapidly replacing leather as an industrial material, but
in everyday life we still come in contact with leather goods in many ways. Most of the shoes we wear are made of leather; so are some of the belts, gloves, purses, and pieces of luggage, to mention just a few articles.

Fundamental operations:

how to transfer designs on to leather,
how to cut leather,
how to do outline tooling,
how to do flat modeling,
how to do embossing,
how to do edge lacing,
how to attach fasteners,
how to dye and color leather.

Related information:

history and early uses of leather,
tanning of leather,
geographical sources of raw materials,
how to differentiate skins and hides,
kinds of leather,
types of dyes and stains for leather,
consumer knowledge of leather and leather articles.

Suggested projects:

book marker, baggage tag, key case, coin purse, billfold.
The metalcraft area. The units offered in metalcraft will cover experiences in the artistic production of articles in copper, brass, aluminum, and silver.

Fundamental operations:
- how to design metal articles,
- how to do pierced work,
- how to overlay,
- how to tool metal,
- how to do soft and hard soldering,
- how to chase metal,
- how to shape metal on a sandbag and other forms,
- decorations on metal,
- how to raise and planish metal,
- coloring or oxidizing copper, brass, and iron,
- how to etch copper, bronze, and aluminum.

Related units:
- know and practice safe working methods,
- know the composition of metals used,
- know the metals and their appropriate uses,
- history and early uses of metals,
- mining and smelting of metals,
- decorating metal surfaces,
- finishes used to preserve metals,
- occupational opportunities in metal industries.
Suggested projects:

ash tray or candy dish, jewel box, bracelet, pin or brooch.

General Drafting

Drafting goes hand in hand with any and all shop activities. To make the most simple of objects from a sketch requires the worker to have some understanding of the elements of drafting. From this basic understanding of drawing it is a matter of the student obtaining the desired level of achievement in the principles of drafting at the correct times as he receives his industrial-arts experiences. Whether integrated into the various areas of a general shop, or concentrated into a separate course, or a combination of both, selections from the following units, or areas of drawing, may be used to help the student learn the desired principles of drafting.

Drafting units:

orthographic drawing principles,
pictorial drawing, free hand sketching,
lettering, machine drawing,
auxiliary views, scale drawing,
inking, tracing, and blueprinting drawing,
surface development, architectural drawing,
electrical drawing, map drawing, 
brush lettering and posterwork, 
project and furniture drawing.

Bench Metalwork

Operation units:
- how to cut metal with a hacksaw,
- how to remove metal with a file,
- how to cut metal with a cold chisel,
- how to bend cold metal,
- how to drill cold metal,
- how to fasten stock with rivets,
- how to cut and tap threads,
- how to produce a hammered finish on metal,
- how to apply finishing materials on metal.

Related units:
- metals commonly used in benchwork,
- holding devices for bench metal operations,
- hacksaws, metal files,
- shears, pliers, and nippers,
- metal fasteners, wrenches, taps, and dies,
- pipe and pipe fittings.

Suggested projects:
- paper knife, towel rack, garden hose holder,
- garden trowel, weeder, door knocker, flower
- pot holder, house numbers.
Sheet Metalwork

Operation units:
how to develop a pattern,
how to cut sheet metal,
how to bend sheet metal by hand processes,
how to bend sheet metal on the bar folder,
how to make seams,
how to wire an edge,
how to turn a burr,
how to bead and crimp sheet metal,
how to rivet sheet metal,
how to soft solder,
how to care for soldering coppers,
how to use stakes in forming metal.

Information units:
solders, fluxes,
identification of common sheet metals,
finishes on sheet metal projects,
common sheet metal tools and their care.

