

A STUDY OF INSTRUCTION SHEETS—
EARLY HISTORY AND PRESENT USE

by

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CHAPTER I

INTRODUCTION

For the past decade instructors in the field of industrial education have been struggling with the problem of individual instruction. It has become more acute during the past ten years, especially the depression years through which we have just passed. As a result of the depression, school boards have economized in many ways, and probably one of the most common methods has been to increase the size of classes throughout the country. (20:Introduction) Along with the increase in class size, the problem of individual instruction has become more pressing, and many attempts have been made to meet the emergency through the use of printed and written instructional materials.

The Problem

Statement of the Problem

It is the purpose of this study (1) to define various terms which have been used by educators in speaking and writing on the subject of instruction sheets; (2) to trace

the beginning of, and to make a study of the development of written instructional material; (3) to review the material which has been written in behalf of, and in criticism of the instruction sheet as a method of solving the individual instruction problem; and (4) to present the attitudes of various teachers toward the use of written instructional material through a questionnaire study. The questionnaire will attempt:

- A. To determine whether or not one type of student profits more than another by the use of instruction sheets
- B. To determine weaknesses of the sheets, if any
- C. To determine their usefulness, and if so in what field, and in what grades
- D. To determine whether or not the work books sold by various publishing houses are taking precedence over home-made work sheets
- E. To determine whether the teacher with years of experience uses instruction sheets more or less than the teacher with little experience
- F. To determine whether or not there seems to be any consensus of opinion of shop teachers surveyed concerning the grades in which instruction sheets have been found most satisfactory for the various units

Importance of the Problem

Much has been written in favor of and also in criticism of the use of instruction sheets as a method of teaching. The writer became interested in the historical background of instruction sheets while working on a research problem dealing with the advantages and disadvantages of instruction sheets as a teaching method.

It is hoped that this study will clarify certain terms which, in the past, have been haphazardly used by writers on the problems of written instruction and will also reveal some of the problems which face shop teachers in their attempt to use instruction sheets in their work.

Definitions of Terms Used

Instructional aids can be had by the teacher today in many forms and under various titles. Some of the terms are confusing to the teacher and misleading to the student. The following are probably the most common terms used in connection with written instructional aids:

1. Instruction Sheet
2. Lesson Plan Outline
3. Lesson Sheet

These terms overlap somewhat and are used interchangeably by educators.

Payne (16:100) has defined a lesson sheet or an instruction sheet as,

any form of written instruction or outline that is placed in the hands of the students for their guidance, whether it is blue-printed, mimeographed, printed, single or separate, part of a series given out separately and later placed in a loose-leaf device, or stapled together with the rest of the sheets of a particular unit or permanently bound by units.

An instruction sheet, says Struck, (23:61-68) is a broad term including "all of the various forms of individual loose-leaf sheets that are commonly referred to under such designation as: operation sheets, job sheets, project sheets, information sheets, and assignment sheets".

Lynn's definition (13:326) is that: "Any such lesson sheets as an instructor uses to aid the effectiveness of his work are called instruction sheets....

Instruction sheets are of two kinds according to whether you are teaching how to do skilled work with tools, or teaching what knowledge like arithmetic, drawing, or science must be acquired in order to be an intelligent craftsman. Instruction sheets of the first kind are called operation sheets, while the latter are called information sheets."

Selvidge and Frycklund (22:135) define the instruction sheet as a "general term applied to all forms of written or printed instruction sheets purporting to give instruction, and the proper use of this term will aid greatly in clearing up difficulties."

As defined by Rodgers and Furney (18:43)

An instruction sheet is one unit of a body of organized teaching material that has been prepared for the pupil to use under conditions that will insure the greatest amount of directed individual progress. It is specifically an agency that provides educational work for the pupils according to their varying abilities and interests for the duration of a class period. It is a means of attaining 'self-education through purposeful activity'.

From the references cited above, the reader will note that the term, "instruction sheet" is interpreted rather loosely at times, and for that reason a clarification of terms is necessary in this study. The term lesson sheet and lesson plan outline seem to apply more nearly to the work of the academic classroom, while the term instruction sheet has a closer tie-up with practical arts courses, as offered in industrial arts education.

Terms As Applied To Instruction Sheets

A careful study of the field has revealed many names used by writers in referring to written instructional material. The writer has analysed thirteen of the terms which have been most commonly used.

1. Operation Sheets — Instruction sheets which center around the doing phase of instruction are known as operation sheets.

Example: How to center stock in a lathe

For sample sheet see appendix

2. Information Sheets — Instruction sheets dealing with knowledge and facts of certain trades are known as information sheets.

Example: How veneer is cut and glued

For sample sheet see appendix

3. Assignment Sheets — Instruction sheets which are designed to direct study over large units of work are known as assignment sheets.

Example: The study of shellac

For sample sheet see appendix

4. Job Sheets — Instruction sheets which tell how to do each step of a complete job are known as job sheets.

Example: How to build a gateleg table

5. Trade Process Sheet — Friese (7:75-78) classifies the job sheet and the trade process sheet as practically the same kind of an instruction sheet, though the process sheet may accompany and supplement the job sheet.

6. Project Sheet — The project sheet is a problem or a problematic act which the student carries through to completion in a natural setting.

Its purpose is to draw forth information by

suggestive questions. Such a sheet helps in making proper judgments and decisions. (16:120)

7. Self-Help Sheets — Where little or no help is given by the teacher, self-help sheets are primarily used. Examples of their use are the International Correspondence Schools, Scranton, Pennsylvania, and the American School, Chicago, Illinois.
8. Task Sheets — The task sheet is a special type of instruction sheet, developed during the World War for the United States Army. Its purpose was to train soldiers to perform rather simple jobs within the shortest period of time possible.
Example: Laying of sills and girders
9. Procedure Sheet — A procedure sheet is a pupil-made outline of operation or steps in a given job. The sheet contains information on tools, materials needed, a sketch of the project, and the "steps" or job procedure in sequence.
10. Job Ticket Sheet — A job ticket sheet compares favorably with the self-help sheets used by certain correspondence schools. This term is applied to the instruction sheets used by the American School, Chicago, Illinois.

11. Loose-Leaf Sheet Textbooks — Loose-leaf instruction sheets placed in a loose-leaf binder can be used in the shop as excellent reference material. Some are bound with rings, staples, and spiral bindings. This method in some cases is used by the International Correspondence School and the University of Wisconsin.
12. Textbooks — When a number of pamphlets dealing with like problems are bound together, the logical result is a textbook. "At least two publishers", says Payne, (16:132) "have adopted the method of binding in such a textbook a colored sheet on which the jobs of succeeding units are printed."
13. Handbooks — Probably the handbook or reference book is used less than any of the other instruction devices listed, but it is included in the list because it is a lesson help and serves a definite need in the individual method of teaching.

Unit of Instruction

Within the field of industrial arts education one finds different writers using various terms to express the same thought. The term, unit of instruction, is

commonly referred to as a learning unit, teaching unit, content, subject, lesson, or element, and sometimes referred to as a step, operation, or a unit operation.

A job can be defined as a task to be accomplished. In doing a task one will find it must be done, says Allen, (1:126) according to certain specific steps, sometimes called the instruction unit, or more commonly, the content or the subject of the lesson.

When we are confronted with the problem of training individuals in any field of knowledge, or accomplishment, says Selvidge, (21:39) it becomes necessary to break up the field into convenient units of instruction. The field, taken as a whole, is too large and too complicated to be handled as a unit. These units are not to be regarded as separate and unrelated things, but as essential elements of the whole, a part of a larger plan.

According to Rogers, (17:120) a unit of instruction is "A body of organized instructional material prepared for the use of the learner, and consists of educational assignments so organized as to provide for the greatest amount of individual progress".

Selvidge and Frycklund, (22:63) have defined a unit of instruction as a step in a larger undertaking. The units must be simple enough for the learner to grasp easily, but at the same time they must challenge the learner.

In summarizing the material written on the unit of instruction method, the following conclusions can be drawn:

1. A unit of instruction varies according to the advancement of the learner; it must be simple for the beginner and more complex for the student who has had experience in the particular line of work.
2. Units are not separate and unrelated elements, but parts of a larger plan.
3. To the teacher these operations or steps become teaching units, while to the student they are learning units.
4. The number of unit operations to teach a certain job or task is not fixed but can be increased by subdivisions of any of the operations, which, up to that time, have been considered as a unit.
5. A job is a task involving one or more of these unit operations. Plain seaming would be considered a unit operation, or a unit of instruction in the canvas working trade, while soldering would be considered a unit operation in the tinner's trade.

Limitation Of The Study

Instruction sheets have been and are being used today in science laboratories, secondary schools, and higher institutions. Information published by the correspondence schools (24:Introd.) shows that such sheets are invaluable as an individual teaching device, as used by the correspondence schools throughout the country. (9:Bulletin No. 13) They have been used in industry and also by the part-time school program of the State of New York in handling large numbers of men and women returning to school for a few hours of work each week. A detailed study of any of the above divisions could develop into a research problem, but no attempt will be made to do that in this study. References will be made to certain contributions made in these various fields to an historical development of the instruction sheet as applied to industrial arts education.

Two sections of the United States have been chosen for the survey: namely, the west coast, consisting of California, Oregon, and Washington, and a section through the middle west, consisting of parts of Illinois, Michigan, Minnesota, and Missouri. The survey has been made in small schools, where one or two shop teachers are employed, as well as the larger city systems.

Summary of Chapter I

An instruction sheet is a general term applied to all forms of written or printed instructional material placed in the hands of the students to aid them in their learning. The following terms are most commonly used in connection with written instructional aids: (1) instruction sheet, (2) lesson plan outline, and (3) lesson sheet.

The term, unit of instruction is referred to as, a learning unit, teaching unit, content, subject, and also as a step, operation, or a unit operation. A unit of instruction is a step in a larger undertaking, and varies according to the advancement of the learner.

CHAPTER II

THE USE OF INSTRUCTION SHEETS

Early History

In making a search of the early written or printed instructional material the author finds he must take the reader back to the middle of the nineteenth century. In the year of 1856 in Berlin, Germany, a Frenchman, Charles Toussaint, arranged to teach students his native language by using lesson assignment sheets and drill sheets, having the work written out and returned to him for corrections and comments. (24:5) Eleven years later Professor Stuart, (3:28) a lecturer in Cambridge University, was forced to adopt the use of a lesson sheet in teaching a certain course to women.

So rigid were the ideas of propriety for women of those days that it was thought quite out of the question for a man teacher to discuss in a personal interview with women students any questions arising from their study. Professor Stuart, therefore, invented the printed lesson sheet which might pass for written discussion and comment through the mails without danger to either instructors or women students.

Thus we find such terms as lesson sheets and assignment sheets being brought into use through the correspondence method of teaching. The first successful attempt at teaching by the correspondence method in

America was approximately 1890, in Fair Point, New York. Dr. William Rainey Harper outlined a course of study, which was taught by mail. Dr. Harper, two years later, became President of the University of Chicago, where he established a correspondence division at the university.

(24:7) The school was a success because such a method allowed students to advance according to their own rate of accomplishment; instructional material was organized to meet individual differences, and a much broader program could be offered by many schools. One of the greatest weaknesses of the correspondence method of teaching was a lack of inspiration from direct contact with the instructor, but this weakness was largely offset by well written and printed instruction sheets, which were known as lesson and assignment sheets. This was the beginning of written instructional material in our country, which was another technique in the method of teaching. It may be seen from these and the following citations that the instruction sheet has had a gradual but steady development in this country, and that this growth has been brought about by a number of forces. As the correspondence schools have played an important role, so have the science laboratory manuals made definite contributions to this development. The use of "job sheets" came to the front rapidly during the period of the World

War, when 1,250,000 men had to be trained to fill technical jobs within a brief period of time. (5:1)

Charles Allen and Robert W. Selvidge were given the task of training unskilled men for special service in the United States Army and also skilled workers in the United States Ship Yards. The means employed were job sheets, made up in the form of instruction manuals.

(11: No. 4) The sheets were highly successful and accomplished their purpose in that they were planned with the major emphasis on training men to perform certain skills in the shortest period of time.

