A Plan of Trade and Job Analysis for Organizing Printing Instruction in School or Plant Situations

Ngo Dinh Duyen

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A PLAN OF TRADE AND JOB ANALYSIS FOR ORGANIZING
PRINTING INSTRUCTION IN SCHOOL
OR PLANT SITUATIONS

BY
NGO DINH DUYEN

A thesis submitted
in partial fulfillment of the requirements for the
degree of Master of Science, Department of
Printing and Journalism, South Dakota
State College of Agriculture and
Mechanic Arts

January, 1964

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A PLAN OF TRADE AND JOB ANALYSIS FOR ORGANIZING
PRINTING INSTRUCTION IN SCHOOL
OR PLANT SITUATIONS

This thesis is approved as a creditable, independent investigation by a candidate for the degree, Master of Science, and acceptable as meeting the thesis requirements for this degree; but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Thesis Adviser

Date

Head of the Major Department

Date
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CHAPTER I

INTRODUCTION

The trade and job analysis approach to managerial and educational problems has been employed effectively in many situations, particularly in vocational instruction in schools and industry.

Training is the "tool for bringing harmonious and cooperative effort into management and labor." (13-161)*

The analysis of jobs, or in the broader sense, of trades, is concerned in considerable degree with the fundamental four B's of scientific management, namely, "There is one Best way to do anything," "There is one Best person to do that thing," "There is one Best method of training that person to do that thing," and "There is one Best method of motivating that person to do that thing in the prescribed way." (12-176) The view that proper training of workers is essential to sound management was found in the American Code of Personnel Administration, summarized by Thomas G. Spates in the following words:

Fourteenth [of the essential practices] is a training program designed to help everyone [on the payroll] perform, in the best known ways, the tasks that are assigned for the attainment of stated objectives. When things go wrong in any one or all of the many functions of general management, investigation has shown that over 80% of the errors and failures...

*Each citation in the thesis refers to the numbered work listed in Literature Cited. The first number refers to the entire work. The figure which follows the hyphen is the page number on which the reference begins.
are due to people who either don't know, can't do or don't care. Training is the only known method that will fill the gaps in knowledge, skill and attitudes that cause things to go wrong at all levels of organization ... (16)

The continuous flow of new methods, techniques and processes, the development of intricate equipment, and the massing of information in the printing trade, require constant upgrading of skills, knowledge, talents and abilities of personnel. Also, the functions and responsibilities of the foremen or shop supervisors, now more highly specialized and better organized, are focused upon the three important phases of plant organization: human relations, production, and training.

The "pick-up" method of learning a trade or training by "absorption," as Charles R. Allen called it (1-11) is time consuming. Neither does the doubtful procedure of "hit and miss" training pay for long.

The preparation for printing as an occupation, whether in the school shop or the commercial plant, demands that shop instructors or plant foremen know how to use and teach the correct, efficient, and economical use of materials and tools. Without an organized system of presentation, any training course becomes a jumbled mass of incoherent information. Trade and job analysis determines the content and sequence of subject matter which will provide well-balanced courses of instruction. Possible overlooked details and overlapping in the student's work may be avoided. Instructional analysis, set up on the basis of the most effective order of learning,
will accelerate the training of craftsmen and allow more effective "breaking in" of new men.

The internationally known Job Instruction Training (JIT) Program developed by the Training-Within-Industry (TWI) Division of the War Manpower Commission during the early days of World War II was a simple, fast, and logical plan using the job-breakdown method to teach "key men in industry (mostly foremen) how to be good teachers, so they could pass their know-how along to workers." (8) Instruction by the job-breakdown method results in much time saved, less confusion, less probability of accident, less tool and equipment damage, and a better degree of control over cost.

The quality and effectiveness of programs of trade and industrial education can be no better than the competence of the teachers. A study of Qualifications and Preparation of Trade and Industrial Teachers conducted by the Division of Vocational Education of the United States Office of Education, indicated that teacher educators, supervisors, and teachers were emphatic in selecting Trade Analysis and Course Construction, Methods of Teaching Industrial Subjects, and Development of Instructional Materials, as the three courses contributing the most to their teaching success. (21-43)

The analysis technique remains the best method of arriving at subject matter content for all levels of industrial education. Verne C. Fryklund further explains this:
There is no other way of delving into uncharted areas to determine what should be taught. There is little need for analyzing over and over again the charted and proved areas, but analysis should also be studied because it is very helpful in mastering teaching methods and in course development. The analysis technique has given identity and meaning to all shopwork. It will become more and more useful in industrial teacher education to those who want to be good teachers. (5)

Trade and job analyses also contribute to keep teacher educators, vocational instructors, in-plant training directors and foremen up to date on new developments in the trade and in education.

**Purpose of the Study**

The present work attempts to:

1. Elicit guiding statements on the purposes of trade and job analysis as a preliminary and indispensable step in the preparation of instructional material for vocational education.

2. Present the underlying principles applicable to the discovery, selection, organization, and classification of trade skill and knowledge for systematic and efficient instruction.

3. Prepare a plan of procedure based upon analytical techniques for analyzing the printing trade and its major divisions.

4. Offer practical suggestions for determining the scope, sequence and tabulation of the trade elements involved in the content inventory process.

It is hoped that the topics covered in this plan may give a quick working knowledge through an organized body of information on trade and job analysis techniques, and that the suggested analysis
procedure may serve as an aid for shop foremen, vocational teachers, and others engaged in printing instruction.

The basic fundamentals herein presented would also be useful to both trade instructors and vocational related subjects teachers in the: (a) preparation of instructional materials, (b) determination of the type of physical facilities required, (c) formulation of methods of presentation, and (d) elimination of obsolete material from courses of instruction.

Methodology of the Study

The library research method was used in gathering material for this study. A comprehensive list of books and periodical articles was prepared through systematic examination of bibliographical material such as: the Education Index, the Industrial Arts Index, the Book Review Digest, the listing of Master's Theses accepted by different colleges and universities in industrial education and particularly in graphic arts and related fields (15), Training Bulletins in Vocational Education, Summaries of Studies in Industrial Education published by the United States Office of Education, publications of the American Vocational Association, and of the National Education Association of the United States.

The titles on the list thus obtained were further checked as to contents, and only those with immediate relevance to the area of interest were retained for review.
Analysis of the source references provided a basis for selection of four publications from which the background material for this study was gleaned: *The Instructor, The Man, and The Job* by Charles R. Allen (1), *How to Teach a Trade* by R. W. Selvidge (14), *Trade and Job Analysis* by Verne C. Fryklund (6), and *Occupational Instruction* by Elroy Wm. Bollinger and Gilbert C. Weaver (3).

Apart from the writer's personal preference, these textbooks on the preparation of instructors for schools or industrial plants have definite advantages over other texts. Although the dates of their original publication appear to make the texts outdated, their thorough and original treatment of the subject remain of fundamental significance. They have been the most often quoted, referred to, and cited in the bibliographies of writings on industrial education. Their authors had gained recognition as authorities in the field, the methods and techniques suggested have been tried, tested for practical application and remain generally accepted. A check of catalogues of the well known publishing companies specializing in the field of technical and vocational education also proved that few newer books have been written which deal exclusively with trade and job analysis for instructional purposes.