Suggested projects:
note pad holder, sheet metal planter,
utility box, dish or tray, funnel.
As the local needs, desires, and facilities may determine, additional units in metalwork may include forging, welding, cast metals, and machine-shop operations, the latter on the metal-turning lathe and other metal cutting machines. By the same criteria of needs and facilities, additional units in other areas of industrial arts, such as home mechanics, electricity, and the graphic arts may be added to the general-shop program, all in accordance with local interests, limitations and the capability of the industrial-arts teacher. Not all teachers will do well in a general shop but any good teacher, with a real desire to serve the full objectives of general education, and enthusiasm for boys and for industrial arts as a vital area of learning in general education, will find the organization of and the teaching in a general-shop program to be a real challenge -- a genuine opportunity to serve his profession and his pupils.
BIBLIOGRAPHY


The general distribution is shown here of the small high schools of Oregon which do offer industrial-arts classes and are included in this study. The names of the schools contacted in this study may be had by referring to appendix B.
APPENDIX B

Following is the list of high schools in Oregon which
fall in the category of five to 11 teachers. The list is
in the order as given in the Oregon School Directory 1951-
1952. Replies were received from all schools except those
marked with an asterisk. For the purpose of this list,
the town in which the school is located is given, except
for such high schools that do not use the name of the town
in which located.

Halfway                  Elmira
Monroe                  Lowell
Philomath               Mapleton
Colton                  McKenzie River High School
Knappa High School      Oakridge
Clatskanie              Siletz
Vernonia                Waldport
Powers                  Brownsville
Brookings-Harbor        Harrisburg
Gold Beach              Mill City
Port Orford             Sico
Canyonville             Shedä*
Drain                   Adrain
Elkton                  Jefferson
Glendale                North Marion High School
Glide                   Heppner
Riddle                  Corbett
Yoncalla                Moro
Condon*                 Nestucca High School*
John Day                Garibaldi
Crane*                  Nehalem*
Cascade Locks*          Wheeler
Parkdale*               Athena
Eagle Point             Pilot Rook*
Jacksonville            Stanfield
Phoenix                 Umatilla
Prospect                Weston
Rogue River             Elgin
Talent                  North Powder
<table>
<thead>
<tr>
<th>Culver</th>
<th>Enterprise</th>
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<tbody>
<tr>
<td>Illinois Valley High School</td>
<td>Joseph</td>
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<tr>
<td>Bly</td>
<td>Wallowa</td>
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<td>Bonanza</td>
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<td>Chiloquin</td>
<td>Gaston</td>
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<td>Gilchrist</td>
<td>Wheeler County High School</td>
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<td>Henley</td>
<td>Amity</td>
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<td>Malin</td>
<td>Dayton</td>
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<td>Merrill</td>
<td>Sheridan</td>
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<td>Creswell</td>
<td>Yamhill</td>
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</tbody>
</table>
Dear Shop Instructor,

Your cooperation will be greatly appreciated in my endeavor to make a study of industrial arts in the small high schools. Certain information of the selected schools is available through the Oregon School Directory, but there is some additional information I need to obtain from you concerning industrial arts in your present school program.

I need to know how many periods of industrial arts are given per average day, the names of those classes (or I.A. subjects) and the length of the classes in weeks (18 or 36 weeks). I am attempting to learn what areas of industrial arts are most often given in the small high school.

Please complete the questionnaire form and return to me in the enclosed self-addressed stamped envelope.

Your immediate reply will be very greatly appreciated.

Sincerely,

L. I. Harter
APPENDIX D

INDUSTRIAL-ARTS QUESTIONNAIRE

How many I.A. classes do you have each day? 

<table>
<thead>
<tr>
<th>Period</th>
<th>Name of Class</th>
<th>Length*</th>
<th>Main I.A. areas in class</th>
<th>Main text used</th>
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<tbody>
<tr>
<td>1</td>
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</table>

*If class is one semester long, what industrial-arts class follows in the second semester?

Do you have any I.A. class that is given on alternate years and not shown in schedule above? 

If so, list the information in blank above.

Underline any of the following units taught in your mechanical drawing classes: posterwork; freehand sketching, architectural drawing, map drawing, graphs and charts.

High School

(Name of School)