These job sheets used by the War Department consisted of brief directions as to the work, equipment to be used, and questions on the operations and principles involved. The men were handled in small groups in order to provide for the development of originality, initiative, and real thinking power. To prevent learning by "rule-of-thumb" the method of teaching was mostly through jobs, questions, problems, and guided discussions. Directions were given on how to use the job sheets, and, regarding sources of information, the following suggestions were given; (11:1)

1. Study of instruments assigned
2. Study of various manuals assigned

3. Discussion with other men on the job
4. Appeal to the instructor in the final analysis

In the introduction to the manual, emphasis was placed on the importance of the learner's answering all questions. It is recognized that information obtained by experience is likely to be retained, while information handed out by the instructor is soon forgotten. The instructor is not to be considered as a source of information, but rather as an authority to judge as to the correctness of the information obtained by the student's own effort. In the introductory chapter of the war manual, Mr. C. R. Dooley, (11:Part III) Educational Director, says that, "These outlines are not intended for the school room but for the shop where they can be used for the guidance of the instructors and the men on the job...The accomplishment of a job is both the end to be attained and the means for instruction."

At the close of the World War the job sheet found its way into the public schools through the industrial arts department. This new technique was brought in, not for the purpose of replacing the teacher by some printed outline of set instruction, which could be handed out at will, nor as a sheet to serve the teacher as a crutch, but as a definite teaching aid. Some of the men who had

been trained in the use of job sheets while in the army went back into the school room, and as they had found the instruction sheet helpful in training soldiers, it was natural for those men to try the same technique in their shop teaching.

But perhaps a successful method of teaching in one situation may be a complete or partial failure in another. Since the job sheet was not intended for the classroom, we find it did not completely meet the needs of the individual as was fondly hoped. The job sheet, as pointed out by Mr. Dooley, was for production purposes, while the industrial arts instructor was interested in the student from the standpoint of instruction rather than production. Experienced and inexperienced writers and teachers criticized the sheets both pro and con. Some believed that the instructor would gradually be replaced by mimeographed sheets; others thought that he might be robbed of his individuality by stereotyped teaching. More optimistic writers could see a broader program for industrial arts through additional helps the sheets would give. A review of some of the writings of industrial educators on this new technique will be necessary for the reader to understand adequately some of the problems growing out of the use of written or printed instruction sheets.

In discussing the value of instruction sheets, Friese (7:75-78) says that they are instructional devices used to assist the instructor in teaching by the imitative method. If used in the right place, they have many advantages, and at the same time they are very limited in their application. He continues by saying that:

The instruction sheet, used as a device with demonstrations, is immediately associated with imitative instruction. This method brings the most rapid results. It is the method of industry. Therefore, when speed and skill are important considerations, it is a valuable aid. It finds its most appropriate place in vocational education. Instruction sheets do have some valid uses in manual arts. No matter what method of instruction may be the dominating one of the course the first instruction given in a course must usually be such as to develop some manipulative skill as a groundwork. This can best be developed most economically by the imitative method. Here then is one valid place for the use of instruction sheets in manual arts.

Friese concludes the study by pointing out the limitations placed upon the teacher and student where job sheets are used in teaching. Unless the teacher has on hand a great variety of job sheets, all requiring the same degree of skill, a choice of articles or problems from which the student can choose is not possible.

In much the same way Schweickhard (19:248) points out certain dangers from the use of detailed job sheets, which were being used by teachers to provide for indi-

vidual interest and individual development. He writes that,

Strict adherence to such a plan limits the scope of selection to the job for which job sheets can be secured, and a large collection of these sheets reveals much duplication of instruction and directions...It does not seem desirable that the way should be mapped out in so great detail that there is nothing left for the boy to solve or think about.

He then suggests a more desirable plan by which the instructor analyzes the field he wishes to cover in each course and proceeds to list the facts, principles, and processes which are to be involved. These principles and processes then can be taught through the medium of written instruction sheets, purchased or shop-made. The boy being interested in the project can work out his own solution by mapping out a plan of performance based upon his knowledge and his ability in the course.

The Classification of Instruction Sheets

In Chapter I, under "definition of terms" the writer has listed and defined thirteen different kinds of instruction sheets which have been, and are now being used in teaching shop work.

For clearness of thought and discussion Mr. R. W. Selvidge (21:9) has classified all types of written or printed material under four general headings as follows:

1. Instruction Units

- a. Operation Sheets. The instruction sheets that tell how to perform manipulative operations are called operation sheets.
- b. Information Sheets. Instruction sheets that deal with items of information are called information sheets.
- c. Assignment Sheets. Instruction sheets, composed largely of questions, designed to direct observation, reading and drill, are called assignment sheets.

2. Jobs

Job Sheets. Instruction sheets that tell how to do complete jobs which may involve a number of operations are called job sheets. They are especially designed to secure production. They also may be used for small unrelated jobs requiring little skill, such as home mechanics.

The following outline gives the most desirable features and the major steps in writing and judging the different kinds of instruction sheets: (21:41-63)

1. Operation Sheets

- a. State the title in very specific terms
- b. List and arrange in logical order all steps involved in performing the operation
- c. Write the instructions for doing each step in simple direct statements
- d. Use as many illustrations as needed in making the operation clear

- e. Use questions if they will help the student to reason out his problem
- f. Give one or two good references

2. Information Sheets

- a. State topic clearly
- b. State facts and information briefly and clearly concerning the topic to be discussed
- c. Choose questions which will direct thought and discussion
- d. Give two good available references

3. Assignment Sheets

- a. State the problem in specific terms
- b. Give exact sources of information
- c. Use questions freely which will direct reading and arouse thought
- d. Write out answers to all questions

4. Job Sheets

- a. State the name of the job
- b. List all specifications
- c. List information needed in doing the task
- d. Give detail procedure in doing the job
- e. List all tools and materials needed
- f. List questions pertaining to the job
- g. Give several good references

Factors Affecting Instruction Sheets Since 1930

Between the years of 1925-1930 many books and magazine articles were published, giving a liberal amount of space to instruction sheets and presenting both their good and bad points. (6, 7, 8, 15, 16, 19, 21, 22, 26). There seemed to be a gradual trend away from the use of the traditional "job sheet", (26:453) but at the same time there was a general feeling that the instruction sheet was an accepted technique when used by a good teacher. The trend at that time was shown by an editorial (14:178) in the Industrial Arts and Vocational Education Magazine. Quoting from the article we find that:

The individual instruction sheet under numerous names and in various forms is at present, (1930) holding the center of the stage in industrial arts and vocational education. It is well that it does, because the individual instruction sheet is a teaching device that promises to solve the problem of individual differences more successfully than any other that has yet been proposed.

Just what the final form of this teaching device is to be cannot as yet be foretold. The instruction sheet is still in the process of development and those who are using it are confronted by the arduous task of choosing the particular form in which they want to write their material from the numerous types and kinds that have so far been devised.

Citing an article in the Industrial Education Magazine for June, 1930, Mr. Willoughsby (26:453) shows that

the trend was toward more extensive use of instruction sheets in many forms, and the tendency was to include considerable related information in connection with manipulative processes. The author points out several defects in instruction sheets and suggests a modification of the traditional job sheet. "No doubt these criticisms have some foundation," says Willoughsby, referring to certain weaknesses of instruction sheets, "but they do not imply that the use of printed instructions is undesirable. They imply rather that the improvement in the organization of the material is needed."

By 1932 the economic depression was being felt throughout the country and thus the natural development of the instruction sheet as a teaching device was impeded as were all phases of education. The American school system was confronted with two major problems of opposing natures. First, there was the increasing demand for a broader curriculum, and second, the need of operating the schools economically. (24:5) Within the fields of industrial arts education, the traditional courses in wood and drawing were not keeping pace with the increasing school enrollment, nor with the many new materials and processes industry was using. This demand for a broader curriculum within the field of industrial arts education was partly solved by a broadening course known as the "general Shop".

The general shop has been defined as a multiple activity shop or laboratory in which a wide variety of industrial activities and experiences are conducted, simultaneously, in different fields of human endeavor, based upon life needs.

The general shop by 1930 was far from a reality, but it had replaced the traditional type of shop work in many places. (12:458) Boards of education favored the idea of one teacher's handling four kinds of activities, such as woodwork, household mechanics, electricity, and sheet-metal work. The variety of activities a shop teacher would have to handle in a general shop program brought new demands in the way of experience and training. This new method of bringing three or four separate fields into one shop, teaching each effectively, called for new organization and new techniques on the part of the teacher. One method of operating the schools economically was to increase the size of classes. Up to the time of the depression, tradition had fostered the smaller class, and teachers in general felt that classes should not be increased beyond the customary size, which for shop classes was about twenty-five pupils, (25:245) while teachers of elementary grades set thirty-six pupils as the best class size. After questioning 1,088 elementary

teachers on the subject of class size, Almack (2:107-109) found from his study that teachers believed that any class was too large if the enrollment was beyond what the teacher had been accustomed to. Shop teachers have contended that the nature of their work, the individual approach to their problem, and the demand for safety called for classes not exceeding twenty-five pupils. (25:245)

Preceding the depression many experiments were made to determine the relative efficiency of large and small classes. Bloomfield and Brooks (4:6-20) have found by experimenting with classes of various sizes that there is no appreciable difference in the achievement of pupils in a small class over those in a large class, but large classes force the student to rely upon himself rather than upon the teacher. They conclude the study by stating that more suitable techniques of instruction could be developed for larger classes. Segel and Proffitt (20:2) in studying along the same line, state that,

The size of class which can be taught efficiently depends upon the subject and the method of teaching, if the pupil is considered constant, and that a job analysis of the curriculum is needed to determine the feasibility of such adaption.

After experimenting with various class sizes in college, Hudelson (10:Bulletin) says that failure or success of large classes is partly due to techniques used.

The study made by Segel and Proffitt (20:6) on the problems of large classes emphasizes instruction sheets as one of the Major Techniques used in handling larger classes. "Assignment sheets, lesson sheets, job sheets, work sheets, work books, unit assignments are various names used to designate instructional material which outlines a portion of the course of study, presented to the pupil for his guidance and direction.... They all represent written aids to instruction; they all involve organization of material for the course and a presentation of it to the pupil."

Advantages and Disadvantages of Instruction Sheets

Instruction sheets of the job sheet type were given a thorough tryout during the years of 1923-29. One of the strongest claims made for industrial arts in the public school curriculum has been that it permits freedom in thinking and in expression, through a wide variety of solutions to the student's problem. But the shop-made and the commercial job sheets which were being used at this time did not develop initiative, but rather had a distinct tendency toward standardization in the assignment of problems and projects, which certainly made the work of the instructor easier but did not develop any individuality within the student. One writer (8:445) within the

field of industrial arts has pointed out that a job sheet can be so organized as to present a general problem and that the selection of details will naturally come as a result of individual thought and reasoning on the part of the individual.

The instruction sheet can be a "great time and energy saver for the teacher", says Payne (16:99). "It practically absolves him from the necessity for teaching. It is the method of 'canned thinking'. The teacher or someone else has done all the thinking, made all the comparisons, judgments, decisions, and has 'preserved' or 'canned' it in the form of an instruction sheet. It is non-thought provoking on the part of the students and cannot, except in a very limited sense, be considered as teaching."

But Payne points out that the instruction sheet has value in dealing with both the fast and the slow student. After the problem has been developed in class by the inductive method, the sheets have definite value as a procedure outline for the students. While we find both Schweickhard and Friese pointing out certain weaknesses in teaching by the use of job sheets, Payne says that the job sheet is one of the best, if not the best, of various kinds of lesson sheets (16:121).

It is the logical outcome of the unit arrangement of subject matter resulting from an analysis of the trade, and is a specific result of the analysis of the job. It is the beginning of the self-help method. It is of most value in classes where the students, because of individual differences, progress at varying rates of speed, and in classes where different kinds of instruction are being given at the same time, such as the general or composite shop.