The above texts and all other pertinent materials readily available were reviewed and analyzed, the essential features interpreted and weighed. A plan of trade and job analysis was developed which presented the basic principles in the simplest and most practical manner as they appeared to the writer.


**Scope of the Study**

This plan of trade and job analysis was developed from the teacher-student point of view instead of the producer or consumer point of view. It was limited to include only background material for understanding the purposes of trade and job analysis leading to a plan of analysis of the printing trade and its major divisions. No attempt was made to investigate the areas of management, curriculum planning techniques, teaching and testing methods, or any areas outside of analysis for instruction. Neither was any attempt made to examine the radical differences or outstanding similarities in trade and job analysis concepts and techniques.
CHAPTER II

TRADE AND JOB ANALYSIS

Terminology

For purpose of presentation of the trade and job analysis technique, the following definitions will be used:

**Occupation**
The economic activity that is the life-work of an individual. (7-373) It differs from "profession," which generally requires licensing and/or college education.

**Trade**
An occupation, exclusive of a profession, requiring manual or mechanical training and dexterity in which skill is applied to the design, manufacture, servicing, or repair of manufactured products. (10-16) There are two major classes of trades: the custom trades involving the production of things, and the service trades limited to the repair, overhaul, or installation of those things. Trades also may be classified as skilled or semi-skilled. When all jobs in a trade can be included in one division, or block, it is called a "single-block trade," as distinct from a "multi-block trade" which can be divided into several blocks.

**Job**
(1) A task performed by a student in order to develop skill or to "try out" the application of a principle; (2) a unit of a trade or task done by a worker in return for pay. (7-303) A job may include a few simple and repetitive operations requiring little or no skill, or it may include a succession of operations requiring a high degree of skill.

**Operation**
A definite set of machine-tool or hand-tool steps forming a convenient "doing unit;" generally considered the smallest practical unit for trade or job analysis work. (7-376) A unit operation occurs in the same form in many different jobs or a trade; for example, setting, proofing, correcting, and distributing type are basic operations.
in the printing trade. An operation may become a job in the occupational meaning when a worker is paid for performing it.

Definitions of Trade and Job Analysis

Webster's Third New International Dictionary defines "analysis" as "separation or breaking up of a whole into its fundamental elements or component parts."

William A. Williams in his handbook for teachers of vocational-industrial education subjects, points out the following common factors that appear in a number of definitions that have been applied to the terms "trade analysis" and "job analysis:"

a. A trade analysis is made up of a group of job analyses.

b. A trade analysis is a breaking down of the trade into jobs accomplished by the worker, and the essential related information that he must know to perform the jobs.

c. A job analysis is a breaking down of a job into manipulative operations performed by the worker, and the necessary safety precautions required to complete the operations.

Williams then synthesizes the above features into a composite definition:

A "trade and job analysis" is a listing of all the jobs a wage-earner must be able to do as he works at his trade, together with all the accompanying operations performed on each job, plus a listing of all the related trade information that he must know. (22-10)

Uses of Trade and Job Analyses

Many kinds of research activities in industry have been frequently confused with trade and job analysis for instructional purposes.
These activities are referred to as job descriptions, job specification, operation analysis, flow and process diagram, man and machine chart, responsibility analysis, time and motion study, and job classification. They are commonly used in: (a) employee recruitment and selection; (b) merit rating, wage determination, job and employee evaluation, placement, transfer, promotion and layoff; (c) improving personnel and public relations, bettering production; (d) determining job-time standards, developing production specifications; (e) estimating costs and budget requirements; (f) safety, health, and medical research; (g) vocational counseling and employee guidance.

In education, analyses are used for such specific objectives as:

To determine scientifically what needs to be taught.
To avoid teaching what is not needed.
To reveal relative emphasis required.
To assist in organizing functional instructional material.
To serve as a basis for valid and reliable testing.
To disclose a suitable sequence for teaching.
To show standards of achievement required.
To bring out suitable means and methods of teaching.
To assist in developing suitable time limits. (17-258)

**Trade and Job Analysis for Vocational Instruction**

When a craftsman becomes an instructor, his trade skill and knowledge alone will not assure him of being an effective teacher. A job printer, for example, may forget the time he spent learning how to hold a composing stick. The basic operations of the trade which he now does through habit may not be considered worth mentioning to the student. Because of his over familiarity with the work, he may skip over
essential details if he does not have an analysis which serves as a check list of the things his trainee must be able to do and must know in order to be proficient in the trade. This detailed inventory of what must be taught compares to a catalogue of the stock a merchant has to sell.

An excellent tradesman, when changing from production to teaching, may encounter difficulties such as (a) inability to determine functional teaching content, (b) inability to arrange trade materials on the basis of learning difficulty rather than production difficulty, (c) inability to distinguish between what must be taught as jobs and that which should be related information, (d) inability to plan for presentation of teaching materials and to select appropriate methods for rapid and thorough instruction, and (e) inability to handle students under instructional conditions.

To be an efficient shop instructor, the tradesman must be master of a new trade, that of teaching, with new operations and tools. Making a trade and job analysis is a necessary step in the preparation of instructional materials for vocational teaching. If the analysis is not complete, the instructor will probably omit many important details. If it is not exact, the student will be improperly trained. If the trade content is not correctly classified, the instructor will not know how to select the best materials and methods of presentation.

Successful teaching depends also upon careful analysis of each phase of the teaching job:
(a) Analysis of subject matter (what to teach).
(b) Analysis of students (whom to teach).
(c) Analysis of teaching facilities, equipment, etc.
   (with what to teach).
(d) Analysis of teaching methods (how to teach).
(e) Analysis of economic and social conditions in the
   community (functioning of teaching). (18-11)

This study is concerned with the first phase, or to be more
specific, with a practical plan for analyzing the printing trade to
provide orderly and systematic progression of instruction in the
field.

Sources of Information for Analyzing a Trade

Some of the most common means to get basic information for
making a complete trade and job analysis are:

1. Personal background of work experience. The tradesman per-
   forms the job and records in sequence on the analysis form every mo-
   tion he makes. In this step, accuracy is more important than speed.

2. Observation of others working at the trade. The analyst
   should focus his attention upon one operation at a time, and observe
   each phase of the job from start to finish. Each movement of the
   worker should be described exactly, and each tool or piece of equip-
   ment he touched in all operations should be listed.

3. Interviewing workers to prepare a master list of jobs and
   operations involved in the trade.

4. Consultation with experienced tradesmen, supervisors,
   instructors, and other persons who are occupationally qualified.
5. Use of a questionnaire. Inquiry blanks or forms covering the elements about which information is needed are sent to workers to be filled out and returned to the investigator.

