INFORMATION TO USERS

This dissertation was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.

2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in "sectioning" the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again — beginning below the first row and continuing on until complete.

4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from "photographs" if essential to the understanding of the dissertation. Silver prints of "photographs" may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.

University Microfilms
300 North Zeeb Road
Ann Arbor, Michigan 48106
A Xerox Education Company
REESER, George William, 1931-
THE RELATIVE EFFECTIVENESS OF SELECTED
INSTRUCTIONAL MEDIA FOR STIMULATING STUDENT
AWARENESS OF AND INTEREST IN THE CONSTRUCTION
INDUSTRY.

The Ohio State University, Ph.D., 1971
Education, industrial

University Microfilms, A XEROX Company, Ann Arbor, Michigan
THE RELATIVE EFFECTIVENESS
OF SELECTED INSTRUCTIONAL MEDIA
FOR STIMULATING STUDENT AWARENESS OF
AND INTEREST IN THE CONSTRUCTION INDUSTRY

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

George William Reeser, B. S., M. A.

The Ohio State University
1971

Approved by

[Signature]
Adviser
Faculty of Industrial Technology Education
College of Education
PLEASE NOTE:

Some pages may have
indistinct print.
Filmed as received.

University Microfilms, A Xerox Education Company
ACKNOWLEDGEMENTS

This writer wishes to express his sincere appreciation to all persons who have assisted him in the completion of this study. Particular gratitude is extended to his major adviser, Dr. Donald G. Lux, Chairman, Faculty of Industrial Technology, for his support, encouragement, and constructive suggestions throughout the preparation and development of this study and the doctoral program. Further appreciation is expressed to Dr. John J. Kennedy and Dr. Frank C. Pratzner who served on the graduate program advisory committee and the dissertation reading committee.

Others who generously assisted in the organization of this study include: Mr. W. E. Barkby, Principal, Canton Junior High School, Canton, North Carolina, Dr. Peter O. Anderson (statistical analysis), The Ohio State University, Dr. and Mrs. Max R. Williams and Dr. John Bell Jr. (readers), Western Carolina University, Dr. Anna Gorman (reading committee), and the staff of the Center for Measurement and Evaluation (test scoring and item analysis), The Ohio State University.

A deep debt of gratitude is due the writer's wife, Rosina, for her continuous assistance, many sacrifices, and moral support throughout the graduate program. To his children, Mark William and Melanie Lynn, he expresses his appreciation for their tolerance, understanding, and sacrifices throughout the course of this study.
VITA

August 27, 1931 ....................... Born-Logansport, Indiana

1952-54 .......................... Active Duty, United States Army

1956 ............................. B.S., Ball State University, Muncie, Indiana

1956-58 .......................... Teacher, Winchester High School, Winchester, Indiana

1957 ......................... M.A., Ball State University Muncie, Indiana

1958-64 ........................ Teacher, Wendell L. Willkie High School, Elwood, Indiana

1964-69 ........................ Assistant Professor, Western Carolina University, Cullowhee, North Carolina

1969-70 ........................ Research Associate, VT-ERIC Clearinghouse, The Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio

1971 ........................ Assistant Professor, Western Carolina University, Cullowhee, North Carolina

PUBLICATIONS

Abstracts of Research and Related Materials in Vocational and Technical Education (ARM) (Quarterly Publication)

Abstracts of Instructional Materials in Vocational and Technical Education (AIM) (Quarterly Publication)

Abstracts of Research in Education Materials in Vocational and Technical Education (RIE) (Monthly Publication)

Abstracts for Current Index to Journals in Education in Vocational and Technical Education (CIJE) (Monthly Publication)
Abstracts were prepared for Educational Resources Information Center (ERIC) Clearinghouse, The Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio.

FIELDS OF STUDY

Major Field: Studies in Industrial Technology Education
Professors Donald G. Lux, Chairman,
and Frank C. Pratzner

Correlative Field: Studies in Educational Research
Professor John J. Kennedy
TABLE OF CONTENTS

ACKNOWLEDGEMENTS................................................................. ii
VITA......................................................................................... iii
LIST OF TABLES........................................................................... vii
LIST OF FIGURES........................................................................ ix

Chapter

I. NATURE OF THE DISSERTATION.............................................. 1

   Orientation to the Problem
   Statement of the Problem
   Objectives of the Study
   Questions to be Answered
   Definition of Terms
   Significance of the Study
   Assumptions of the Study
   Limitations of the Study
   Chapter Summary

II. REVIEW OF RELATED LITERATURE........................................ 9

   Introduction
   Educational Needs
   Nature of Interests
   Interest, Ability, Achievement
   Selection of Construction Industry Interest Inventory
   Studies Involving Instructional Procedures
   Chapter Summary

III. ORGANIZATION OF THE STUDY.......................................... 29

   Introduction
   Population and Sample
   Socio-economic Questionnaire
   Instrumentation
   Instructional Treatments
   Treatment-Group Assignment
   Experimental Design
   Research Variables
   Hypotheses
Test Administration
Data Collection
Chapter Summary

IV. ANALYSIS OF DATA................................................................. 64

Introduction
Analysis of Achievement Data
Analysis of Interest Inventory Data

V. SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS... 74

Introduction
Purpose of the Study
Objectives of the Study
Review of Literature
Methodology
Findings
Conclusions
Recommendations
Recommendations to the Researcher
Recommendations to the Practicing Educator

APPENDIX

A. Socio-Economic Information............................................. 84
B. Group Data................................................................. 85
C. Construction Industry Achievement Test......................... 95
D. Revised Construction Industry Achievement Test............. 105
E. Construction Industry Interest Inventory......................... 115
F. Construction Technology Tape Script............................. 125
G. Titles of Slides Used In Coordinated Slide-tape Presentation 142
H. Booklet "A World of Opportunity in Construction"........... 146
I. Booklet "Construction: A Man's Work".......................... 177
J. Construction Industry-Teacher-lecture Outline................ 191
K. Experimental Treatment Schedule................................. 196
L. Correspondence........................................................... 200