Newkirk and Stoddard (15:50-51) call attention to several outstanding defects in teaching, where instruction sheets are used, yet they claim that these defects do not apply to all types of sheets, and that the objectionable features are gradually being eliminated in favor of the better types of sheets. They point out the following weaknesses:

1. These sheets give special favor to the student who reads well.
2. The pupil is deprived of a chance to analyze the job and find out for himself what is to be accomplished.
3. The pupil is robbed of the opportunity of planning the doing of the job.
4. They do not provide an opportunity for the student to ask questions.

In giving personal instructions in shop teaching Ericsson (6:291) finds the job sheet the greatest offender among the different kinds of instruction sheets. He says,

Methods of handling tools—the actual mechanical processes—are carried haphazardly, simply in order to get the results suggested and get them in the shortest possible time. This does not strengthen the prevocational or finding value of the experience, since the student can get no true conception of the work of the trade in this way.

Ericsson points out six evils of the job sheet, but he summarizes his discussion by saying that much of the trouble can be overcome by the wide-awake teacher.

The major portion of the criticism which has been reviewed in this study has been directed toward the job sheet.

It is this inflexible character of the job sheet, and the fact that it takes all the responsibility from the student that has caused most of the criticism of the instruction sheet. These criticisms do not apply to the sheets based upon units of instruction rather than jobs. (21:62)

Although much of the criticism aimed at the job sheet can be justified, the job sheet has had an important but limited place in industrial arts. In a situation where large numbers of like articles are to be produced, the job sheet method certainly is the most efficient and most accurate. But this is bordering on production and not instruction. The job sheet finds its greatest usefulness in a field where simple unrelated jobs occur frequently, and in which little skill is required in the

accomplishment of the task. Many unrelated jobs, such as replacing a windowpane, or repairing a screen door, can profitably be taught by the use of a job sheet. Similar jobs, which involve few operations, can easily be taught as a unit. But in most cases a job cannot be treated as a unit of instruction because it is too complicated.

Selvidge and Frycklund (22:65-66) state that,

Jobs are not the things to be taught; rather we wish to teach the elements that make up the jobs....The instruction unit deals with a principle of an operation that is more or less general in its application and is not limited to one particular job... In teaching, these instruction units are not presented as separate and unrelated things, but the instructions should be prepared without reference to a particular job, and should be so written that they will apply to any job in which this element is involved. This makes it possible to use a great variety of jobs as a means of teaching, gives great flexibility, and emphasizes the things to be taught... The units of instruction consist of the things we wish to teach; the problems or jobs offer a variety of more or less interesting opportunities to teach them.

Summary of Chapter II

1. History

Early instruction sheets made their appearance first in Berlin, Germany, in 1856, and were known as lesson sheets. Later they were used in Cambridge University, and then introduced into America through the correspondence schools. During the World War job sheets

were used in industry as well as for training men for technical jobs.

2. Kinds of Instruction Sheets

All instruction sheets can be classified as operation sheets, information sheets, assignment sheets, or job sheets.

3. Use of Instruction Sheets During the Last Decade

From 1920-1930 instruction sheets were used in the industrial arts department of the public schools of this country with some success. During the past ten years the use of instruction sheets has partly been affected by the growth of the general shop, the economic depression, and the increase in the size of shop classes.

4. Advantages and Disadvantages of Instruction Sheets

Instruction sheets have definite value in teaching manipulative skills; written instructions are much more accurate than oral instructions; they are in permanent form, and can be read and reread. Some of the disadvantages are: they give special favor to the student who reads well; they rob the student of the opportunity of planning his work; and the use of instruction sheets is likely to break the personal contact between teacher and student.

CHAPTER III

METHOD OF SECURING AND HANDLING DATA

All data used in this thesis were secured (1) by a survey at Oregon State College, and (2) by a questionnaire sent through the mail. During the summer session of 1939, at Oregon State College, a survey was made among the students enrolled in the industrial arts department regarding their use of instruction sheets in teaching shop work. Then during the school year of 1939-40 the same questionnaire was sent to several city supervisors of industrial arts in the west and middle west. The questionnaires were distributed among teachers of shop work and then collected and returned. A total of 166 questionnaires has been used in this study. All questionnaires have been grouped, (1) according to schools in small and medium-sized communities, and (2) according to schools in large communities where industrial arts is under the control of a city supervisor. In some cases the returns from small and from large schools have been handled separately, while in other cases a combination study has been made.

Table I represents a compilation of all returns on sheet 1 of the questionnaire. This takes in the schools

in the small and the large communities. The table deals with the value of instruction sheets in teaching various industrial arts subjects in various grades, whether in elementary or advanced classes, and whether in a general shop or a unit shop.

A careful study of Table I reveals the following information:

1. Forty-one courses now taught or previously taught have been listed as industrial arts courses
 2. Twenty-eight of the forty-one courses were taught in a unit shop
 3. Twenty-three of the forty-one courses were taught in a general shop
 4. Twenty-eight of the forty-one subjects were taught as elementary courses, while twenty-seven were taught as advanced shop courses
 5. Elementary woodwork was taught equally as frequently in each grade, with a gradual tapering off in the upper secondary level.
- The study also reveals that woodwork was taught about equally as often in the general shop and unit shop

6. A greater number of general metal courses was taught in a general shop plan than a unit shop plan
7. Mechanical drawing was taught one-third as often in a general shop program as in a unit shop program, while elementary electricity was taught equally as often in both shops
8. The principal courses taught in order of greatest frequency were wood, mechanical drawing, electricity, and metal work

Complete Data From Page 1 Of The Questionnaire

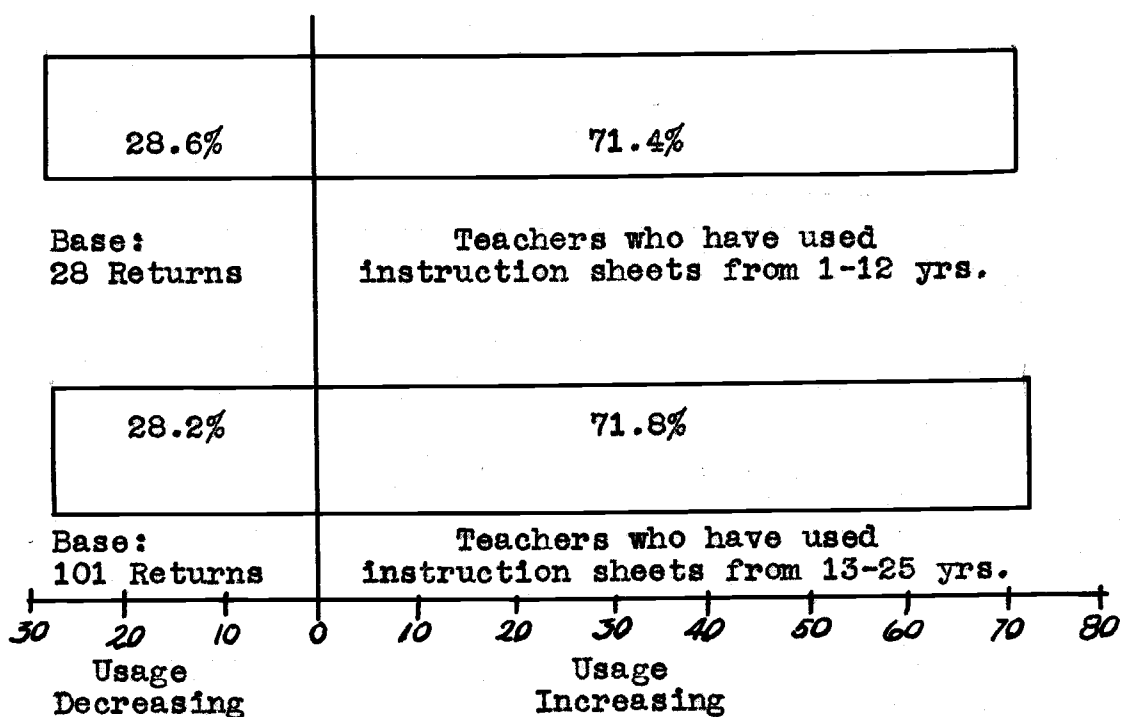
A STUDY OF- INSTRUCTION SHEETS- EARLY HISTORY AND PRESENT USE COURSES TAUGHT	Have Taught	Now Teaching	Seventh Grade	Eighth Grade	Ninth Grade	Tenth Grade	Eleventh Grade	Twelfth Grade	Elementary Grade	Advanced Shop	General Shop Program	Unit Shop Program
WOOD:												
1. Hand woodwork	98	66	75	70	89	86	49	47	39	24	23	29
2. Furniture Construction	70	54	12	14	54	64	54	54	10	27	10	26
3. Wood Turning	72	54	12	22	59	65	50	46	19	21	11	23
4. Wood Finishing	44	36	19	27	37	35	29	28	11	7	11	8
5. Boat Building	16	8	4	3	4	6	8	9	2	5	2	2
6. Carpentry	21	13	3	3	7	8	11	16	5	6	4	5
7. Pattern Making	3	4	0	1	1	1	5	5	1	1	0	1
8. Hand Carving	1	0	1	1	2	1	1	1	0	1	0	0
9. Ski Making	0	1	0	0	0	1	1	1	0	0	0	0
10. Furniture Repair	0	1	0	1	0	0	0	0	0	0	0	0
METAL:												
1. General Metal Work	35	28	13	23	27	14	15	13	13	7	16	7
2. Machine Shop	26	22	1	8	20	22	21	21	9	9	9	7
3. Forging	31	17	4	8	24	25	19	17	8	4	9	3
4. Bench and Sheet Metal	21	18	5	8	18	16	12	12	6	0	6	2
5. Art Metal	17	20	3	8	14	6	10	10	5	2	5	2
6. Foundry	9	5	0	1	7	5	5	5	2	2	1	1
7. Metal Finishing	7	5	3	3	6	5	4	3	2	1	1	3
8. Ornamental Iron	0	1	0	0	1	1	1	1	0	0	0	0
9. Home & Farm Mechanics	1	1	0	0	0	0	0	0	0	0	0	0
DRAWING:												
1. Mechanical Drawing	98	75	43	37	83	70	55	50	32	32	11	32
2. Architectural Drawing	42	26	3	2	15	24	33	31	9	9	2	15
3. Lettering	46	37	18	16	36	29	26	25	17	10	3	12
4. General Drawing	33	24	12	12	24	17	11	11	11	0	5	8
5. Printing	4	5	5	3	7	4	4	4	3	3	0	3
6. Free Hand Drawing	1	1	0	0	0	1	0	0	0	1	0	1
7. Sign Painting	1	1	0	0	0	0	1	1	0	0	0	0
ELECTRICITY:												
1. Elementary Electricity	34	31	17	31	26	14	10	10	16	7	10	10
2. Electric Wiring	13	10	3	6	12	12	6	3	6	6	3	5
3. Radio Construction	11	9	1	6	9	8	5	6	2	6	2	4
4. Motor Winding	6	8	0	1	7	10	4	4	1	5	0	5
MISCELLANEOUS:												
1. Auto Mechanics	24	12	1	3	9	9	15	16	9	6	6	6
2. Upholstery	18	11	4	3	11	16	13	11	4	3	2	5
3. Reed and Fibre	16	6	9	11	11	9	8	7	6	1	1	5
4. Plumbing	1	1	0	1	2	1	1	1	1	0	0	0
5. Aviation	0	1	0	0	1	1	1	1	1	0	0	0
6. Orthopedic Convalescent	1	1	1	1	1	0	0	0	0	0	0	0
7. Plastics	1	0	0	0	0	1	1	0	0	0	0	0
8. Heating & Ventilating	1	0	0	0	0	0	0	1	0	1	0	0
9. Leathercraft	1	0	0	0	0	1	0	0	0	0	0	1
10. Concrete	0	1	0	1	1	0	0	0	0	0	0	0
11. Industrial Science	1	0	0	0	1	0	0	0	0	0	0	0

Questions taken from the questionnaire (see appendix) are repeated here, together with the findings about each. Graphs are included for many of the questions to illustrate graphically the results. Where pertinent, the data are divided to compare results found in the schools of small communities with those in large communities.

1. How long have you used instruction sheets?
Give approximate time in years.
2. Is your use of instruction sheets increasing or decreasing?