6. Study of the literature on the trade: (a) Books on trade and industrial education. (b) Published and unpublished job analyses. In printing, three publications proved helpful for this purpose: 

*Teaching Apprentices in the Printing Trades*, a manual for instructors in schools of printing and for foremen having supervision of apprentices in printing plants, published by the Department of Education of United Typothetae of America (18); *Standards of Attainment in Industrial Arts Teaching*, a report of the American Vocational Association containing a list of 62 unit-operations in printing (2); and the *Composite Analysis of the Printing Trades*, a research project of the National Graphic Arts Association (9). The latter represented a compilation of the "best features found in many of the outstanding printing trade analyses" prepared by printing instructors and journeymen printers. (c) Trade books. These are excellent sources of related information and may be used to check technical or trade terminology familiar to workers in the field. (d) Trade periodicals, professional reports, pamphlets, manufacturers' manuals. These and other printed materials provide good analysis data and firsthand information regarding technological changes in the trade.
CHAPTER III

PROCEDURES FOR ANALYZING THE PRINTING TRADE

The following five distinct steps were used in developing this plan of analysis:

1. Analyzing the trade by major divisions or blocks.
2. Analyzing each major division of the trade by jobs.
3. Analyzing trade jobs by operations.
4. Analyzing each major division for trade information.
5. Assembling the trade and job analysis.

Analyzing the Trade by Major Divisions or Blocks

Reasons for Analyzing the Trade by Major Divisions—Trade analysis for unskilled or specialized workers performing semi-skilled jobs requires only an inventory of the specific operations concerned. There is no question as to analyzing by major divisions if the trade is a single-block trade. For skilled crafts such as printing, however, the analysis becomes more extensive.

The initial step in making the analysis is to break the trade down into major divisions or blocks. This makes possible a simpler, more orderly procedure, and reduces confusion because further analysis can be concentrated on one trade division at a time.

The preliminary classification of trade divisions is used to delimit training areas. In printing, the instruction may include the entire range of the trade, as in apprentice training, or it may cover
only one block of the trade. Thus, a compositor may become a wage-earner without knowing much about presswork.

Under production training conditions it is necessary to identify the blocks, but it is not always possible to rotate students according to the complexity of the blocks, nor to start with the least complex block. (6-72)

Determination and Classification of Major Divisions—"A major division may ordinarily be defined as a part of a trade that could conceivably be treated as it were a separate trade." (22-14) Each major division includes units of similar experience, abilities, materials, equipment, methods, or conditions, and has separate operations and information topics which generally are different from those in other divisions.

Some common bases for breaking down a trade into its major divisions or subdivisions are mentioned below with examples:

a. Type of tools or equipment used

   Machine composition: Linotype machine operations
                      Intertype machine operations
                      Monotype keyboard and caster operations
                      Phototypesetting machine operations

   Presswork: Platen presswork
                Cylinder presswork
                Rotary presswork

b. Kinds of materials used

   Platemaking: Stone
                 Metals
                 Gelatin
                 Paper
                 Rubber
                 Plastics
c. Type of service or product

Commercial or Job Printing
Books
Newspapers
Magazine (4)

Advertising
Reproduction
Decoration
Educational Media
Label
Money
Periodicals
Materials
Equipment
Tools
Machines (11-111)

d. Basic processes involved

Estimating
Laying out
Composing
Proofreading
Presswork (3-17)

Block cutting
Engraving
Platemaking
Stenciling
Embossing (11-111)

Although the approach used to analyze the trade by divisions may vary with individual preference, the content involved is exactly the same. (3-18)

In the past, many printers could do all types of printing operations. Today, the number of all-around printers is diminishing because each printing craftsman usually has a specialty which he does most of the time. With this general trend to specialization, instruction in printing is largely confined to one of these four basic types:
Relief printing (commonly called letterpress), Offset lithography, Intaglio printing (gravure and engraving), and Stencil printing (mimeographing and silk screen printing).

Regardless of the process employed, most printing work goes through four stages, each constituting a trade in itself: composition, platemaking, presswork, and bindery work.

The major divisions of a trade may be divided into smaller units or trade subdivisions. Thus, typesetting may be subdivided into hand typesetting and machine typesetting. Trainees in printing may specialize even further, for example, operating a particular make of typesetting machine in a compositing room.

The different divisions of a trade may be independent or related. The teaching content of an independent trade division has no relation to that of any other division, so it can be taught in any sequence. In a related trade division, the student needs the skill and knowledge he has acquired therein before he can progress through another division. A classification of major divisions of the trade, therefore, should be determined for the purpose of effective instruction.

Dividing the trade into divisions may also provide a natural grouping into payroll jobs or blocks.

The following list of work areas selected from the major fields in printing may be of use in planning the analysis of the trade by its major divisions and subdivisions.
1. Composition

Hand composition

Machine composition

- Linotype–Intertype machine operations
- Monotype keyboard operations
- Monotype caster operations
- Elrod operations
- Ludlow Typograph operations
- Phototypesetting work

Proofreading

Stonework

2. Platemaking

- Photoengraving
- Electrotyping
- Stereotyping
- Rubber and plastic platemaking

3. Presswork

- Platen presswork
- Cylinder presswork
- Rotary presswork
- Offset presswork
- Rotogravure presswork
- Copperplate presswork

4. Bindery

- Job bindery
- Edition and pamphlet bindery
- Blankbook and looseleaf bindery
5. Offset-Lithography stands apart as a separate trade group.

Suggestions for Analyzing the Trade by Major Divisions—

1. In making a preliminary listing of the major divisions of the trade, it is helpful to use a two-column worksheet with the following headings: (a) Name of the trade being analyzed, (b) left column: Divisions, (c) right column: Comment.

The tentative trade divisions are listed in the left column. It is advisable to make use of the Dictionary Of Occupational Titles (20), the Occupational Outlook Handbook (19-392), vocational guidance and career information on printing, and trade school catalogues, in breaking down the trade into its divisions and subdivisions. The suggestions or comments obtained through consultation with other printing craftsmen or instructors are recorded on the corresponding line in the column at the right.

2. In naming the major divisions of the trade, phrases rather than sentences are used.

3. To reduce repetition of trade activities, and to avoid confusion or overlapping in the later procedures, it is necessary to be consistent in using the same analysis approach throughout the entire listing. In their final form, the trade divisions are numbered for easier identification.

4. For convenience in analyzing the trade, various record forms may be used, such as large charts, index cards, and bound or unbound sheets. For purposes of illustration, the writer used sheets
8 1/2 x 11 inches in size. Only one side of the paper was used. The form, size, color, shape, and headings, however, should be suited to circumstance and need not conform to those herein described.

5. A sample record form for major divisions is shown in Figure I. Such a sheet should be the first page of the trade analysis. It carries the following information:

- Name of the trade
- Code of the trade
- Summary of the trade
- Major divisions of the trade

The first three items were obtained from the Dictionary of Occupational Titles. (20-1028) Information for item (d) was taken from the listing completed on the worksheets.