BIBLIOGRAPHY........................................................................ 205
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of the Relevant Characteristics of Experimental Treatment Groups</td>
<td>32</td>
</tr>
<tr>
<td>2. Analysis of Variance, One-Way Classification for the Variable--Reading</td>
<td>33</td>
</tr>
<tr>
<td>3. Analysis of Variance, One-Way Classification, for the Variable--Iowa Basic Skills Test (Total Academic)</td>
<td>33</td>
</tr>
<tr>
<td>4. Occupation of Mothers of Students Recorded by Experimental Group</td>
<td>35</td>
</tr>
<tr>
<td>5. Occupations of Fathers of Students Recorded by Experimental Group</td>
<td>36</td>
</tr>
<tr>
<td>6. Educational Level of Mothers of Students Recorded by Experimental Group</td>
<td>37</td>
</tr>
<tr>
<td>7. Educational Level of Fathers of Students Recorded by Experimental Group</td>
<td>38</td>
</tr>
<tr>
<td>8. Construction Industry Achievement Test Sub-scale Items</td>
<td>41</td>
</tr>
<tr>
<td>9. Construction Industry Interest Inventory Sub-scale Items</td>
<td>43</td>
</tr>
<tr>
<td>10. Results of the Item-analysis of the First Pilot Test Data on the &quot;Construction Industry Achievement Test&quot;</td>
<td>45</td>
</tr>
<tr>
<td>11. Results of the Item-analysis of the Second Pilot Test Data on the Revised &quot;Construction Industry Achievement Test&quot;</td>
<td>48</td>
</tr>
<tr>
<td>12. Results of the Item-analysis of the Pre-test Data on the &quot;Construction Industry Achievement Test&quot;</td>
<td>58</td>
</tr>
<tr>
<td>13. Summary of the CIAT and CIII Characteristics of Experimental Treatment Groups</td>
<td>59</td>
</tr>
<tr>
<td>14. Analysis of Variance, One-Way Classification, for the Variable--CIAT Pre-test Scores</td>
<td>60</td>
</tr>
</tbody>
</table>
15. Analysis of Variance, One-Way Classification, for the Variable—CIII Pre-test Scores .............................................. 60
16. Analysis of Variance, One-Way Classification, for the Variable—CIII Sub-scale-Management Practices ................................................................. 61
17. Analysis of Variance, One-Way Classification, for the Variable—CIII-Sub-scale-Production Practices ............................................................................................................... 61
18. Analysis of Variance, One-Way Classification, for the Variable—CIII-Sub-scale-Personnel Practices ............................................................................................................... 62
19. Comparison of Participants' Achievement ................................................................................................................................. 67
20. Analysis of Variance, One-Way Classification, for the Variable—CIAT Post-test Scores ................................................................. 68
21. Comparison of Treatment Groups on CIII Sub-scale--Management Practices ............................................................................................................... 69
22. Comparison of Treatment Groups on CIII Sub-scale--Production Practices ............................................................................................................... 70
23. Comparison of Treatment Groups on CIII Sub-scale--Personnel Practices ............................................................................................................... 71
24. Comparison of Treatment Groups on CIII Total Scores ................................................................................................................................. 72
25. Analysis of Variance, One-Way Classification, for the Sub-scale Variable--Management Practices of the CIII Post-test Scores ............................................................................................................... 73
26. Analysis of Variance, One-Way Classification, for the Sub-scale Variable--Production Practices of the CIII Post-test Scores ............................................................................................................... 73
27. Analysis of Variance, One-Way Classification, for the Sub-scale Variable--Personnel Practices of the CIII Post-test Scores ............................................................................................................... 74
28. Analysis of Variance, One-Way Classification, for the Variable--Total CIII Post-test Scores ............................................................................................................... 74
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. First Order Matrix of the EPIC Structure for Evaluation.</td>
<td>12</td>
</tr>
<tr>
<td>2. Second Order Matrix of the EPIC Structure for Evaluation—Structure of Variables.</td>
<td>14</td>
</tr>
<tr>
<td>3. Specific Variables of the Second Order Matrix of a Structure for Evaluation</td>
<td>15</td>
</tr>
<tr>
<td>4. The Range of Meaning Typical of Commonly Used Affective Terms Measured Against the Taxonomy Continuum</td>
<td>20</td>
</tr>
</tbody>
</table>
CHAPTER I

NATURE OF THE DISSERTATION

Orientation to the Problem

In a recent directive President Nixon called on the Department of Health, Education and Welfare to direct its efforts toward encouraging the states to train construction workers (1970, pg. 1). Much work has already been initiated to achieve this goal. For instance, the U. S. Office of Education has already identified seventeen states as having exemplary construction training programs. Many of these states have begun exploratory experiences in occupations, occupational information, and career development for the various groups of construction occupations.

In a recent article Ketchan concluded that all youth had basic or common needs that might well be grouped into a unified core. He believed that an industrial arts program should include, "occupational information, basic elementary skills, experiences, and activities designed to develop an appreciation and understanding of the knowledge of industry" (Ketchan, 1969, pg. 41). He asserted that "both industrial arts educators and those responsible for industrial-technical education must work together in a united effort to adjust their programs to the ever changing needs of youth" (pg. 42).
The changing needs of youth and the changes in industrial techniques have occurred so rapidly that our nation's schools have experienced difficulty in assisting youth in keeping abreast of current industrial developments. Industrial arts education is one program that has tried, for over a century, to provide an opportunity for all young people to gain insight into the technology of modern industry and to relate this knowledge to future citizenship and occupational goals. While all phases of education may contribute to industrial orientation and preparation, industrial arts is the only program to claim these as educational objectives.