Figure 1

Years Used and Present
Popularity of Instruction Sheets



Total Returns: 129
Average No. of Years Used: 7
Range: 1-25 Years

Figure 1 is based on questions 1 and 2 of the survey. A slight difference of only 0.4 per cent in the two groups studied is shown. One may conclude from a study of Figure 1 that the use of instruction sheets among teachers with many years of experience increases at the same ratio as that among teachers with a very few years of experience.

3. What kind or kinds of instruction sheets have you used to the best advantage?

Figure 2

Type of Sheets Preferred

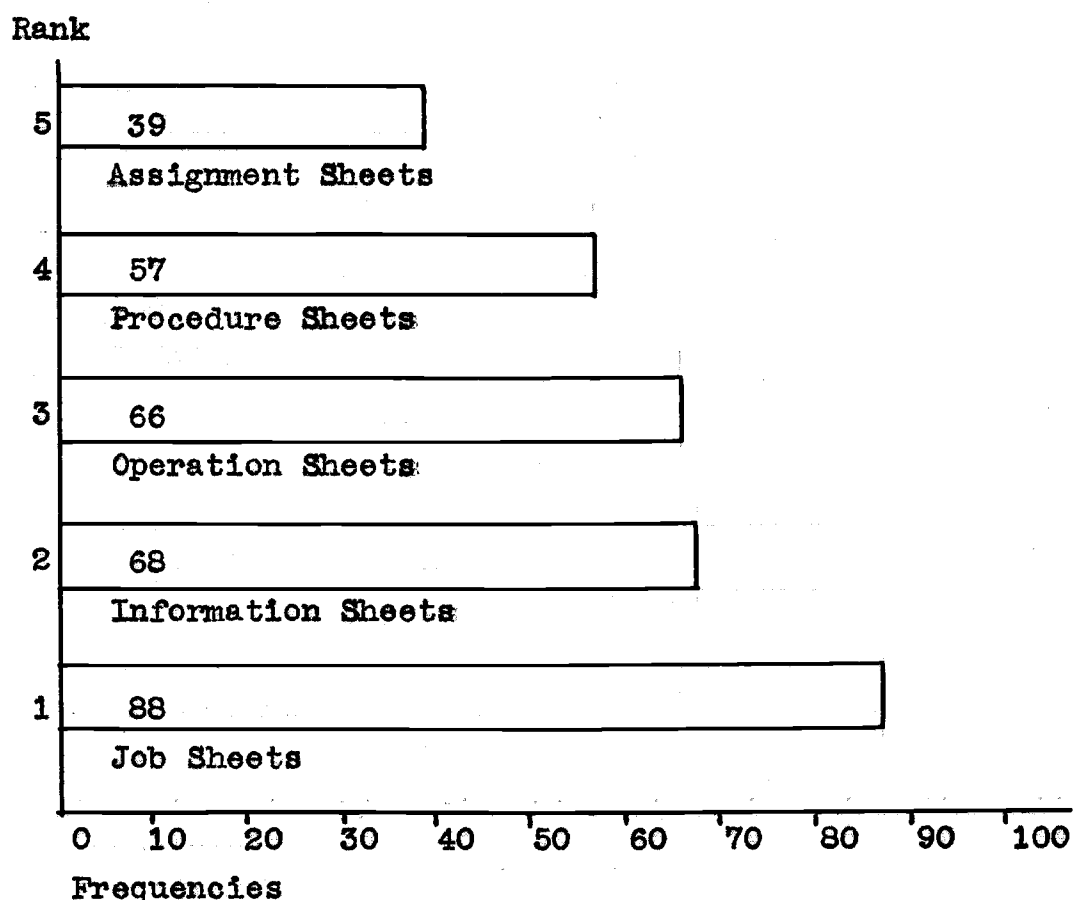


Figure 2 clearly indicates that the job sheet is used to the best advantage among those sheets surveyed, and that assignment sheets are used to the least advantage. In spite of the fact that job sheets have been criticized by various writers as the weakest type of instruction sheets, they have been found to have the greatest usage among teachers who have contributed to this study.

4. Do students learn the names of tools and materials much more quickly and thoroughly by the use of instruction sheets?

Figure 3

Teaching the Use of Tools
and Materials Through Instruction Sheets

Yes 73.5%	No 26.5%
--------------	-------------

(Yes 106, No 38, Total 144)

A study of the separate returns from the small and large schools shows a difference of only 3% on question 4. This study bears out the belief that written instructions are better than oral instructions, partly because they are in permanent form and can be read and reread. A teacher replied to this question by saying that the answer was "dependent upon the method of presentation."

5. Do instruction sheets give a better understanding of related information which would often be neglected in oral instruction?

Figure 4

Teaching of Related Information
Facilitated Through the Use of Instruction Sheets

Yes 83% *	No 17%
--------------	-----------

(Yes 114, No 23, Total 137)

* Read: 114 teachers (83%) said instruction sheets gave a better understanding of related information than oral instruction.

Industrial arts instructors emphasizing the use of instruction sheets claim that teachers who depend upon oral instruction often neglect much of the related information. Figure 4 shows that 83% of the teachers responding to question 5 have found that related information is taught much more satisfactorily when presented to a class through written instruction.

6. Do you have difficulty in getting students to follow instruction sheets?

Figure 5

Difficulties of Teachers with Students
in Following Instruction Sheets

Yes 70%	No 30%
------------	-----------

(Yes 55, No 23, Total 78) Returns from small schools

Yes 64.6%	No 35.4%
--------------	-------------

(Yes 42, No 23, Total 65) Returns from large schools

Yes 67.8%	No 32.2%
--------------	-------------

(Yes 97, No 46, Total 143) Returns from all schools

The returns on question 6 have been charted separately for the small and large community schools and also together. Teachers in schools in the large communities complained of the difficulty in getting students

to follow written instructions. One teacher said he had difficulty with the poor readers, while another said the greatest problem was with the students of the low I.Q. level. Some of the teachers expressed the belief that the problem was easier when instruction sheets in the form of job sheets were used.

7. Do you find instruction sheets increase individual progress?

Figure 6

Increasing Individual Progress by the
Use of Instruction Sheets

Yes 87.8%	No 12.2%
--------------	-------------

(Yes 122, No 17, Total 139)

The results of one hundred and twenty-two (122) replies out of one hundred and thirty-nine (139) showed that individual progress in class was increased by the use of instruction sheets. The answer to the question would be "yes, to a few and no, to a majority", said one teacher. The answer would be "dependent upon class size", said one, and "dependent upon the grade", replied another.

8. Will the boy with a low I.Q. get more out of the course by using instruction sheets?

Figure 7

Progress of the Low I.Q. Student
by Use of Instruction Sheets

Yes 32.9%	No 67.1%
--------------	-------------

(Yes 25, No 51, Total 76) Returns from small schools

Yes 24.6%	No 75.4%
--------------	-------------

(Yes 15, No 46, Total 61) Returns from large schools

Yes 29.2%	No 70.8%
--------------	-------------

(Yes 40, No 97, Total 137) Returns from all schools

A careful study of the combined returns on the completed questionnaire shows a higher percentage of responses from teachers in schools of the small communities. However, Figure 7 gives a higher percentage of negative responses from schools in the large com-

munities on question 8. Several teachers commented on question 8 by saying that the problem is not whether the boy can read instruction sheets, but rather, whether the boy will take time to read the sheets.

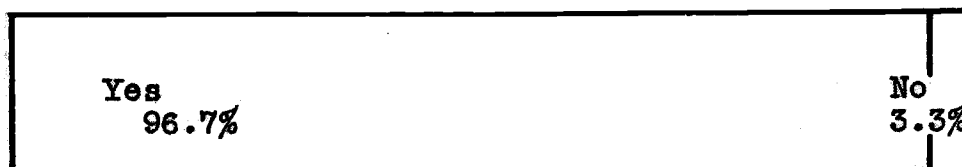
9. Does the brighter boy accomplish more by using instruction sheets?

Figure 8

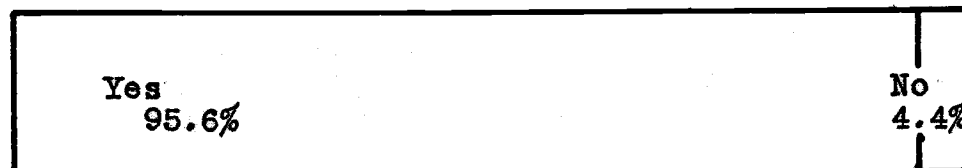
Progress of the High I.Q. Student
by Use of Instruction Sheets



(Yes 73, No 4, Total 77) Returns from small schools



(Yes 59, No 3, Total 62) Returns from large schools



(Yes 132, No 7, Total 139) Returns from all schools

Figure 8 speaks strongly for the use of instruction sheets in teaching students with a high I.Q., the response of 96.7% being the highest to any question in this study. The sharp contrast between figures 7 and 8 may be due to the fact that instruction sheets are phrased and illustrated in such a manner that only the brighter student can profit by their use.

10. Does the instruction sheet help the boy to get and retain all that is given in a demonstration?

Figure 9

Value of Instruction Sheets
as an Aid to Class Demonstrations

Yes 93.5%	No 6.5%
--------------	------------

(Yes 130, No 9, Total 139) Returns from all schools

One of the strongest claims for the use of instruction sheets is that they have value in following up demonstrations. One might say that the better illustrated sheets would have a greater value in follow-up of demonstrations.

11. Do you consider the reading level of the pupil?

Figure 10

Pupil Reading Level and Instruction Sheets

Yes 87% *	No 13%
--------------	-----------

(Yes 121, No 18, Total 139)

* Read: 121 teachers (87%) consider the reading level of students.

The majority of teachers (87%) reply very definitely that they consider the reading level of the pupil in preparing instruction sheets.

12. Do well written instruction sheets help the boy to analyze his job?

Figure 11

Job Analysis and Instruction Sheets

Yes 92%	No 8%
------------	----------

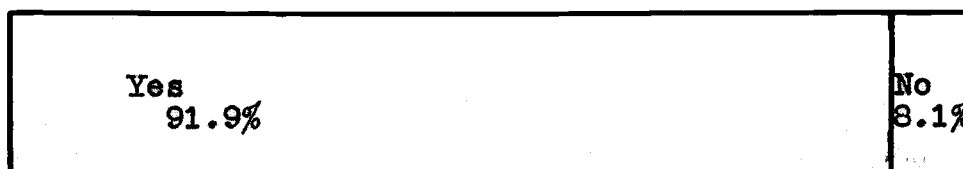
(Yes 132, No 11, Total 143)

The ability to analyze a job has been stressed by many writers as one of the most important phases of shop work. Over 90 per cent of the teachers replying to this question believe that the ability to analyze a job is greatly strengthened by the use of instruction sheets. However, there is no way for the reader to know from a study of this diagram how many of the teachers stress job analysis in their instruction sheets.

13. From your experience with instruction sheets does their use train the student to attack his work in a systematic way?

Figure 12

Value of Instruction Sheets in
Training for Systematic Attack of Job



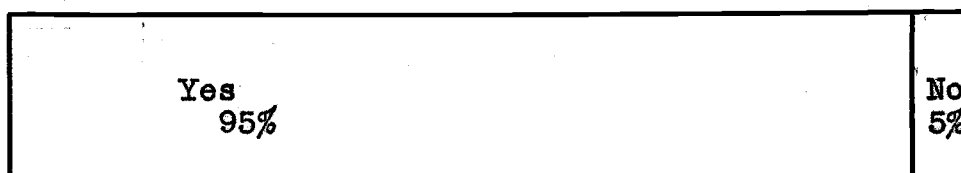
(Yes 125, No 11, Total 136)

In the opinion of the teachers replying to this study, systematic attack of a job and the analysis of a job are of equal importance. The teacher who has been in the habit of using instruction sheets which outline the work step by step (the job sheet as an example) would probably reply in the affirmative to this question.