Analyzing Each Major Division of the Trade by Jobs

Reasons for Analyzing Major Divisions by Trade Jobs—In order that the trade may be reduced successively to smaller units and eventually to its instructional content, it is necessary to identify the jobs of each trade division before proceeding with more details.

The second step in making the trade analysis is to divide each major division into trade jobs.

In printing, like other trades which are composed of a number of distinct operations, the nature of the work and the range of available equipment make it impossible to organize class instruction permitting an entire class to work at one operation or job at the same time. The listing of all conceivable jobs that may occur in the
TRADE ANALYSIS

Trade ........................................... Compositor .......................................... Code Number .......... 444.010

Trade Summary
(Extracted from the Dictionary of Occupational Titles, published by the United States Department of Labor)

Perform any or all of the duties concerned with the hand and machine setting of type, the assembling of type and cuts in chases, and related duties prior to the actual printing operations. Is typically a skilled worker who has completed a lengthy apprenticeship and is thoroughly versed in type style and printed page make-up.

Major Divisions of Trade

1. Hand Typesetting
2. Machine Typesetting
3. Proofreading
4. Imposition
5. Lockup

Figure I. A sample record form for major divisions
Actual size: 8 1/2 x 11 inches
White paper
trade will furnish a basis for the shop teacher in planning instructional sheets to provide individual instruction for students who are placed at various stages of learning progress.

**Determination and Classification of Trade Jobs**—In agreement with the definitions previously given to the term "job," Bollinger and Weaver say of their interpretations: "A job is any type of work or undertaking either mental or manual, consisting of a series of operations which result in a finished or semi-finished job or service or product..." (3-50)

Trade jobs, work jobs, projects, and jobs are interchangeable terms according to many authors of textbooks in trade education. "A work job is to be thought of as a given task, as a definite quantity or piece of work accomplished. It is any single piece of work a man is called upon to perform in the course of his employment as a tradesman." (22-17)

There are three ways of setting up jobs: (a) by exercises, (b) by practical productive work, and (c) by a combination of the above.

From a theoretical standpoint, practical production jobs are better suited for manipulative skills training than are abstract exercises, which usually embody only a few operations and with no productive value.

Printing, as other indoor production trades, permits practical and typical trade jobs to be taught under actual working conditions which approximate trade situations.
Most production trades consist mainly of jobs of one type, classified as assembling, shaping, forming, service, maintenance, or technical. Typesetting, for example, is made up principally of assembling jobs. Making layouts and estimating are technical jobs because they do not themselves result in assembling activity, yet are essential for production. Cleaning, repairing and general upkeep of tools and equipment are maintenance jobs. Service jobs, such as manipulation of materials handling equipment, contribute only to easing production. Shaping jobs may be found in folding, box making, die-cutting, and embossing work.

Jobs selected for training should be typically representative of the trade, have instructional value and conform to the objectives of the courses of study. They must also interest the student and have some utilitarian value. They should be chosen so that succeeding jobs will provide opportunities for extending the student's skill and knowledge toward trade proficiency.

Successive jobs must be arranged in the order of learning difficulty, i.e., from simple to complex and from familiar to unfamiliar, rather than in good production order, although the order may often be the same. Jobs that require the fewest operations usually come first and those with most complex operations come last. Other factors concerning the instructional sequence will be discussed in the next analysis step.

It is impossible to decide beforehand what and how many jobs should be included in the educational program because the time
allotted and the equipment provided for instruction differ with the circumstances. The list of jobs would be best if reasonably complete, containing a greater number of items than could be taught in any school or plant, and permitting the teacher to select those most suitable to his teaching situation.

It is evident that the shop instructor who conducts his training courses on the basis of practical productive work will have, in addition to the planning work, many managerial problems not usually found in the exercise method.

Suggestions for Analyzing Major Divisions by Trade Jobs—

1. In preparing the list of typical trade jobs of each major division, it is convenient to use a worksheet carrying the following headings: (a) Name of the trade, (b) Title and identification number of major division, (c) left half page column: Trade Jobs, (d) right half page subdivided into six vertical columns with these captions: too large, too difficult, not typical, mere exercise, not appealing, acceptable.

The trade jobs are written down in no definite order as they come to mind. Printing textbooks, catalogues, trade magazines, and other trade analyses can be consulted for additional inventory. Separate worksheets should be used for each trade division. The list of trade jobs is revised for possible repetition or overlapping, then re-examined for completeness and appropriateness. Each item is evaluated by placing a check mark in the proper checking column.
2. Williams recommends four basic rules for trade analysis writing which he quoted from *Job Analysis*, a training and reference manual published by the War Manpower Commission (Washington, 1944) as follows:

   a. A terse, direct style should be employed.
   b. Each sentence should begin with a functional verb.
   c. The present tense should be employed throughout.
   d. All words that do not impart necessary information should be omitted. (22-18)

3. The title composed for each job should be specific and describe one typical trade job only. Examples in Hand Binding are:

   Make a memorandum pad
   Bind a photograph album
   Bind a photograph folder
   Bind loose sheets into book form
   Bind magazines into book form
   Rebind an old book

4. The jobs in the completed list should be arranged in a good instructional order. A practical way to do this is to transfer each job title to an individual index card and shuffle the cards in sequence of jobs from the simplest to the most difficult to learn.

   The final list of trade jobs is then copied from the catalogued cards. Like the list of major divisions, all trade jobs are numbered for further identification.

5. A sample form for recording trade jobs has been reproduced as Figure II. Notice that another color of paper was used for easier identification when the trade analysis is in assembled form. This form has two columns. In the left column are listed the trade jobs performed in each corresponding major division. This information was
<table>
<thead>
<tr>
<th>Trade Jobs</th>
<th>Trade Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Set Visiting Cards</td>
<td></td>
</tr>
<tr>
<td>2. Set Simple Poem Forms</td>
<td></td>
</tr>
<tr>
<td>3. Set Simple Prose Forms</td>
<td></td>
</tr>
<tr>
<td>4. Set Voucher Checks</td>
<td></td>
</tr>
<tr>
<td>5. Set Menus</td>
<td></td>
</tr>
<tr>
<td>6. Set Shipping Labels</td>
<td></td>
</tr>
<tr>
<td>7. Set Tickets</td>
<td></td>
</tr>
<tr>
<td>8. Set Motto Cards</td>
<td></td>
</tr>
<tr>
<td>9. Set Tariff Tables</td>
<td></td>
</tr>
<tr>
<td>10. Set Student's Daily Schedules</td>
<td></td>
</tr>
<tr>
<td>11. Set Programs</td>
<td></td>
</tr>
<tr>
<td>12. Set Bookplates</td>
<td></td>
</tr>
<tr>
<td>13. Set Two-Color Booklet Title Pages</td>
<td></td>
</tr>
</tbody>
</table>

**Figure II.** A sample record form for trade jobs

*Actual size: 8 1/2 x 11 inches*

*Green paper*
copied from the completed worksheets. The right column is designed for later use in listing "Trade Information." More than one sheet may be used if the number of trade jobs or trade information topics requires a long list. In the latter case, the term "continued" in parentheses is added after the major division title on each succeeding sheet.