One of the major goals for a contemporary industrial arts education program is to "Discover and Develop Talents, Aptitudes, Interests, and Potentialities of Individuals for the Technical Pursuits and Applied Sciences" (AVA Bulletin, 1968, pg. 10). The problem of this study is directly related to student interest in the "technical pursuits and applied sciences (technology)" of the construction industry.

If public education is to train students in construction occupations or make them aware of construction work opportunities, then the schools must identify and teach students who are interested in or might become interested in pursuing a career in the construction industry. This goal requires schools to make students aware of the types and varieties of jobs within the construction industry.
Statement of the Problem

The effects of a variety of instructional methods for presenting occupational information about the construction industry are not presently known with a high degree of certainty. Therefore, one can only guess how effectively different instructional methods affect student awareness of and interest in the construction industry.

Objectives of the Study

The researcher's purpose in making this study was to determine the extent to which selected instructional methods might increase student awareness of and interest in the construction industry. From this primary purpose were derived two specific objectives. The specific objectives were:

Objective 1: To determine whether selected media had a positive and differential effect upon student awareness of occupations in the construction industry.

Objective 2: To determine whether selected media had a positive and differential effect upon student interest in the construction industry.

Questions to be Answered

The researcher examined and assessed the results of an experimentally designed study to provide answers to the following questions:

(1) Were there differences in learning achievement within each treatment group as measured by scores on a "Construction
Industry Achievement Test" administered as a pre-test and again as a post-test?

(2) Were there differences in learning achievement between treatment groups as measured by scores on a "Construction Industry Achievement Test" administered at the conclusion of the experimental study?

(3) Were there differences in occupational interest within each treatment group as measured by responses on a "Construction Industry Interest Inventory" administered as a pre-test and again as a post-test?

(4) Were there differences in occupational interest between treatment groups as measured by responses on a "Construction Industry Interest Inventory" administered at the conclusion of the experimental study?

**Definition of Terms**

The following words and phrases were defined to clarify reading and to preclude a terminological problem.

Construction Industry Technology - that part of industrial technology which includes knowledge about construction management, production, and personnel systems used to produce and service material goods on sites.

Achievement Test - an evaluation instrument usually administered at the end of a period of learning to measure a person's comprehension or knowledge of the content of instruction.
Cognitive Domain - "... includes those objectives which deal with the recall or recognition of knowledge and development of intellectual abilities and skills." (Bloom (ed.), 1956, pg. 7).

Students' Awareness of the Construction Industry - for this study, the knowledge possessed by eighth grade students about the construction industry as determined by a reliable construction industry achievement test.

Interest Inventory - a list of statements, about the practices that occur in any one or more occupational areas, which are designed to assess, in depth, the specific interests of people.

Affective Domain - a domain of objectives which describes changes in interests, attitudes, and values, and the development of appreciations and adequate adjustment (Krathwohl, 1964, pg. 7).

Students' Interest in the Construction Industry - for this study, the construction industry interests of eighth grade students were defined as their curiosity and inquisitiveness about performing construction industry practices as delimited by the Construction Industry Interest Inventory (CIII).

Significance of the Study

The development of appropriate work-related attitudes is one essential objective for industrial arts and occupational education programs. A review of available literature on work-related attitudes did not reveal how this objective might be achieved; nor did it reveal the degree of student awareness and acceptance of this objective. Thus, it was decided to determine if the awareness and interests of students
in a selected occupational area could be affected by alternative instructional methods.

As a result of this study a recommendation is made to classroom teachers and other educational personnel regarding the relative effectiveness of selected instructional methods for stimulating student awareness and interest.

**Assumptions of the Study**

The study was developed using the following assumptions:

(1) All data collected by the guidance counselor were reasonably valid and reliable measures of pupil ability.

(2) The guidance counselor accurately recorded the results of the Iowa Basic Skills Test for later use.

(3) Junior high school industrial arts students possessed some unknown level of awareness about the construction industry.

(4) Students expressed an awareness about construction industry practices by responding to a pre-test on construction industry practices.

(5) Junior high school industrial arts students possessed some unknown level of interest about the construction industry.

(6) Students expressed their interest about construction industry practices by responding to statements about the construction industry on the basis of a one-to-five Likert rating scale.

**Limitations of the Study**

Inherent in any problem are certain limitations that can be
identified but not controlled. The limitations of this study were:

(1) The use of one purposively selected school as a sample should be considered in any interpretation of the results of the study.

(2) The three experimental groups and one control group used in the study were comparatively selected from several eighth grade classes.

(3) The use of three instructional methods should be considered in any interpretation of the results of the study.

(4) The content for the three instructional treatments was limited to occupational information about construction practices as described in two publications entitled "A World of Opportunity in Construction" and "Construction: A Man's Work."

(5) The instructional units were written for this study and, therefore, were out of context with the regularly assigned course content.

(6) The comprehensive achievement test was constructed for this study and tested with over 260 students. It was refined by item analysis after two pilot testings. The limitation of the instrument with regard to validity and reliability should be considered (see instrumentation description, page 49).

(7) The "Construction Industry Interest Inventory" was constructed and tested by a previous researcher with nearly 900 students. It was refined by item analysis after two pilot testings. The limitations of the instrument with regard to validity and
reliability should also be considered (see instrumentation description, page 42).

**Chapter Summary**

The purpose of this study was to determine how three different instructional methods affected public school students' awareness of and interest in construction industry occupations. Two objectives were developed about student achievement and interest. From these two objectives came four questions to give direction to the analysis. A list of defined terms was included to preclude a terminological problem. Six basic assumptions and eight study limitations provided the necessary direction for this study.
CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

This chapter presents a selected review of the literature concerned with awareness and interest change as related to evaluation of educational objectives. While some research in industrial arts closely parallels this study, only part of it has relevance to the context and method of this study. A discussion of those relevant studies follows.