14. Do instruction sheets help solve the problem of the management of large classes?

Figure 13

The Value of Instruction Sheets in the
Management of Large Classes



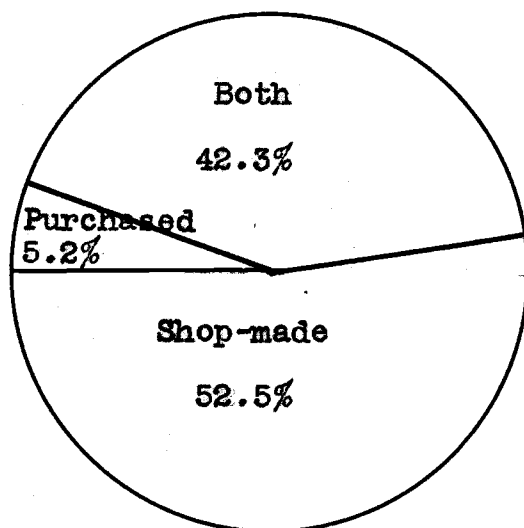
(Yes 137, No 6, Total 143)

The affirmative reply to the above question is almost 100 per cent in favor of instruction sheets. It has been claimed that the instructor is released from many unnecessary details, and thus his time can be given to a closer supervision of shop activities.

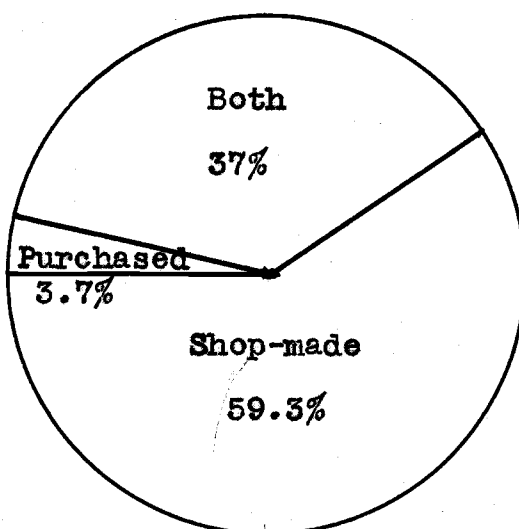
15. Do you make your own instruction sheets?

Figure 14

Shop-made and Purchased
Instruction Sheets



(Shop-made 41, Purchased 4, Both 33, Total 78)
Schools in small communities



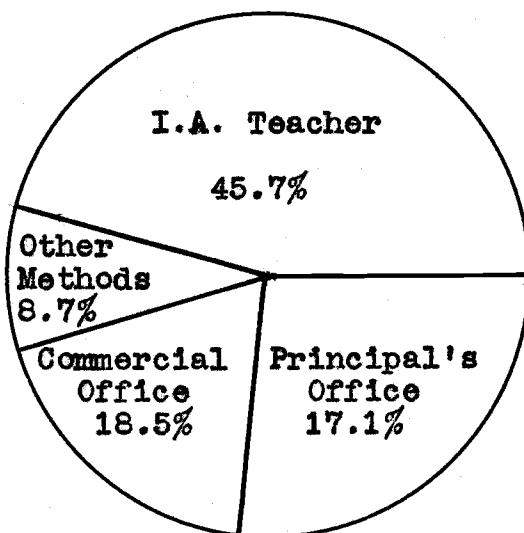
(Shop-made 38, Purchased 2, Both 24, Total 64)
Schools in large communities

Over half of the returns from the schools in the small and the large communities show that the teachers make their own instruction sheets. (See Figure 14.) The survey also shows that 6.8 per cent more of the teachers in the large schools make their own instruction sheets, which is not a high percentage when one would expect to find much better facilities in the larger schools for duplicating sheets.

16. If you use your own instruction sheets, who does the duplicating?

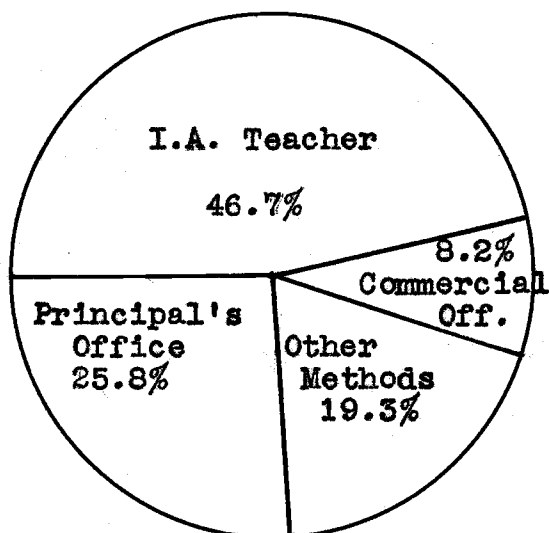
Figure 15

Sources for Duplicating Instruction Sheets



(Industrial Teacher 32, Principal's office 19,
(Commercial office 13, Other methods 6)
Schools in small communities

Figure 15 (Cont'd)



(Industrial arts teacher 29, Principal's office 16, Commercial Office 5 Other methods 12)

Schools in large communities

In Figure 15 about one-half of the returns from both communities show that the teacher does his own duplicating and that one-fourth is done in the principal's office. For other methods, the following were used in the small schools: N.Y.A. help 2, blueprinted 3, office-practice class 2, secretary to board 1, and print shop 1. In the large schools the following Other Methods were used: Print shop, N.Y.A., superintendent's office, industrial arts office, supervisor's office, and a local blueprint company.

17. Would you use more sheets of your own making if you had the time for their preparation?

Figure 16

Shop-made Sheets in
Relation to the Time Element

Yes 87.8%	No 12.2%
--------------	-------------

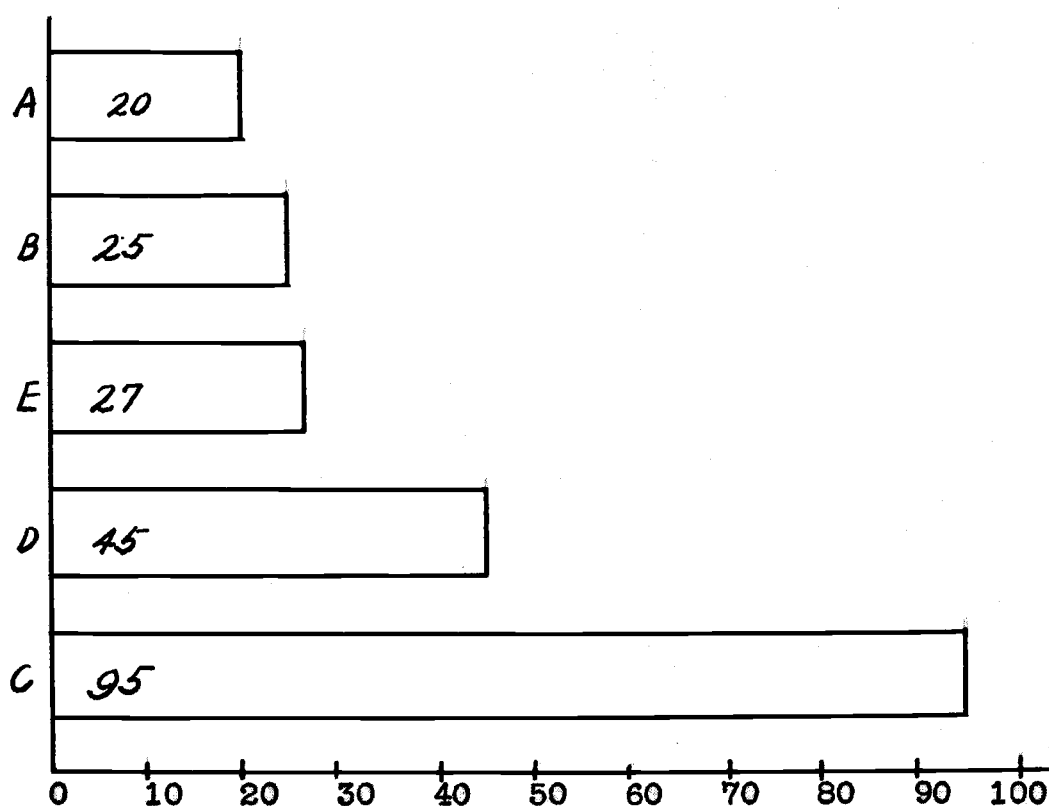
(Yes 123, No 17, Total 140)

In spite of a number of disadvantages which develop from the use of instruction sheets, a study of Figure 16 would indicate that the time element was the biggest hindrance to the preparation of instruction sheets. Better facilities in the shop department for duplicating sheets might help from the standpoint of the time element, although methods of duplicating as shown in Figure 15 seem adequate.

18. Are your instruction sheets typed, hectographed, mimeographed, blueprinted, or prepared by other methods?

Figure 17

Methods of Duplicating Instruction Sheets



Frequencies A. Typed, B. Hectographed, C. Mimeographed,
D. Blueprinted, E. Other methods

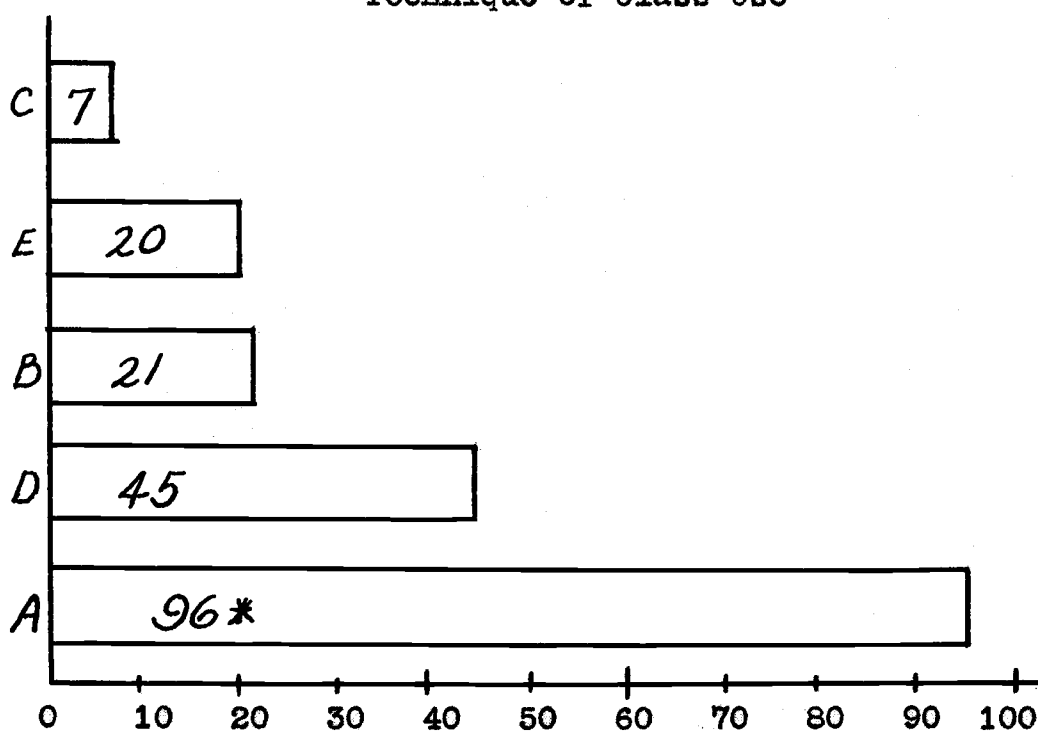
Of the eight methods used in duplicating instruction sheets as shown in Figure 17, the mimeograph method was used to the greatest extent. That may have been due to the economy of the method, and it may be that schools were better equipped for this particular method of dupli-

cation than for any other. The blueprint method was used with equal frequency in the small and the large communities. The hectograph method was used more often in the schools of the small communities, while instruction sheets made by the printing method were found to be used only in schools of the large communities.

19. Check the different ways you use instruction sheets in class.

Figure 18

Technique of Class Use



Frequencies

* Read: Ninety-six teachers distributed written instructions as single sheets.

A. Handed out as single sheets, B. Glued to sheet metal, C. Fastened between celluloid, D. Mounted on cardboard and shellacked, E. Other methods.

Slightly over half of the responses from the small and the large community schools (50.7%) show that shop teachers still pass out written instructional material as single sheets, while approximately one-fourth (23%) use instruction sheets fastened to cardboard.