A handy arrangement for listing trade jobs in graphic chart form will be described in the next analysis step.

The trade jobs in Hand Typesetting listed on the sample record form were classified on the basis of amount of material introduced, progressing from simple straight matter, which would aid in learning the type case, line spacing and indenting, through jobs of increasing difficulty involving tabular and ornamental forms, to two-color composition and forms requiring special preparation. These are the jobs that compositors do; they can be used as a guide in choosing from current jobs the variety and number that are needed for training students. Any of the jobs may be produced in various sizes, colors, and on many kinds of stock.

**Analyzing Trade Jobs by Operations**

*Reasons for Analyzing Trade Jobs by Operations*—A program of training can not be built on trade jobs alone, just as a course of study in arithmetic can not be based solely on mathematical problems. Several fundamental operations and principles are required for solving
mathematical problems. Similarly, to the manipulative elements of the trade, or called operations, must be added a certain amount of information before the student can perform satisfactorily all required jobs in the trade.

The third step in analyzing the trade is to divide each typical trade job of each major division into its component operations. The operations listed will ultimately represent lesson units in trade instruction.

Because an operation occurs frequently in many jobs, it would be wasteful of time and material to repeat teaching the same operation in successive jobs. A list of all basic trade operations which the student would be expected to learn would permit an orderly, systematic and thorough instruction. Such an inventory of operations would also provide the trade teacher with a means of checking on his students' progress and to keep track of what has been assigned, accomplished, and unlearned by each student.

**Determination and Classification of Operations**—An operation is a way of doing something. It is a definite step showing how the tradesman uses tools, machines, and materials in the completion of a job. Setting type, taking a proof, inking the press, cutting stock, are all specific, manipulative operations easily recognizable by the printer.

Operations should be expressed in terms of action. They encompass various skills that must be performed again and again in the practice of a trade. Fryklund points out the following seven important characteristics, helpful in identifying an operation:
1. It occurs frequently in a trade with considerable uniformity of content; it is constant from shop to shop in a trade.
2. It involves teachable content.
3. It is a distinct unit which, when completed, makes the worker feel that he has come to a good stopping place.
4. It has its greatest value when combined with other operations; alone it is usually of little value.
5. The length is such as to make suitable content for a class demonstration.
6. It is such that when it is put with other operations in combination, together they produce or service something larger without gaps or overlapping between them.
7. It involves depicting, shaping, forming, or assembling.

(6-47)

The operation chosen as a lesson unit must be complete in itself. It should not contain too much material for the student to comprehend at one time, nor should it take too long to teach in a single session. Each job should introduce one or more new operations. Succeeding jobs usually include a number of operations previously introduced, because such repetition helps develop manipulative skill. To avoid confusion between an operation and an information topic, the task should be listed as an operation if it includes manipulative or machine work.

Each trade operation consists of several steps. For example, in offset lithography, "make a halftone with a glass crossline screen" is a job in which the operations performed would be:

1. Prepare the copy
2. Set the camera
3. Make the exposures
4. Process the film
The steps in each of the above operations vary in size. Also called operating steps, they are a small group of activities which are necessary to perform the operation, and serve to make up the instructional material. Thus, operation (2) "Set the camera" would embody such steps as: (a) adjust arc lights, (b) focus camera, (c) set screen distance, (d) center and check image on ground glass, (e) adjust the lens diaphragm, (f) adjust the integrating light meter, (g) turn off white lights in darkroom, leaving safe-lights on, and (h) load film.

The description of trade operations with details covering every conceivable step, point, motion, or precaution, however, is only needed by shop teachers when writing instruction sheets or planning lesson presentation. This listing of operating steps is optional and is not regarded as part of the analysis procedure, the operations being considered the smallest manipulative units.

Many operations are auxiliary in nature. For example, cleaning the press or changing and adjusting roller trucks on a platen press are not directly involved in making impressions, though they are necessary for continuous production. Auxiliary operations should be incorporated in the unit-operation and need not be listed under separate headings. Likewise, operations covering the use of tools, measuring, planning, and laying-out, are distributed among jobs as each operation is required rather than being taught as separate lessons.

To secure the most effective teaching sequence, Allen suggests that the instructor determine and make use of the progression factors
which he defines as "things that affect the speed, ease and thoroughness with which a learner progresses through an order of instruction." (1-81)

Bollinger and Weaver indicate that the major factors in arranging operations for a course of study are:

1. The degree of difficulty in learning the operation which depends upon:
   a. The dexterity required.
   b. The technical information needed.
   c. The necessity for sound trade judgment.
   d. The severity of tests which the results must undergo.

2. The probability of early use of the operation.
3. The frequency with which the operation will be used.
4. The appropriateness of the operation for the maturity of the pupils. (3-47)

Fryklund indicates that in practically all trades, frequency of use of operations and arrangement of jobs from simple to complex are the usual progression factors. (6-82) The degree of difficulty in performing a job is not a constant factor, being a human consideration that varies with individuals.

Suggestions for Analyzing Trade Jobs by Operations—

1. A worksheet should be used to make a preliminary listing of the operations in each job of each major division of the trade. The worksheet carries the following captions: (a) Name of the trade, (b) Title and identification number of the major division, (c) Title of the trade job followed by its number, (d) left half page column: Trade Operations, (e) right half page subdivided into five vertical
checking columns with headings: too large, too small, incomplete, not
doing, acceptable.

The titles and numbers of the major division and trade jobs
should conform with those determined during the two previous analysis
steps. Separate sheets should be used for each trade job.

The operations are first listed without definite order.

Printed trade materials and actual performance of each job may
be helpful in determining whether or not any items have been overlooked.
A list of tools and equipment used in the trade may assist in calling
to mind additional operations. Each tool or machine is usually related
to one or more operations.

If practicable, the worksheets should be rechecked in conference
with others who know the trade. The checking columns are for use in
judging the appropriateness of each operation listed.

The operations of each trade job should be finally arranged in
an instructional order and numbered separately.

2. In listing trade operations, the same style for preparing
trade job descriptions should be used. The "doing" factor must be
expressed by an action verb such as adjust, fold, or set.

If an operation is repeated in subsequent jobs, identical de-
scriptive statements for the operation to be repeated should be used.

3. When an operation is judged too complicated to be taught in
one lesson, it would be appropriate to make some natural division and
present the material in two units. If the operation is too simple, it
should be incorporated in the operation which precedes or follows it.
4. When previously overlooked or new operations are discovered, they should be added to the master list immediately to keep it as complete as possible.

5. Trade operations should be recorded on sheets of yet another color. If more than one page is needed for a single division, the term "continued" in parentheses should be inserted after the division title on the succeeding pages. Figure III is a sample record form for trade operations of Job No. 13 of Hand Typesetting. The list of operations was transferred from the worksheets.