Educational Needs

Many psychologists and educators have investigated the needs of youth and have agreed that "needs" can be identified and met using two general approaches, an individual and a social approach. While the individual approach attempts to identify the needs of youth by studying the child as he exists at a given moment, the social approach attempts to discover the needs of youth by identifying the conditions of society in which the child lives. The difference between these approaches represents the needs of society and thus the needs for society's youth.

In discussing the needs of youth, Tyler wrote:
The pertinent needs of youth are translated into educational objectives by identifying the new patterns of behavior that children must acquire in order that each may satisfy his needs. The new patterns of behavior are the educational objectives. They involve the development of knowledge and understanding, attitudes and interests, skills and abilities (1953, pg. 220).

Kearney, in discussing educational settings, cited the following kinds of behavioral patterns:

1. Knowledge and understanding: learn and retain facts
2. Skills and competencies: pupil performance that can be completed with ease and precision
3. Attitudes and interest: emotion and motives of pupils
4. Action patterns: pupil's behavior as he uses knowledge, understanding, and skills (Kearney, 1953, pp. 60-63).

Two behavioral patterns related to age and lessons or tasks that an individual must learn are called developmental tasks. These developmental tasks, defined by Havighurst, are "tasks which arise at or about a certain period in the life of the individual, successful achievement of which leads to his happiness and to success with later tasks, while failure leads to unhappiness in the individual, disapproval by the society, and difficulty with later tasks" (Havighurst, 1953, pg. 22).

Havighurst attempted to list the developmental tasks common to all persons in the American society. He subdivided the life span into age periods, one of which is the "Development of Personal Independence". Havighurst listed the following developmental tasks for this age period:

1. Accepting one's physique and using the body effectively
2. Achieving emotional independence of parents and other adults
3. Achieving assurance of economic independence
4. Selecting and preparing for an occupation
5. Preparing for marriage and family life
6. Developing intellectual skills and concepts necessary for civic competence (1953, pp. 120-139).

If developmental tasks reflect the needs of youth, these tasks can be considered to be the general objectives of formal education. Developmental tasks can and do influence the statement of objectives to an appreciable degree.

Educators and curriculum theorists have frequently agreed that what can be learned can be expressed in learning outcomes. Learning outcomes, once ordered, can begin with a threefold division of educational objectives: cognitive, affective, and psychomotor (Krathwohl, Bloom, and Masia, 1956, pg. 6).

Within the cognitive domain, the taxonomy provides for knowledge and intellectual skills and abilities. The affective domain includes attitudes, appreciations, and emotional and social adjustment. The psychomotor domain deals with types of small and large muscle skills and coordinations such as those involved in physical training, mechanical work, and clerical trades. While psychomotor objectives are important, the researcher chose only to develop a cognitive (awareness) and an affective (interest) objective for the study. An assessment of these dimensions is best described by reviewing a three dimensional evaluation structure.

A three dimensional evaluation structure, developed by the EPIC Evaluation Center, Tucson, Arizona, is a systematic way to assess current and innovative programs. EPIC is an acronym for Evaluative Programs
for Innovative Curriculums. EPIC personnel established that the success or failure of any program is determined by the interaction of specific forces within the educational environment. They described the forces in terms of specific dimensions and variables operating in a three dimensional structure (EPIC, 1968 pg. 30). Figure 1 presents the elements found in an educational environment.

Figure 1

First Order Matrix of the EPIC Structure for Evaluation (EPIC, 1968, pg. 39)

The specific dimensions for evaluation of an innovative program are listed in the EPIC Evaluation Model as (1) behavior dimension, (2) program dimension, and (3) population dimension. These three forces are the interacting specific forces within the educational environment which determine the success or failure of innovations in modern
programs of instruction. They are described in terms of specific dimensions and variables operating in a three dimensional structure (see Figure 1). The behavior dimension is defined by the variables of Cognitive, Affective, and Psychomotor Behavior. The program dimension is defined by the variables of Method, Content, Organization, Facilities, and Cost. The third dimension is the population dimension which is defined by the variables Student, Teacher, Specialist, Administrator, and Family. The first order matrix is a scheme to illustrate the EPIC structural dimensions for program evaluation (EPIC, 1968, pg. 39).
Figure 2 presents the second order sub-categories and the specific variables of each of the dimensional cases found in Figure 1. The removed cells represent the specific concerns in this study.
Figure 3
Specific Variables of the Second Order Matrix of a Structure for Evaluation

![Diagram of Affective and Cognitive Domains]

Figure 3 depicts the specific context from the model universe for this study. A description of the Cognitive and Affective Domains is included here to further describe these two dimensions.

The "Cognitive" dimension taxonomy provides for two major classes - knowledge, and intellectual skills and abilities. Bloom, et al. (1956) conclude:

Knowledge as defined here includes those behaviors and test situations which emphasize the remembering, either by recognition or recall, of ideas, material, or phenomena. The behavior expected of the student in a recall situation is very similar to the behavior he was expected to have during the original learning situation. In the learning situation the student is expected to store in his mind certain information and the behavior expected later is the remembering of this information. Although some alterations may be expected in the material to be
remembered, this is a relatively minor part of the knowledge behavior or test. The process of relating and judging is also involved to the extent that the student is expected to answer questions and problems which are posed in a different form in the test situation than in the original learning situation.

...remembering is only one part of a much more complex process of relating, judging, and recognizing (pg. 62).

Following this definition, knowledge (1.0) is sub-divided into types such as:

1.1 **Knowledge of Specifics** - the recall of specific and isolable bits of information

1.2 **Knowledge of Terminology** - of referents for specific verbal and nonverbal symbols.

1.3 **Knowledge of Specific Facts** - of dates, events, persons, places, sources of information, etc. . . .

1.4 **Knowledge of Trends and Sequences** - of the processes, direction, and movements of phenomena with respect to time. . .

1.5 **Knowledge of Criteria** - of the criteria by which facts, principles, techniques, and procedures are employed in a particular subject . . .