20. What is the average length of the instruction sheet you use? Give pages.

Out of 134 replies to the above question, 67.1% of the teachers in the combined communities used instruction sheets of one page, while about one-fourth (26.1%) used instruction sheets of two pages. The rest of the teachers used sheets of three and four pages. From the standpoint of economy and ease of handling, the one-page instruction sheet seems to be the best.

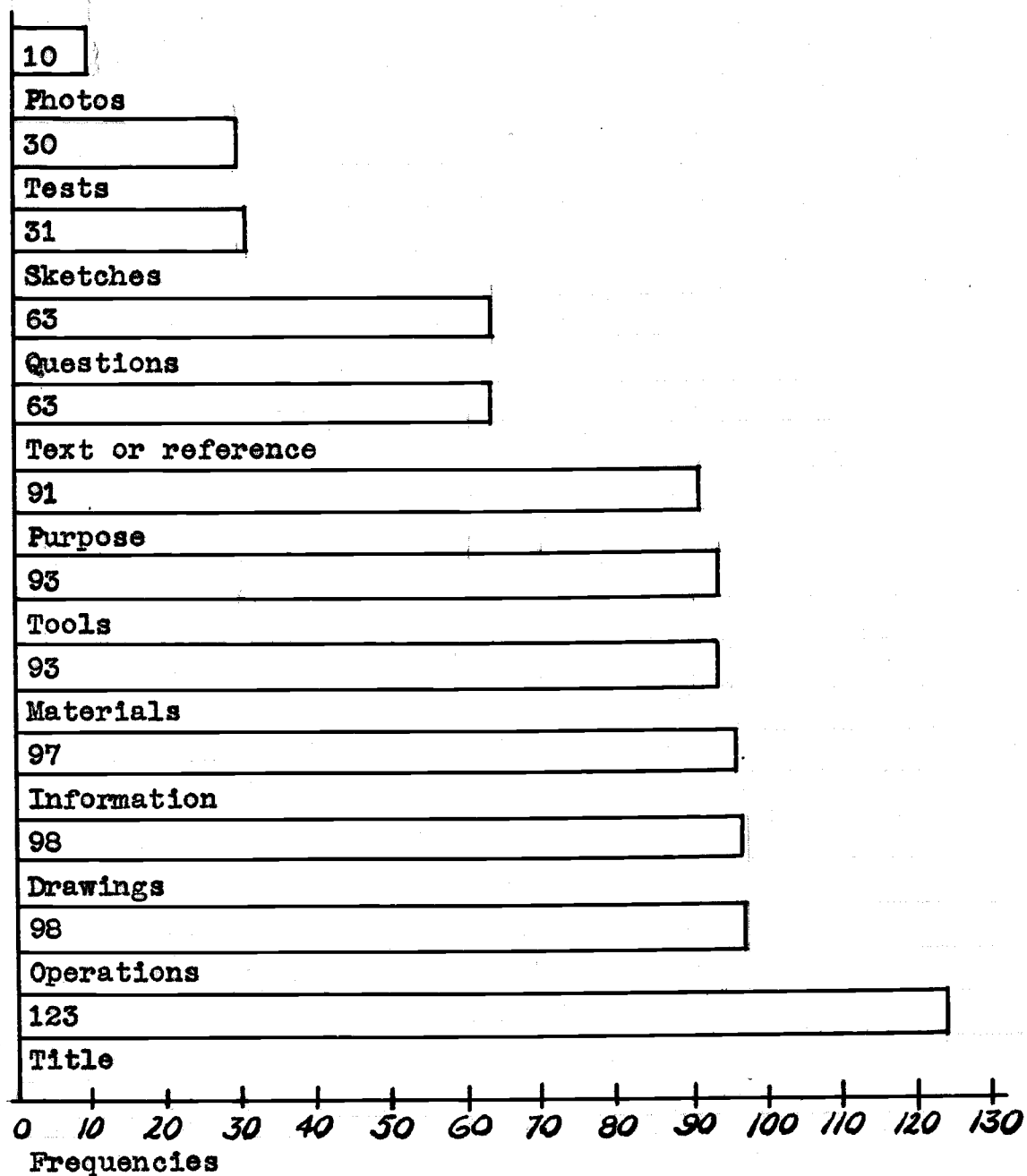
21. Check the features you include in most of your instruction sheets. Title (123), purpose (91), tools (93), materials (93), information (97), operations (98), text or reference (63), drawings (98), photos (10), place for sketches (31), questions (63), and tests (30).

The first seven features in Figure 19 (reading from bottom to top) were considered the most important by all teachers of this study. References and questions were considered one-half ($1/2$) as important as the title, while tests and sketches ranked one-fourth ($1/4$) as

important. Photographs were used by a very small percentage of teachers. The expense involved no doubt would be the main objection to their use.

Figure 19

Features Included on Instruction Sheets



22. Do you buy instruction sheets in loose-leaf form?

Figure 20

The Use of Purchased Instruction Sheets

Yes 22.4%*	No 77.6%
---------------	-------------

(Yes 15, No 52, Total 67) Small communities

Yes 16%	No 84%
------------	-----------

(Yes 9, No 49, Total 58) Large communities

Yes 19.2%	No 80.8%
--------------	-------------

(Yes 24, No 101, Total 125) Both communities

*Read: Of the 67 teachers answering this question 15 or 22.4% purchased instruction sheets for class use.

A very small percentage of teachers from the small and the large communities buys instruction sheets at all, according to Figure 14 (5.2% in the small schools and 3.2% in the large schools). Teachers of the small community schools purchase 6.4% more of the loose-leaf type of sheets.

23. Do you purchase bound sheets known as work books?

Figure 21

Purchased Work Books

Yes 44%	No 56%
------------	-----------

(Yes 33, No 42, Total 75) Small communities

Yes 24%	No 76%
------------	-----------

(Yes 14, No 44, Total 58) Large communities

Yes 35.4%	No 64.6%
--------------	-------------

(Yes 47, No 86, Total 133) Both communities

A comparison of the teachers (Figures 20 and 21) in the small and the large communities shows a greater percentage of the small community teachers using both single sheets and bound sheets known as work books. This would be expected when out of the total number of sheets used, a greater percentage of sheets is made in the schools

of the large communities (52.5% for small communities and 59.3% for large communities.)

24. Does each student have his own individual work book?

Figure 22

Number of Individual Work Books

Yes 38.9%	No 61.1%
--------------	-------------

(Yes 28, No 44, Total 72) Small communities

Yes 40.7%	No 59.3%
--------------	-------------

(Yes 24, No 35, Total 59) Large communities

The percentage of individual work books used, as shown in Figure 22, is slightly greater in the schools of the large communities, perhaps because of better facilities within the school for making such sheets, but Figure 21 shows that the greater percentage of work books purchased are bought in the schools of the small communities.

25-A. Would you use more of the published sheets if they were better illustrated with drawings and half-tones?

Figure 23

The Use of Published Sheets in Relation to Cost

Yes 76.4%	No 23.6%
--------------	-------------

(Yes 81, No 25, Total 106) All schools

25-B. Would you use more of the published sheets if they were cheaper?

Yes 80.1%	No 19.9%
--------------	-------------

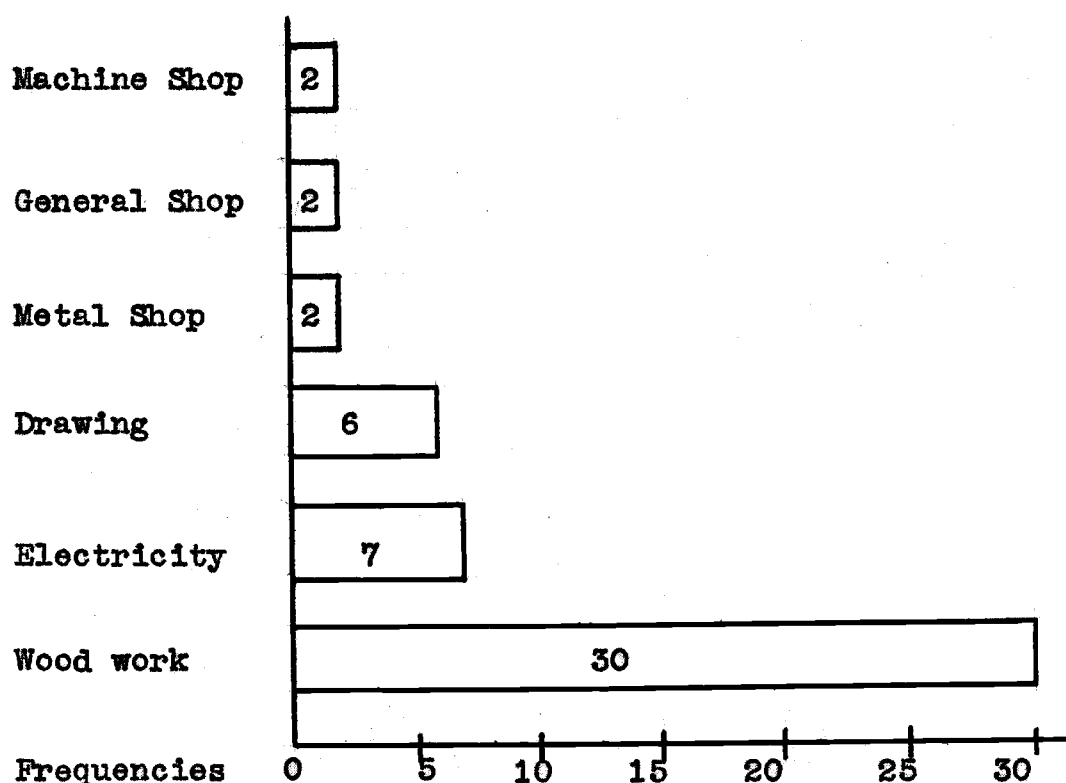
(Yes 85, No 18, Total 103) All schools

From a study of Figure 14, the reader would conclude that purchased sheets are used very little as a teaching device by teachers in the small and the large communities. The combined return shows that 76.4% of the teachers are interested in: (1) purchased sheets which are better illustrated with drawings and half-tones, and (2) 80% of the teachers would use more published sheets and work books if they were cheaper. The implication would be that a work book published today meeting these two requirements would be exceedingly popular.

26. In what subjects do you find the best work books being published today?

Figure 24

Field of Published Work Books

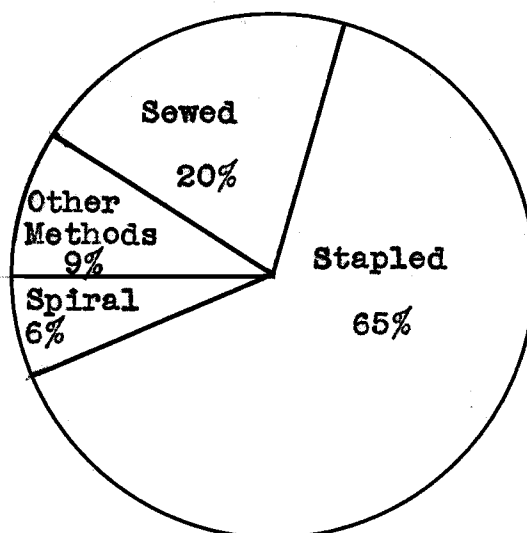


Of the six kinds of work books being used, as shown in Figure 24, over half of the returns (61%) show that the best work books are found in the field of woodworking. The reader would expect this to be true, as most of the early instruction sheets were written in the field of woodworking.

27. What type of binding is used in assembling your work books?

Figure 25

Type of Binding



(Stapled 56, Sewed 18, Spiral 4, Other Methods 8, Total 86)

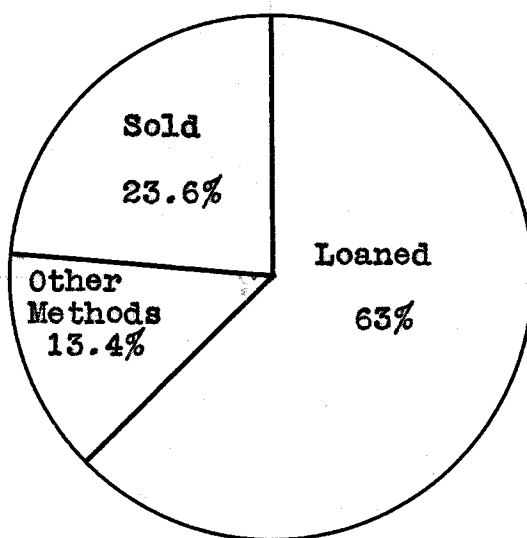
Schools in small and in large communities

Sixty-five per cent of the returns from the combined schools show that work books are fastened with staples. The twenty per cent that were sewed were largely in schools equipped to teach printing.