6. The relative order of instruction of operations may also be determined by a content analysis chart (Figure IV). The nature of the material included therein and the charting procedure are described below:

a. The operations are listed in the vertical column at the left as indicated on the chart.

b. The name of type jobs are entered in the slanting spaces across the top of the chart.

c. The operations which appear in each job are marked by placing (x) marks in the appropriate squares under that job.

d. The operations which have full horizontal rows of (x) marks should be then transferred to the top of the list. These are operations which appear in most jobs. Being frequently used, they must be taught first.
TRADING ANALYSIS

Trade Compositor Code Number

Major Division Hand Typesetting (continued) No. 1

+-----------------+-----------------+---------+
<table>
<thead>
<tr>
<th>Trade Job No.</th>
<th>Trade Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Set Two-Color Booklet Title Page</td>
</tr>
<tr>
<td></td>
<td>1. Analyze the copy</td>
</tr>
<tr>
<td></td>
<td>2. Make a layout</td>
</tr>
<tr>
<td></td>
<td>3. Set composing stick to measure</td>
</tr>
<tr>
<td></td>
<td>4. Set type</td>
</tr>
<tr>
<td></td>
<td>5. Space line</td>
</tr>
<tr>
<td></td>
<td>6. Remove type from stick and place on galley</td>
</tr>
<tr>
<td></td>
<td>7. Justify line</td>
</tr>
<tr>
<td></td>
<td>8. Lead type</td>
</tr>
<tr>
<td></td>
<td>9. Set rules</td>
</tr>
<tr>
<td></td>
<td>10. Set display type</td>
</tr>
<tr>
<td></td>
<td>11. Set numerals</td>
</tr>
<tr>
<td></td>
<td>12. Set cuts, ornaments</td>
</tr>
<tr>
<td></td>
<td>13. Tie up type form</td>
</tr>
<tr>
<td></td>
<td>14. Take a proof on proofpress</td>
</tr>
<tr>
<td></td>
<td>15. Read and mark proofs</td>
</tr>
<tr>
<td></td>
<td>16. Make corrections</td>
</tr>
<tr>
<td></td>
<td>17. Break up for color</td>
</tr>
<tr>
<td></td>
<td>18. Set register forms</td>
</tr>
<tr>
<td></td>
<td>19. Take second proof. Revise</td>
</tr>
<tr>
<td></td>
<td>20. Check for register</td>
</tr>
<tr>
<td></td>
<td>21. Clean type form</td>
</tr>
<tr>
<td></td>
<td>22. Distribute form after it is printed</td>
</tr>
<tr>
<td></td>
<td>23. Return materials to proper places</td>
</tr>
</tbody>
</table>

Figure III. A sample record form for trade operations
Actual size: 8 1/2 x 11 inches
Yellow paper
## CONTENT ANALYSIS CHART

**Prepared By:** NQQ DINH DUONG

**TITLE OF UNIT:** Hand Typesetting

<table>
<thead>
<tr>
<th>TRADE JOB NUMBERS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analyze the copy</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Make a layout</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>3. Set composing stick to measure</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>4. Set type</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>5. Space line</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>6. Justify line</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>7. Lead type</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>8. Remove type from stick and place on alley</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>9. Tie up type form</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>10. Take a stone proof</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11. Take a proof on proof press</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>12. Road and mark proofs</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>13. Make corrections</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>14. Take second proof - Review</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>15. Check with layout or news for register</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>16. Clean type form</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>17. Distribute form after it is printed</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>18. Return materials to proper places</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>19. Set quotation marks</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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**Figure IV.** A sample content analysis chart  
**Actual size:** 17 x 22 folded to 8 1/2 x 11 inches
e. Auxiliary operations which can not be checked readily against the job should be placed at the bottom of the list with no (x) marks.

f. The job titles may now be shifted in such manner that the job column with the fewest (x) marks from top to bottom is on the left, and the longest column is on the farthest right. The length of the vertical columns increases gradually from left to right. This means that the simplest job, the one with the fewest operations, is taught first. The last operations on the list are the least used ones.

g. The operations are numbered from the top of the form.

h. All (x) marks could be replaced by numbers which correspond to the numbers of the operations. The operations involved in each job can be seen instantly by reading down the vertical column. These numbers may also be used for easy identification if instruction sheets should be written later.

Some specific advantages of the content analysis chart are:
(a) it reveals relationships that can not be shown by the use of cards or bound sheets; (b) it eliminates the possibility of omissions and duplications in operation listings; (c) it is the most simple, practical and effective device for arranging jobs and operations in a logical instructional order; (d) it permits the instructor to check the achievement of each student at any point and at any time during
the training period. This is possible by substituting the names of the students for the titles of the jobs in the content analysis chart, and by leaving out the (x) marks. Figure V illustrates the application of the content analysis chart as a progress record form in which the operations were listed in the slanting columns across the top of the chart. Different systems of marks can be used to indicate the level of a student's ability. For example, numeral 1 indicates that the student has been introduced to a new operation. As soon as he is able to perform the operation without instruction but still under supervision, he is given mark 2. When he is able to perform the operation proficiently and without aid of the instructor, mark 3 will be given.

The time required to complete an operation or job may be recorded on the content analysis form to show students the standard of performance they are to attain in order to succeed in the trade. The time should be established from an extensive time study of each machine and hand operation under average working conditions. This is, however, not an easy task, due to the great variety of jobs in printing.

The content analysis chart may be made any size by extending the number of slanting columns to the right and adding to the number of lines at the bottom.

Analyzing Each Major Division for Trade Information

Reasons for Analyzing Major Divisions for Trade Information—
To reduce the trade to its points of instruction, after all operations
**PROGRESS RECORD**

**TITLE OF UNIT:** Hand Typesetting  

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**Figure V.** A sample progress record form  
Actual size: 17 x 22 folded to 8 1/2 x 11 inches
have been inventoried, the fourth analysis step is to determine the information content of each trade division.

A tradesman must be able to perform skillfully the manipulative operations of his trade. Whenever he does an operation, moreover, he needs practical information to give direction and understanding to its completion. Topics of information, however, are not listed with the operation units because trade information is not actually part of the operations, but constitutes independent units of instruction. The treatment of information and operation topics separately is to avoid confusing the student in his skill development and habit formation for which repetition and attention are necessary. (14-31)

The analysis of each trade division for its essential information will allow the arrangement of trade information topics in pedagogical order from which specific courses of study can be developed.

**Determination and Classification of Trade Information**—The operations which must be done in a trade concern manipulative or machine performance. The trade information which must be known by the tradesman involves mental functions related to operations and jobs. Trade information is also known as related information or related trade information.

Information in trade analysis is taught by the trade instructor in the shop. It should not be confused with the related subjects that are taught as separate courses by other than shop teachers and often in rooms separated from the shop. (6-53)
Trade information topics are independent of the trade operations and different from the auxiliary knowledge which is integrated with the operations. For example, the printer's system of measuring, type faces, size and quality of paper, are technical information topics which do not appear in any of the operations.