1.6 **Knowledge of Theories and Structure** - of the body of principles and generalizations, together with their interrelations, which present a clear, rounded, and systematic view of a complex phenomenon, or field (Bloom, et al., 1956, pg. 201).
Bloom, et al. (1956) described other categorical groupings of the cognitive domain to include:

2.0 Comprehension
   2.1 Translation
   2.2 Interpretation
   2.3 Extrapolation

3.0 Application
4.0 Analysis
5.0 Synthesis
6.0 Evaluation (pg. 204).

The "Affective" dimension refers to the feeling aspect of behavior. David Krathwohl, Benjamin Bloom, and Bertram Masia, developed much information with implications for educational objectives. One concern of this group was to search for a classification scheme that would provide a means of ordering and relating different kinds of affective behavior. The researcher tried to order and relate different affective behaviors using the concept of "internalization." "Internalization" refers to the end product of the educational and internalization process; a person has accepted certain values, attitudes, interests, etc., and is then guided by these regardless of outside influences, be it teacher, principal, specialist, or family. The person acts as he does because to do so is in itself satisfying (Krathwohl, Bloom, and Masia, 1964, pg. 32).

The main categorical grouping and sub-grouping titles are noted in the following sequence:

Affective Domain Classification

1.0 Receiving
   1.1 Awareness-the person is aware of the feelings of others
   1.2 Willingness to Receive
1.3 Controlled or Selected Attention

2.0 Responding
   2.1 Acquiescence in Responding
   2.2 Willingness to Respond
   2.3 Satisfaction in Response

3.0 Valuing
   3.1 Acceptance of a Value
   3.2 Preference for a Value

4.0 Organization
   4.1 Conceptualization of a Value
   4.2 Organization of a Value System

5.0 Characterization by a Value Complex
   5.1 Generalized Set
   5.2 Characterization

This classification represents the range of meaning of commonly used affective terms, as measured against the taxonomy continuum. Krathwohl, et al., best describes the affective domain continuum as the following:

1. The affective continuum begins with the student's merely Receiving (1.0) stimuli and passively attending to it (sic).

2. His Responding (2.0) to stimuli or request, willingly by responding to these stimuli, and taking satisfaction in his responding,

3. His Valuing (3.0) the phenomenon or activity so that he voluntarily responds and seeks out ways to respond,

4. His Conceptualization (4.1) of each value responded to,

5. His Organization (4.2) of these values in systems and finally organizing the value complex into a single whole, a Characterization (5.0) of the individual (Krathwohl,

Figure 4 represents the major concerns of the materials, e.g., interests, appreciations, attitudes, conceptualization of values, and adjustments, from which the continuum was derived. "... an analysis of the range of meanings used for each of these terms did lead to an understanding of the characteristics of the affective domain which would have to be both encompassed and ordered. It also led to the formulation of the principle needed to establish a continuum" (Krathwohl, Bloom, and Masia, 1964, pp. 24-25).

Nature of Interests

McCall (1965, pp. 53-63) wrote that an adequate theory of interests does not exist. Super (1949, pp. 405-406) suggested that an adequate theory of interests must build on the findings concerning the relationship between general aptitude and interest. Interests are the product of interaction between inherited aptitudes and endocrine factors, on the one hand, and opportunity and social evaluation on the other.

Experimentally an interest is a response of liking; an aversion is a response of disliking (Strong, 1943, pg. 6). When one completes an interest inventory he indicates whether he likes, is indifferent to, or dislikes an item. In most measurements of interests, it is assumed that any one of these responses may be made and that all three responses will be found to each item among a number of responses.

Since interest involves reactions to specific things, it must be learned. Thorndike concluded (1935, pg. 189):
Figure 4 The range of meaning typical of commonly used affective terms measured against the taxonomy continuum (Krathwohl, Bloom, Masia, 1964, pg. 37).
The results of our experiments support the conclusion that a person can be taught new attitudes and tastes as surely though not as thoroughly as he can be taught facts and skills. The basic principles of learning by repetition and reward seem to operate with wants, interests, and attitudes as they do with ideas and movements.

Tuttle concluded (1940, pg. 102) that the evidence is fairly conclusive that occupational interest patterns are well established in many children by fifteen years of age. He also believed that interests can be learned.

Tastes can be directly cultivated. Motives can be created. The possibility of increasing strength has been established beyond reasonable doubt. Indeed, it has long been recognized, as witness successful efforts for many generations in cultivating appreciation of the various fine arts.

**Interest, Ability, Achievement**

Interests are not static. They change somewhat from time to time. Interests supply something that is not disclosed by ability and achievement. They point to what the individual wants to do; they are reflections of what he considers satisfying. If our objective is happiness and success, we must consider both interests and abilities; for surely enjoyment is just as important as efficiency in everyday life.

A 1961 study by Craven proposed that specific interests are learned--acquired under "central control" that is not consciously directed. Initially, "interest" is an indiscriminate anticipation of pleasure or satisfaction. It continues to be an effect; it is a response of liking or preferring. Interest serves an adaptive purpose because it helps a person select from his environment with the greatest economy of thought and effort the things that gratify him. Interest
facilitates the behavior required to satisfy an insistent need to relate rewardingly to the environment (Craven, 1961, pg. 10).

Darley and Hagenah (1955) concluded that "claimed interests have somewhat less permanence over time than measured interests; claimed interests emerge from different causal factors--factors more associated with prestige, family pressures, aspiration levels, transient considerations, and misconceptions of the world of work--than do measured interests." Measured interests usually tap only affective responses--likes and dislikes, and preferences. Expressed interests may have the same affective components, but they also represent conscious efforts to integrate pressures and needs, hopes and aspirations, successes, and failures (1955, pg. 78).

These few studies proved to be of little direct value to this study. Also, the research in industrial arts provided little evidence that any unified studies on student awareness and interest have been completed.