28. Is the work book lent to the student, sold to the student, or distributed by other plans?

Figure 26

Class Use of Work Book



(Loaned 59, Sold 22, Other Plans, 12 Total 93)
Schools in small and in large communities

The most common method used by teachers from both communities was to lend work books to the students. Nearly one-fourth, or 23.6%, sold the work books outright to the students. Under "Other methods" the following were used: placed on shop shelf in the library, furnished by school, and furnished to student on payment of shop fee.

29. Is the work book used up (consumed) by the pupil during the year or semester?

Figure 27

Length of Time Work Books are Used

Yes 14%	No 76%
------------	-----------

(Yes 20, No 64, Total 84)

From small and large communities

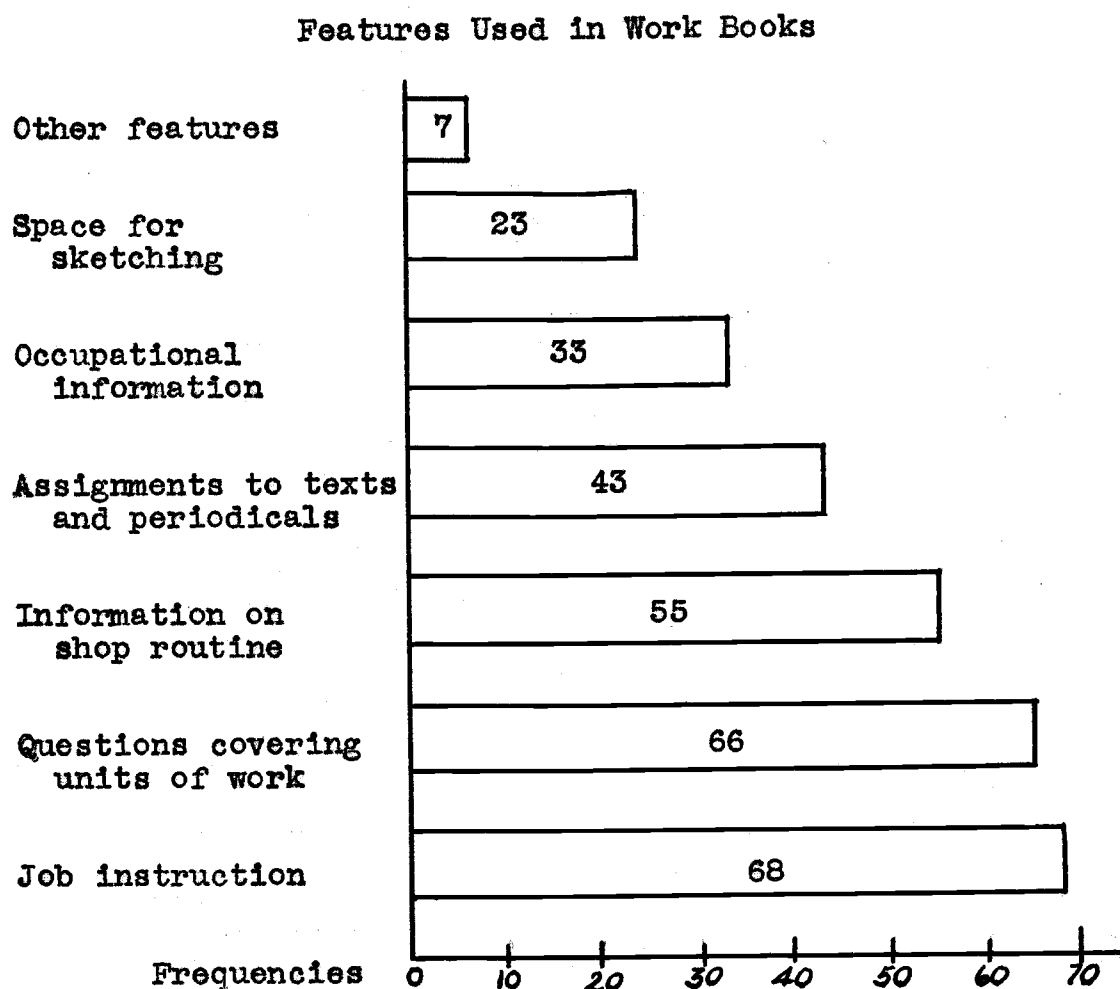
Slightly over three-fourths of the teachers (76%) who replied to this question used work books longer than a year and did not permit each pupil to consume or use up a copy. Several teachers replied to this question by saying that their work books were planned for two school years.

30. If you sell shop-made work books to the students, how much do you charge?

Sixteen teachers replied to this question, with the lowest charge of five cents, the highest one dollar, and the average price, twenty cents. Some teachers said the cost of the work book was dependent upon whether it was for junior high school or senior high school shop work.

31. Check features included in work books you use.

Figure 28



Such features as "job instruction" and "questions" on various units of work rank as the most important in this study. Guidance through occupational information is becoming a necessary part of shop work books as shown by Figure 28. Under "other features" safety instruction was listed by several teachers as a vital part of a good work book.

CHAPTER IV

SUMMARY AND RECOMMENDATIONS

This study has been built around the four major problems given in the introduction, namely: (1) definition of terms as applied to instruction sheets, (2) brief history of the beginning and the development of written instructions, (3) favorable and unfavorable criticisms of instruction sheets and (4) teachers' attitudes on instruction sheets, obtained by a survey. A summary of the first three problems has been given at the end of Chapters I and II. The data presented in Chapter III are based on the experience of teachers who have used instruction sheets from one to twenty-five years.

1. Table I (See Chapter III) reveals that instruction sheets have been used most successfully in:

- a. Woodwork in the ninth and tenth grades,
and in the unit shop program
- b. General metal work in the elementary shop
and in the general shop program
- c. Mechanical drawing in the elementary shop
and the unit shop program
- d. Teaching electricity in the elementary
shop, with equal success in the general
shop and unit shop programs

- e. Teaching miscellaneous subjects in the unit shop program, with auto mechanics leading in the eleventh and twelfth grades

2. Figure 1 reveals that the use of instruction sheets increases and decreases at approximately the same ratio among teachers with one to twelve years' experience as among those with thirteen to twenty-five years' experience. Figure 1 also shows that teachers who have contributed to this study have used instruction sheets on an average of seven years.

3. In spite of the fact that job sheets have been more severely criticized than all other kinds of sheets, this study reveals that job sheets are used to a greater advantage than all other kinds.

4. This study shows that about seven-eighths of the teachers (87.4%) have found that instruction sheets make definite contributions in the management of large classes, the teaching of related information, the analysis of jobs, the giving of class demonstrations, and in the promotion of the individual progress of pupils.

5. Almost all of the teachers (95.6%) believed that the brighter boy accomplished more by the use of instruction sheets, while only 29.2% of the same group said that the duller pupils accomplished more.

6. From a study of Figures 14 and 15 it is shown that the shop teacher, in addition to his regular classroom work, has the responsibility of making over fifty per cent (50%) of the instruction sheets used. Out of the total number made within the school, the teacher himself makes 45% of the sheets he uses. In spite of the fact that many new methods of duplicating school material have recently appeared on the market, the mimeograph method is still used to the greatest extent (See Figure 17).

7. The average length of instruction sheets used by most of the teachers in this study was one page. These are handed out as single sheets in over 50% of the cases. The single sheet seems to be more economical and also easier to handle.

8. A collection of instruction sheets dealing with a particular subject or subjects bound together is known as a work book. The subject has not been dealt with to any extent by recent writers, but the author has included several questions in the survey in order to determine the trend of their usage. Work books, whether shop made or purchased, seem to be slowly but increasingly becoming a necessary part of the shop teacher's equipment. The high cost of published sheets and the lack of good illustrations and drawings on those that are printed have a decided influence on the number purchased.

From a study of the six subjects listed in Figure 24, wood work offered the best and the largest number of published work books today. Sixty per cent (60%) of the teachers have found from experience that the best way to use the work books is by lending the books to the students. By using this method the books are not consumed (used up) during a single course, but can be made to last over a period of two school years.

Recommendations:

Since the job-sheet type of instruction sheet has received the greatest amount of criticism by writers, and since the job sheet is the most commonly used of the five studied in this survey, it is recommended that teachers who make their own sheets, and publishers of commercial job sheets give more attention to sheets which place additional emphasis on student planning and analysis of the work.

Since approximately one-third of the teachers believe that the low I.Q. student gets no more out of a course by the use of instruction sheets, and since 95.6% of the teachers believe that the high I.Q. student gets more out of a course where such sheets are used, it is recommended that shop teachers give more thought to the planning of sheets which can be read and interpreted by

the students in the lower I.Q. brackets.

Since about 55% of the sheets are shop made, and approximately seven-eighths (87.8%) of the teachers would make more shop-made sheets if time permitted, it is recommended that a few advanced students of the drawing classes be trained in the construction of sheets, and the reproduction of drawings and sketches, and that part of their time be given to filling this need. Of the teachers questioned, 76.4%, would use more of the published sheets, if such sheets were better illustrated, and if they were cheaper. It is recommended that the publishers of work books produce books that are more clearly and completely illustrated.

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APPENDIX

NEW TRIER TOWNSHIP HIGH SCHOOL

During the past fifteen or twenty years much has been written in favor of, and in criticism of the use of the individual instruction sheet, in teaching the various industrial arts courses.

In cooperation with the Department of Industrial Education of Oregon State College a survey is proposed to determine whether;

- (1) the use of instruction sheets is increasing or decreasing,
- (2) the shop teacher can "put across" his work more effectively by the use of well written instruction sheets,
- (3) the trend is toward shop-made instruction sheets or purchased sheets,
- (4) the present trend is away from single sheets and toward work books.

These are a few of several important problems included in this study.

As one interested in the field of industrial arts, you probably will be willing to cooperate in such a survey. This study will take only ten minutes of the teacher's time to check.

Please use the enclosed postal card to indicate the number of forms you would be willing to distribute among the teachers of your staff. They will be forwarded to you, with return postage enclosed.

Sincerely yours,

DEFINITION OF INSTRUCTION SHEET:

An instruction sheet is any form of written instruction or outline placed in the hands of students for their guidance. This includes:

JOB SHEETS, which tell how to do each step of a complete job.

Example: "How to Make a Taboret."

OPERATION SHEETS, which center around the doing phase of instruction.

Example: "How to Center Stock in a Lathe."

INFORMATION SHEETS, which deal with facts related to a course of instruction.

Example: "Copper and its Uses in Industry."

ASSIGNMENT SHEETS, which are designed to outline a unit of learning.

Example: "A Study of the History of Shellac."

PROCEDURE SHEETS, which are pupil-made outlines of operations, or "steps" in a given job. They contain such information as tools, materials, a sketch of the project, and the "steps" or job procedure in sequence.