There are three categories of information topics: technical information, general information, and guidance information, all form the basis for independent lessons.

a. Technical trade information is information directly or indirectly related to the job, absolutely necessary to the worker in order for him to form judgments in executing his work. Some examples of printing technical information topics follow, whose headings should be outlined when making the complete analysis.

1. Printer's measurements
2. Printing papers
3. Rules for composition
4. Classification of type faces
5. Principles of display (6-56)

b. General trade information is information that is desirable, helpful for the tradesman to know but is not necessary. The worker can get along in his trade without general information, so it may be left out if training time is limited. Information of this type is concerned with social, economic, and indirect scientific aspects of the trade. A few samples of general information topics in printing are:
1. Printing in America
2. Invention of Printing
3. Gutenberg, Caxton, Caslon, Bodoni, Goudy, Manutius
4. Papermaking
5. Composition of books (6-58)

c. Guidance trade information involves information that is related to selecting, preparing for, securing, adjusting, and upgrading in an occupation. For example:

1. The printing trade
2. Opportunities in printing
3. Ethics of the trade
4. Hints for young printers
5. Apprenticeship, high school, trade school, college (6-60)

Some convenient headings under which each division of the trade can be examined to determine its essential trade information content are:

1. Trade equipment
2. Trade materials and processes
3. Trade mathematics
   Arithmetic
   Geometry
   Typical problems in the trade, short cuts, formulae
4. Trade science
   Physics
   Chemistry
5. Trade drawing
   Art and design
   Color harmony
6. Trade terms
   Trade English
7. Health and Safety
   Occupational hazards
   Safe trade practices

8. Trade History
   History of industry
   History of invention

9. Guidance information
   Career opportunities
   Employment conditions
   Trade and educational organizations
   Labor laws

It is simpler and easier to organize trade information which
cannot be included with operations into the above major phases.

The trade equipment category includes such things as hand
tools, machine tools, fixtures, furniture, books, special clothing and
all necessary appliances that are used rather than consumed.

A trade material is "any substance which becomes a part of the
finished product or article, or which in the making of the article is
consumed beyond further use." (3-74) Paper, ink, glue, proof paper,
lubricating oil, type cleaner, string, etc. are examples of materials
so used in the printing trades. Information about trade materials may
be classified under three headings: (a) Properties of materials, (b)
Qualities of materials, and (c) Specifications, standard sizes and
standard grades of materials. (3-75)

Trade mathematics include, besides the elementary operations in
arithmetic, the calculations, measurements, short cuts, formulae, and
special problems that are not commonly known by workers in other
trades. Examples of trade calculations in printing are: the point
system as applied to printing tools, type and space computations, and estimating composition.

Trade science refers to explanatory statements of chemical or physical principles which affect procedure on the job, to directly answer questions pertaining to materials, equipment, processes, results obtained or conditions observed in the operations of the trade. It does not attempt to give all the scientific theory, however. The following are some examples of trade science in Composition: optical illusion in spacing, properties of metal and wood furniture, harmonizing color with stock and subject, proportion of lead, tin and antimony content in foundry, Linotype, and Monotype metals.

Trade drawing involves the reading, interpretation, and making of diagrams, sketches or layouts as determined by the needs of the jobs. The compositor, for instance, should understand and translate the sketches of the layout artist. Photographers and workers in printing are required to have some knowledge of the fundamentals of art and design, such as shape, proportion, size, ornamentation, color harmony and appropriateness.

Trade terms include the names of equipment, material, processes, operations and other commonly used trade terminology. Although trade terms are not usually taught in separate lessons, their complete listing in the analysis is helpful in keeping the instruction thorough with the most complete language of the trade. English remains of particular importance to printers. In the standard apprenticeship lessons
for printers, the following units are most common: (a) The dictionary, (b) Capitals and printers' marks, (c) Fundamentals of English grammar, (d) English composition and letter writing, and (e) Copy preparation and proof-reading.

Health and Safety instruction is essential for the protection of the student, resulting in his more efficient and economical vocational preparation. The habits acquired will be invaluable to the trainee in his future trade practice. A list of trade hazards with means of preventing accidents and industrial diseases is therefore necessary. The listing of dangers to the worker and the corresponding safety precautions may be organized under these four classifications: (a) Accidental dangers, (b) Dangers due to carelessness, (c) Dangers due to ignorance, and (d) Occupational dangers. (3-96)

The amount and content of information on trade history and trade guidance depend upon many factors such as the time available, the objectives of the training program, and the interests of the students.

Suggestions for Analyzing Major Divisions for Trade Information

1. Worksheets are again used in planning trade information topics for each major division. The headings on each worksheet should conform with the identification determined during the previous analysis steps concerning the name of trade, and name and number of major division. Separate worksheets should be used to make the listing of trade information under the topics: tools and equipment, trade materials,
trade mathematics, trade science, trade drawing, trade terms, health and safety, etc. Captions such as "Trade information: tools and equipment," "Trade information: materials," are written in the space at the head of the column on the left half page. The remaining half page is divided in five vertical checking columns with these headings: taught by others; too large; too small; irrelevant; acceptable. Each item of trade information listed is evaluated by placing a check mark in the appropriate column.

2. The list of tools and equipment is useful in organizing information topics on trade equipment.

To determine the necessary instruction units on trade materials, it is advisable to start by making a list of all the materials used in the trade, then examine each item with reference to three characteristics: properties, qualities, and specifications.

The list of trade operations also aids in recognizing typical trade calculations; for example, the operation "set composing stick to measure" suggests the application of the point system to printing tools.

For the listing of safety precautions, the lists of operations, tools and equipment already compiled are the best sources of suggestions.

Reference to trade literature is helpful in composing topics for the other areas of trade information.
3. To select trade information topics and enter them in the order in which they will first be used, the following suggestions are offered:

a. On the list of trade jobs which have been arranged in an effective instructional order, take Job No. 1 and determine what trade information on equipment should be given in connection with that job. Such items should be written down on a worksheet.

b. The lists of information on trade materials, trade mathematics, trade science, and trade drawing should also be examined, and the items related to Job No. 1 be recorded consecutively on that same worksheet.

c. The same process should be repeated for the next job, and so on until all information topics are distributed properly among the trade jobs of the major division.

The distribution is such that each information topic comes to the student only when he needs it for the first time on the job. Therefore, each item on the list of trade information on equipment, materials, etc., is crossed out after being transferred to the worksheet.

4. If an information topic is too broad to be covered in one session, it should be divided to avoid confusion on the part of the student. If the information topic is too small, it should be presented as part of some other trade information lesson, or taught in connection with some appropriate operation. For example, information
on "string" in Hand Composition may be introduced at the same time the student is taught how to tie up a form. Information on recognition of stock, trade terms, care of tools and machines, safety precautions may be introduced in the same manner.