Selection of Construction Industry Interest Inventory

Buros's Mental Measurement Yearbook (1965) listed twenty-nine different interest tests; the majority of these involve vocational interests. The tests are general in nature and include several different scales exemplifying vocational areas. Buros listed no interest inventories dealing specifically with construction industry technology, or its sub-categories: management technology, production technology, and personnel technology. The inventories dealt with construction industry technology and its sub-categories only in a
superficial manner, as they relate to other occupational areas.

Buros's *Tests in Print* (1961) listed forty-one different types of inventories and tests dealing with interests. Many of these tests are the same as those listed in his *Mental Measurement Yearbook*. The tests presented in *Tests in Print* are of a general survey nature and do not focus upon any specific categories of industrial technology.

The two popular inventories, the Kuder Preference Record and the Strong Vocational Interests Blank, were designed to assess individual interests in various occupations. Each of the inventories has major sub-categories called scales. The scales are general areas of interest such as mechanical interests, outdoor interests, scientific interest, and clerical interests. The researcher considered these two inventories to be too general for the study objectives and the specific treatments of the study. The Strong Vocational Interest Blank, containing 400 items, was not recommended for use with boys below seventeen years of age except by a competent counselor (Strong, 1943, pg. 1).

The "Construction Industry Interest Inventory" (see Appendix G) developed by Young (1968) for a doctoral study was selected to be used in the study because it reflected the field of knowledge of construction industry technology. The researcher obtained permission to use the copyrighted "Construction Industry Interest Inventory" for this experimental study (see Appendix L).

**Studies Involving Instructional Procedures**

In a recent National Conference on Research in Industrial Arts held at The Center for Vocational and Technical Education, The Ohio
State University, a summary table of a forced choice ranking of research needs in industrial arts indicated a high conference participant response to a need for an answer to the question "What instructional procedures are most efficient?" (1969, pg. 14). The description of the summary table further stated that "As content increases, the question of instructional efficiency assumes new importance" along with placing emphasis on "measurable objectives" and "goal-oriented instruction" as a major research concern for industrial arts (1969, pg. 14). The question asked seems to indicate a need for the kind of study which is here-in reported.

One of the goals for industrial arts recently published by the American Vocational Association (1969, pg. 10) has a direct bearing on this study. The stated goal is to:

Discover and Develop Talents, Aptitudes, Interests and Potentialities of Individuals for the Technical Pursuits and Applied Sciences.

Efforts should be made to allow for differences of interest so that a student, when making an occupational choice, can better assess his potentialities and interests, understand his environment, and condition himself to the rapidly changing demands of technology and society.

Short and Haughey (1966) found that an overview provided by audio tape proved advantageous. They also found that the addition of written responses to a slide-tape presentation caused increased attention and better post-test scores (pg. 111).

There are only a few studies dealing with multi-media presentation. Briggs (1968), in an extensive survey of media research, contended that
the bulk of research in this area showed no significant difference. This was attributed to the possibility that in a learning situation a medium fails and succeeds alternately by dealing with components necessary for the learning tasks. For this reason, the authors of the survey suggested a movement toward multi-media packages which would contain the necessary array of media to effectively implement the learning task (pg. 97).

Atliyeh (1968) found through a national study of post-high school institutions that students learned more efficiently by programmed instruction than by the traditional lecture. The study concluded that students performed better on theory application than they did on concept recognition. Atliyeh also contended that the addition of visuals to the program caused concept recognition to improve (Atliyeh, Back and Lumsden, 1968, pg. 41).

Vernon (1953) stated that students of high ability had difficulty handling graphical material when unaided by an explanation. She concluded that "people usually understand diagrams better when they are accompanied by verbal explanation than when they are presented alone." She also found that students had difficulty relating written descriptions to graphs. She contended that if descriptions were given simultaneously through audio tape, while the students analyze the graph, learning would increase (pg. 37).

Research on multi-media by Hofer (1963) found that the use of photographs and printed instructions was more effective in teaching lower ability students (pg. 465).

Kodak (1966) found that the time required to train industrial
assembly workers was reduced fifty percent when the training sequence used color slides and tape recordings.

Berman (1968) stated the following advantages of multi-media methods:

1. Maximum student involvement through media control.
2. Self-paced instruction by optional carrel preview or postview.
3. Frees the teacher by simplicity of production and revision, reuse of the presentation, and operation by students (1964, pg. 857).

In a recent document entitled "Related General Information," Murback (1968) stated that there were two kinds of related information: The first pertaining to skills and technical knowledge in a particular job (related job theory), and the second involving personal, community, and occupational content (related general information). This study is concerned with the latter category of information.

Super and Roper (1941, pg. 487-98) developed an information test which presented "an adequate idea" of an occupation through pictures on a screen and then measured how much information had been retained. The theory is the same as for the conventional information test; i.e., that those persons interested in the occupation will remember more than the noninterested.

Chapter Summary

This chapter presented a review of literature relative to educational needs, evaluation technique, nature of interests, definition of interests and studies involving instructional procedures.

The educational needs of youth were identified by Tyler as he
described the involvement of: (1) knowledge and understanding, (2) attitudes and interests and, (3) skills and abilities. Kearney described these as behavioral patterns while adding a fourth behavioral pattern entitled action patterns. Havighurst used the term developmental tasks to describe the above patterns as he reflected on the needs of youth.

A systematic way of assessing the problem in this study evolved from the EPIC evaluation model. This model is a three dimensional structure designed to be viewed through the First Order Matrix, Second Order Matrix, and the Specific Variables of the Second Order Matrix. The content of the specific variables enables one to study the respective parts of the cognitive and affective domains.

Krathwohl, et al., (1964) developed much information with implications for educational objectives. This information is described in a classification scheme called the Affective Domain Continuum. The continuum begins with the student's merely receiving, responding, valuing, organizing, and ends with characterizing.