1. How long have you used instruction sheets? Approx. time in years. ()
2. Is your use of instruction sheets: Increasing? ()
Decreasing? ()
3. Which kind or kinds of sheets have you used:

To the best advantage?	(Job Sheets.....()
	(Operation Sheets.....()
	(Information Sheets.....()
	(Assignment Sheets.....()
	(Job Sheets.....()
	(Operation Sheets.....()
To the least advantage?	(Information Sheets.....()
	(Assignment Sheets.....()
	(Procedure Sheets.....()
4. Do students learn the names of tools and materials much more quickly and thoroughly by the use of instruction sheets?
Yes _____ No _____
5. Do instruction sheets give a better understanding of related information which would often be neglected in oral instruction?
Yes _____ No _____

6. Do you have difficulty in getting students to follow instruction sheets? Yes _____ No _____
7. Do you find instruction sheets increase individual progress? Yes _____ No _____
8. Will the boy with a low I.Q. get more out of the course by using instruction sheets? Yes _____ No _____
9. Does the brighter boy accomplish more by using instruction sheets? Yes _____ No _____
10. Does the instruction sheet help the boy who cannot get and retain all that is given in a demonstration? Yes _____ No _____
11. Do you consider the reading level of the pupil? Yes _____ No _____
12. Do well written instruction sheets help the boy analyze his job? Yes _____ No _____
13. From your experience with instruction sheets does their use train the student to attack his work in a systematic way? Yes _____ No _____
14. Do instruction sheets help solve the problem of the management of large classes? Yes _____ No _____

SHOP MADE INSTRUCTION SHEETS

15. Do you make your own instruction sheets (____), or purchase them (____), or use a combination? (____)
16. If you use your own who does the duplicating: Yourself? (____), principal's office? (____), commercial office? (____), other methods? (____)?
17. Would you use more of your own making if you had the time for their preparation? Yes _____ No _____
18. Are your instruction sheets typed? (____), hectographed? (____), mimeographed? (____), blueprinted? (____), black and white prints? (____), other methods? (____)
19. Check the different ways you use instruction sheets in class.
 - a. Handed out as single sheets. (____)
 - b. Glued to sheet metal and hung in shop room. (____)
 - c. Fastened between celluloid. (____)
 - d. Mounted on cardboard and shellaced. (____)
 - e. Other methods. (____)

20. What is the average length of the instruction sheet you use?
Give pages. (_____)
21. Check the features you include in most of your instruction sheets. Title (____), purpose (____), tools (____), materials (____), information (____), operations (____), text or reference (____), drawings (____), photographs (____), place for sketches (____), questions (____), tests (____).

DEFINITION OF A WORK BOOK:

A work book is a set of instruction sheets of a particular subject bound together for convenience in handling.

22. Do you buy instruction sheets in loose-leaf form? Yes____ No____
23. Do you purchase bound sheets known as work books? Yes____ No____
24. Does each student have his own individual work book? Yes____ No____
25. Would you use more of the published sheets if they were better illustrated with drawings and half tones? Yes____ No____
If cheaper? Yes____ No____
26. In what subjects do you find the best work books being published today?
Subjects _____
Title _____
Author _____
27. What type of binding is used in assembling your work books?
Stapled (____), sewed (____), spiral (____), other methods (____)
28. Is the work book loaned to the student, (____) or sold to the student, (____), or other plans? (_____)
29. Is the work book used up (consumed) by the pupil during the year or semester? Yes____ No____
30. Check features included in work books you use.
- a. Information relating to shop routine.....(____)
 - b. Occupational information relating to
guidance.....(____)
 - c. Assignments to texts and periodicals.....(____)
 - d. Questions covering each unit of work.....(____)
 - e. Job instruction.....(____)
 - f. Space for sketching.....(____)
 - g. (Other features) _____
-

31. If you sell shop-made workbooks to the students how much do you charge? (_____)

Please write name here: _____

School _____

Town or City _____

State _____

Comments: _____

OREGON STATE COLLEGE
Department of Industrial Arts
Corvallis

HOW TO MAKE A DRAWER SLIDE

General Information:

A satisfactory test for good drawer construction is the ease with which the drawer opens and closes. This depends upon the construction of the slides on which the drawer rests, as well as the construction of the drawer. Slides carefully constructed and properly fastened to the rails give additional strength to the furniture.

Procedure:

MAKING SLIDES

1. Figure 1 shows a drawer slide made from a solid piece of wood. The rabbet can be formed on the universal saw, the jointer, or with a rabbet plane. See operation sheet No. 68 for further instructions.
2. Figure 2 shows a slide made from two pieces fastened together with screws and glue. Scrap materials can be utilized by this method.

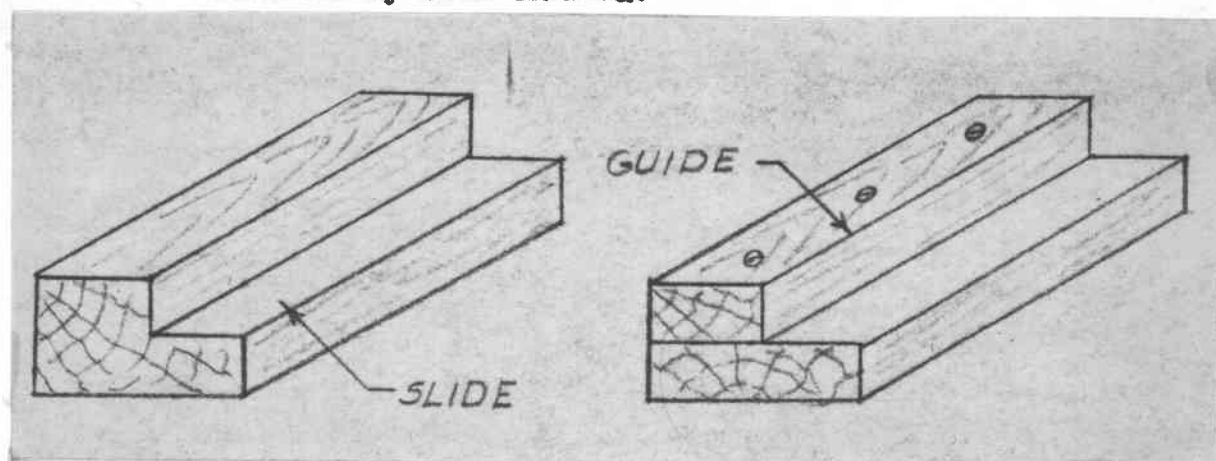


Fig. 1

Fig. 2

FITTING AND FASTENING SLIDES

3. Fit the slides to the table by making them the same length as the distance from the inside of front rail to the inside of back rail. Fig. 3.
4. Cut wood strips approximately $\frac{3}{4}$ " x 1" and fasten to the rails with screws as in Fig. 3. Adjust position of strips until top edges of slides are flush with opening cut in front rail to receive drawer.

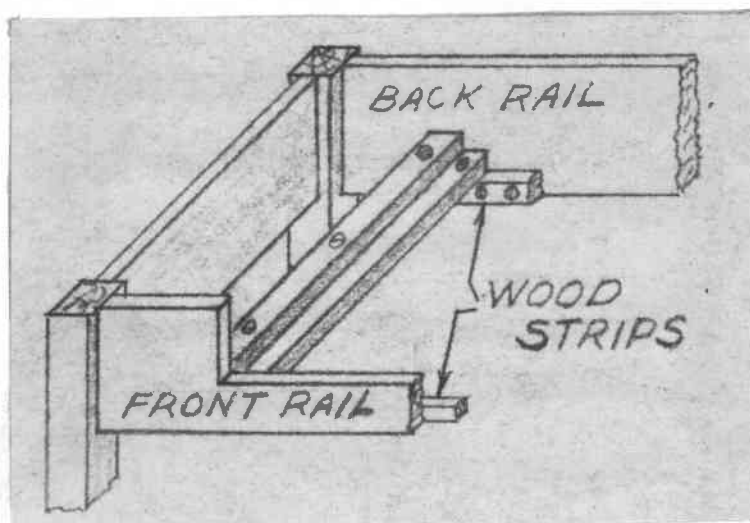
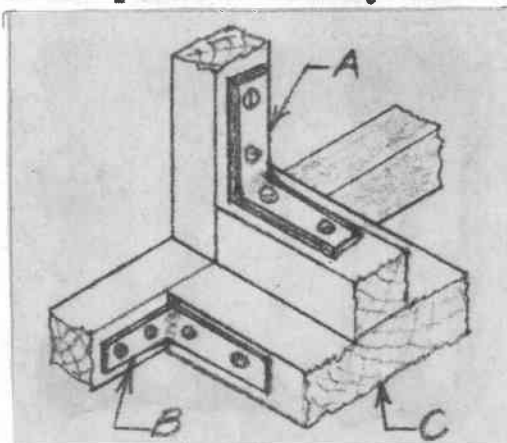


Fig. 3.

5. Figure 4 illustrates the method to be used where support strips are not used. This method makes possible a deeper drawer. Two angle irons (A and B) support and brace the slides.
6. Construct a double drawer slide as shown at Figure 4 (C). This method can be used successfully where drawers are to be placed side by side.



References:

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2. Brown and Tustison, "Instructional Units in Hand Woodwork", p. 182-184.
3. Fryklund, V. C and Laberge, A. J. "General Shop Woodworking", p. 68-69.

Questions:

1. What kind of screws should be used in fastening the slides to the wood strips? Why? (See Fig. 3)
2. Make a sketch of three kinds of corner braces that could be used at (A and B) in Fig. 4.
3. How would the front of the drawer be affected if the top edges of the slides were not flush with the bottom edge of the opening cut in the front rail?
4. What part of the drawer slide should be perfectly smooth? Why?

Sheet 1 of 2.

Information - A.

OREGON STATE COLLEGE
Department of Industrial Arts
Corvallis

COPPER AND ITS USES IN INDUSTRY

GENERAL INFORMATION:

Copper is one of the very important elements in industry, being easily distinguished by its peculiar red color.

HISTORY

Copper and copper alloys were known and used by the Egyptians in 4700 B.C. The Chinese had discovered and were using copper in certain phases of their arts and crafts as early as 2500 B.C. Some of the early copper came from the island of Cyprus; hence the Latin name: Cyprium.

CHARACTERISTICS AND PROPERTIES

Copper is ductile and malleable. A ductile metal is one that can be drawn out into a very thin wire. A metal capable of being extended and shaped by pressure, or by hammering is said to be malleable. While copper is malleable, repeated hammering or drawing hardens it, and causes it to become brittle. To overcome the hardening process copper is heated to a very dull red and immediately dropped into cold water. This is known as annealing.

COPPER ALLOYS (COMBINATIONS WITH OTHER METALS)

Copper plus tin equals bronze.

Copper plus zinc equals brass.

Copper plus nickel equals monel metal.

USES

Copper is consumed in large quantities today. It is extremely valuable in many industries, of which the following fields are of major importance: electricity, mechanical appliances, allor metals, money coinage, munitions of war, ship-building, architecture and the arts and crafts.

Questions:

1. Give a definition of an alloy.
2. A penny of one cent coin is a copper alloy.
Give the names of the other metals used.
3. Explain the meaning of the word "anneal".
4. Give three uses for bronze.
5. Give the names of four copper alloys.

References:

The New International Encyclopedia, p 56-60.

Sheet No. 1.

Assignment W.F.

OREGON STATE COLLEGE
Department of Industrial Arts
Corvallis

The Study of Shellac

Shellac was very valuable to the ancients, but it is much more valuable to the modern world, and will have a far greater value in the "artistic and commercial development of tomorrow." The earliest written record on shellac was by the Roman Historian Pliny, in 77 A.D. Its earliest uses were for making beads, amulets, bracelets and rings, to enrich the appearance of certain rulers in India. Many of the early explorers found the product in wide use by the Orientals, and as a result of trading the new product has become known all over the world.

Few products of industry find such varied and extensive uses as shellac. The fact that shellac gives a soft, waxy finish for furniture and interiors rather than a brilliant gloss, makes it in great demand among painters, decorators, finishers and furniture manufacturers. Aeroplanes, electrical appliances, insulating materials and making phonograph records are a few uses for it today.

Your Job

To be familiar with the production, manufacture and uses of shellac.

Directions

Read the following references:

1. Schmidt, Walter K. "Problems of the Finishing Room"
2. Griffith, Ira A. "Ess. of Wood Working" P. 194-195.
3. "The New Int. Encyclopedia" P. 432-433.
4. Crandall, E.A. "Shellac" (Pamphlet)

Results of Your Readings

Be able to answer orally, or to hand in a well written report based on the following questions:

1. Definition of the word "Shellac".
2. Where and how often is a shellac crop produced?
3. How is shellac gathered?

4. How is it cleaned and graded?
5. How is it bleached? Give the steps and materials used.
6. What liquid is used in "cutting" shellac?
7. Give several uses for stick shellac.
8. Mention at least a dozen uses for shellac.
9. Approximately how many pounds a year does the United States import? What is its value?