5. As previously mentioned, in organizing trade information content, a distinction should be made between the major independent units of trade information and the detailed points of auxiliary knowledge that are part of every operation and must be included when teaching the operation. For example, to do the operation, "set a line of type," the student should know "how to set type." Therefore, the knowing step should not be separated from the doing step; they must be kept together and taught by the shop instructor in sequence of occurrence in the operation, whether they are manipulative or informational in nature. (6-55)

6. The trade information topics are recorded on the same form as the trade jobs previously described. The items of trade information are copied from the completed worksheets, and numbered as shown in Figure VI. Even though the columns are side by side, it does not mean that the information topics must match the trade jobs one by one, rather they are essential for performing all jobs of one major division of the trade.

The term "continued" in parentheses should be included after the major division title on the top of each additional page to be used for listing trade information.
<table>
<thead>
<tr>
<th>Trade Jobs</th>
<th>Trade Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Set Visiting Cards</td>
<td>1. Use and care of tools and equipment: composing stick, galley, composing</td>
</tr>
<tr>
<td></td>
<td>rules, stones, proof presses, roller</td>
</tr>
<tr>
<td></td>
<td>brayers, tweezers.</td>
</tr>
<tr>
<td>3. Set Simple Prose Forms</td>
<td>3. The point system of measure: point, pica, nonpareil, type sizes, calculations.</td>
</tr>
<tr>
<td>4. Set Voucher Checks</td>
<td>4. Type faces: use of appropriate type</td>
</tr>
<tr>
<td>5. Set Menus</td>
<td>faces, handling type, identification</td>
</tr>
<tr>
<td>6. Set Shipping Labels</td>
<td>of types.</td>
</tr>
<tr>
<td>7. Set Tickets</td>
<td>5. Spacing and justifying materials: (sizes, uses, computations, care in</td>
</tr>
<tr>
<td></td>
<td>handling) quads and spaces, lead and</td>
</tr>
<tr>
<td></td>
<td>slugs, furniture, reglets.</td>
</tr>
<tr>
<td>10. Set Student's Daily Schedules</td>
<td></td>
</tr>
<tr>
<td>11. Set Programs</td>
<td>8. Principles of display, design, use</td>
</tr>
<tr>
<td>12. Set Bookplates</td>
<td>of color in printing.</td>
</tr>
<tr>
<td>13. Set Two-Color Booklet Title Pages</td>
<td></td>
</tr>
</tbody>
</table>

Figure VI. A sample record form for trade information  
Actual size: 8 1/2 x 11 inches  
Green paper
<table>
<thead>
<tr>
<th>Trade Jobs</th>
<th>Trade Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Selection of rule, borders, ornaments.</td>
</tr>
<tr>
<td>10.</td>
<td>General safety shop practices.</td>
</tr>
<tr>
<td>11.</td>
<td>Printers' materials: paper, ink, type (making, classification, characteristics, uses).</td>
</tr>
<tr>
<td>13.</td>
<td>Vocational opportunities, trade and educational organizations.</td>
</tr>
</tbody>
</table>

**Figure VI.** A sample record form for trade information  
Actual size: 8 1/2 x 11 inches  
Green paper
7. The trade information units do not appear on the chart because they are not attached to particular jobs as are operations. Some instructors, however, prefer to enter the basic items of trade information in the slanting columns added at the bottom of the content analysis chart for easier reference.

**Assembling the Trade Analysis**

After the trade summary sheet has been prepared (example on page 21) and all major divisions of the trade have been analyzed separately, each in its jobs, operations, and information, the trade content is typed on record forms similar to the examples shown on pages 26 and 34. The following steps are suggested to assemble the analysis in final form:

1. Prepare a cover sheet containing the following information, typed in three lines of capital letters located at the top of the page:

   Trade Analysis  
   Name of the Trade  
   Code Number of the Trade

2. All the completed forms prepared for the trade analysis will be assembled in the following order:

   a. Cover sheet  
   b. Trade summary sheet  
   c. Trade jobs and trade information sheet of major division No. 1  
   d. Trade operations sheets pertaining to major division No. 1 arranged in order of number of trade jobs  
   e. Trade jobs and trade information sheet of major division No. 2  
   f. Trade operations sheets pertaining to major division No. 2 arranged in order of number of trade jobs (the same procedure is repeated until all sheets are put in place)
3. Number each page of the analysis at the center of the bottom margin.

4. Prepare a table of contents listing only the page numbers of sheets of the same type as (b), (c), (e), mentioned above.

5. Punch holes in all sheets for binding in a loose-leaf ring notebook, or any other preferred means of binding.

The difference in color of record forms for trade jobs and trade information, and for trade operations permits location of each major division faster by flipping through the pages and looking at the major division number which was identified on the trade summary sheet.
CHAPTER IV

CONCLUSION

The analysis of trades is a form of laborious research work in which "thoroughness must not be sacrificed for speed." It requires a knowledge of the trade, the ability to analyze, and discriminating judgment. A comprehensive analysis is developed through the long process of evaluation, modification, adjustment, subtraction, and addition. Its value, however, is not limited to the written form but is found in the use of the results of the work.

Analysis is the first step in preparing for occupational instruction. It is a means to an end, and this end is one or several courses of study which are made up of facts and skills organized into job form to be used as the basis for actual teaching.

The shop instructor needs to understand how the analysis was made, and how it can be used in order to properly assemble the material for courses of instruction to meet certain training conditions. The procedures call for stating the objectives definitely, and recognizing the differences between the doing aspects and related knowledge.

In step with industrial progress, new processes, materials, and tools introduced for use in the trade force the instructor to revise the analysis periodically to eliminate misstatements and outmoded operations. Trade content should be modified in accordance with training objectives, physical conditions, equipment, materials, and
trainees' interests. Unlike many industries, however, new jobs in the printing industry generally have not become routine, thus rendering trade analysis unnecessary. The trade itself changes slowly so that its content from which courses of instruction are derived, will change but little over a term of years.

A common difficulty in analysis procedures is the tendency to oversystematize, thus making the results of analysis too complicated for use in shop training. (6-69)

Analyzing a trade is a subjective process, due to differences between individuals who undertake the analysis. One of the best ways to lend more objectivity to the analysis involves the cooperation of two or more persons who all are familiar with analysis techniques.

New developments in industrial practices do not change the economic principle that there must be trained manpower with the know-how to process materials into finished products. With respect to the necessity of determining things that should be known and done for trade training purposes, Dr. Verne C. Fryklund told the writer: "The printing industry will still need printers but there may be more efficient equipment with which to work as in all industries. Fundamental elements of processing will be quite constant as are the elements in mathematics. The elements are quite constant but the problems will always vary in time and in geographic location."

Printing in a general high school and in a vocational or technical school is the same as printing in an apprenticeship training
program or commercial plant. There are differences in aims and in
time but not in content.

Operations and information topics will be important in printing
as in other occupations. Wherever a trade is taught, its analysis is
necessary and worthwhile in the study of techniques of teaching, course
development and evaluation.
LITERATURE CITED