McCall (1965) and Super (1949) discussed the nature of interests while Strong (1943) and Thorndike (1935) described interest as a specific reaction to things. Tuttle (1940) concluded that occupational interests are well established in many children by fifteen years of age. Craven (1961) proposed that specific interests are learned, while Darley and Hagenah (1955) concluded that measured interests usually tap only affective responses--dislikes and likes, and preferences.

A "Construction Industry Interest Inventory" developed by Young (1968) was selected to be used in this study. It contained three sub-
scales of construction management, construction personnel, and construction production which reflected the field of knowledge relevant to this study.

A National Conference on Research in Industrial Arts (1969), goals for Industrial Arts published by the American Vocational Association, and various research reviews gave direction to the types of instructional procedures used in this study. While only a few studies presented instructional presentation methods in the field of industrial arts, some studies in other areas were of value. Short and Haughey (1966) found audio-tape to be advantageous. Briggs (1968) found that in a learning situation a medium fails and succeeds alternately by dealing with components necessary for the learning tasks. Kodak (1966) found that the time required to train assembly workers was reduced fifty percent when the training sequence used color slides and tape recordings. Super and Roper (1941) discovered that those students who were interested in the occupation remembered more than the noninterested.

The review of relevant literature on student awareness of and interest in the construction industry, as defined in this study, revealed a concern for their being investigated. This concern was based primarily on the lack of available studies in this area.

The methods utilized throughout the reviewed literature were useful in developing the procedures, methodology, and data analysis techniques for this study.
CHAPTER III

ORGANIZATION OF THE STUDY

Introduction

The purpose of this study is to determine whether student awareness of and interest in the construction industry can be changed or affected by varying the method of presenting occupational information.

This chapter describes the population and sample criteria, instrumentation, instructional treatments, and treatment group assignment. Other topics include the experimental design, the research variables, the research hypotheses, test administration procedures, data collection procedures and the chapter summary.

Population and Sample

The experimental study was conducted in Canton Junior High School, Canton, North Carolina in the fall of 1971. The school was selected on the basis of the following criteria:

(1) The public school administration's willingness to participate in an experimental research study;

(2) The teachers' willingness to participate in an experimental research study;

(3) A public school having eight occupational education classes
of eighth grade students; and

(4) The accessibility of the data to be used in this study.

Industrial arts programs were not readily available in western North Carolina; therefore, an occupational education program was selected for this study. A description of an occupational education program follows:

An occupational education program, designed to serve all students in grades six through nine, is a complete occupational exploration program for the middle school. It is only a part of a more comprehensive kindergarten through senior high school program as recommended by a state educational study committee.

The purpose of this program is to provide occupational education for all students as an integral part of the total education process. The program design is an adaptation of the basic program in effect in the middle grades. It alters the curriculum by the addition and expansion of practical "hands on" shop type experiences and an infusion of occupational information into all subject areas. These two components are supported by improved guidance services and a modification of the basic curriculum which is designed to provide greater holding power for potential dropouts (State Department Guidelines, 1969, pg. 2).

All students selected for participation in the study were in the eighth year of their educational program and between the ages of 13 and 15. The students were selected according to the following criteria:

(1) Students were currently enrolled in an "Occupational Education" program.

(2) Students were enrolled in "Occupational Education" since the beginning of the 1971-1972 school year.

(3) Students were not exposed to construction industry occupational knowledge prior to participation in the experimental treatment.
All schools, programs, and students in western North Carolina who could meet the above criteria were considered to be a potential population for this study. From this population a sample was drawn.

The population of this study consisted of all eighth grade students enrolled at Canton Junior High School, Canton, North Carolina. From this population a purposive sample of four naturally assembled classes was selected.

Data from a socio-economic questionnaire (see Appendix A) and information provided by the guidance counselor for each subject were collected to describe the characteristics of the four selected groups. The mean reading level for each of the four groups on the Iowa Basic Skills Test was obtained and a minimal number of students (N=6) were reassigned to groups in order to have four groups of nearly equal reading ability (see Appendix B for the data used in this study.) Table 1 shows the number of participants in each experimental group as well as the relevant characteristics used in this study.
TABLE 1

SUMMARY OF THE RELEVANT CHARACTERISTICS
OF EXPERIMENTAL TREATMENT GROUPS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Treatment Groups</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Number of Subjects*</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>116</td>
</tr>
<tr>
<td>Age of Subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>13.5</td>
<td>13.7</td>
<td>13.7</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>.69</td>
<td>.77</td>
<td>.85</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>Iowa Basic Skills Test (Reading Ability Score)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>7.8</td>
<td>7.7</td>
<td>8.0</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.2</td>
<td>2.0</td>
<td>2.2</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Iowa Basic Skills Test (Total Score-Academic Ability)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>80.2</td>
<td>81.4</td>
<td>81.0</td>
<td>81.6</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>13.8</td>
<td>13.4</td>
<td>14.7</td>
<td>13.3</td>
<td></td>
</tr>
</tbody>
</table>

* Equal group representation happened by chance.

Table 1 presents a summary of the mean age difference for each group participating in the study. An analysis of the data revealed that groups B and C recorded the highest mean age (13.7) while group D recorded the lowest mean age (13.2). However, the mean age group difference did not appear to be significant because the standard deviation for each group was quite similar.

Table 1 also presents the mean reading level score and the total academic achievement of each group as measured by the Iowa Basic Skills Test along with the standard deviations of each group.
A one-way analysis of variance program (The Ohio State University, ANOVA 1, libr., public) was utilized to test for differences among groups on each of the two variables (Reading portion and total academic achievement on the Iowa Basic Skills Tests). These analyses are shown in Tables 2 and 3.

**TABLE 2**

**ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE--READING**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>3</td>
<td>2.6</td>
<td>.87</td>
</tr>
<tr>
<td>Within</td>
<td>112</td>
<td>505.1</td>
<td>4.51</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>115</td>
<td>507.7</td>
<td></td>
</tr>
<tr>
<td><strong>F ratio</strong></td>
<td></td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 3**

**ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE--IOWA BASIC SKILLS TEST (TOTAL ACADEMIC)**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>3</td>
<td>33.64</td>
<td>11.21</td>
</tr>
<tr>
<td>Within</td>
<td>112</td>
<td>21,441.64</td>
<td>191.44</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>115</td>
<td>21,475.28</td>
<td></td>
</tr>
<tr>
<td><strong>F ratio</strong></td>
<td></td>
<td>.06</td>
<td></td>
</tr>
</tbody>
</table>
No significant differences were found among participant groups in:

(a) Mean reading scores \((F_{.95} (3,115 \text{ d.f.}) = 2.69)\), or

(b) Mean total academic scores \((F_{.95} (3,115 \text{ d.f.}) = 2.69)\).

Therefore, based on these analyses, the groups were considered to be relatively similar with regards to two relevant characteristics of participants.

**Socio-economic Questionnaires**

The socio-economic questionnaires were analyzed to obtain a description of each participant's age, his parents' occupations, and his parents' educational attainments. These results were not used in the establishment of the four groups. They are included here to further describe the similarity of each group.

**Occupations of Mothers**

Table 4 contains a summary of the occupations of the mothers of students who participated in the experiment. An analysis of this data revealed that between forty-eight and fifty-eight percent of the mothers in each of the four groups were housewives. The second highest occupational category was "general laborer", which was defined as having employment at a manual job. These two categories accounted for slightly less than seventy-two percent of the total occupations while the remaining categories of bankteller, nurse, nurse's aide, secretary, social worker, teacher, and teacher's aide accounted for the remaining twenty-eight (28) percent.
### TABLE 4

**OCCUPATION OF MOTHERS OF STUDENTS**
**RECORDED BY EXPERIMENTAL GROUP**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Parents in Group</th>
<th>Percentage of Parents in Group</th>
<th>Total Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>1. Bankteller</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2. Housewife</td>
<td>16</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>3. Nurse</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4. Nurse's Aide</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5. Laborer, General</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6. Secretary</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7. Social Worker</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8. Teacher</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>9. Teacher's Aide</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

**Occupations of Fathers**

Table 5 contains a summary of the occupations of fathers of the students who participated in the experimental study. An analysis of the data revealed that the largest single category of occupations was general laborer with a percentage slightly less than thirty-nine. The trade areas accounted for about thirteen percent while the remaining occupations accounted for slightly over forty-eight percent. The occupations were
## TABLE 5

OCUPATIONS OF FATHERS OF STUDENTS
RECORDED BY EXPERIMENTAL GROUP

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Parents in Group</th>
<th>Percentage of Parents in Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>1. Accountant</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2. Carpenter</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Electrician</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4. Laborer General</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>5. Machinist</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Maintenance Engineer</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7. Merchant</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8. Minister</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9. Personnel Manager</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10. Physician Pharmacist</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11. Pipefitter Plumber</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>12. Retired, Unknown, Deceased</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13. Salesman</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>14. School Pers.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>15. Supervisor</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>16. Truck Driver</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>
rather evenly distributed across the four sample groups.

Parents' Educational Attainment

Tables 6 and 7 list the educational attainment of parents, of the students who participated in this study, in one of seven categories. The categories range from less than seven years of public school education to college graduates with a master's degree or more. Slightly more than seventy-four (74) percent of the mothers hold a high school diploma or more, while slightly less than seventy (70) percent of the fathers hold similar educational levels. The percentage of each level appears to be about evenly distributed across the four treatment groups for both mothers and fathers.

<table>
<thead>
<tr>
<th>TABLE 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUCATIONAL LEVEL OF MOTHERS OF STUDENTS</td>
</tr>
<tr>
<td>RECORDED BY EXPERIMENTAL GROUP</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>LEVELS</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>1. Graduates,</td>
</tr>
<tr>
<td>Master's or above</td>
</tr>
<tr>
<td>2. College Graduate</td>
</tr>
<tr>
<td>3. Some College Training</td>
</tr>
<tr>
<td>4. High School Graduate</td>
</tr>
<tr>
<td>5. Some High School Training</td>
</tr>
<tr>
<td>6. Junior High School</td>
</tr>
<tr>
<td>7. Less Than Seven Years</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

...
### TABLE 7

**EDUCATIONAL LEVEL OF FATHERS OF STUDENTS**  
**RECORDED BY EXPERIMENTAL GROUP**

<table>
<thead>
<tr>
<th>LEVELS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Graduates, Master's of above</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>.043</td>
</tr>
<tr>
<td>2. College Graduate</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>20</td>
<td>.172</td>
</tr>
<tr>
<td>3. Some College Training</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>13</td>
<td>.112</td>
</tr>
<tr>
<td>4. High School Graduate</td>
<td>10</td>
<td>13</td>
<td>10</td>
<td>10</td>
<td>43</td>
<td>.371</td>
</tr>
<tr>
<td>5. Some High School Training</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>21</td>
<td>.181</td>
</tr>
<tr>
<td>6. Junior High School</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>.052</td>
</tr>
<tr>
<td>7. Less than Seven years</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>.069</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>116</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Summary of Tables**

Tables 4, 5, 6, and 7 demonstrate that parental backgrounds of the students in the four groups are quite similar. This evidence indicates that no further switching of students within the four groups is needed to obtain groups with similar parental backgrounds.

**Instrumentation**

This study utilized two instruments designed to measure how much students' interest in the construction industry changed during the experimentation. These instruments were: (1) the Construction Industry Achievement Test (CIAT), and (2) the Construction Industry Interest Inventory (CIII).
Achievement Test Development

In order to accomplish the first research objective of the study (see p. 3) it was necessary to secure a measure of student awareness of the construction industry prior to administering the treatments and again following the treatments. To measure student awareness a reliable construction industry achievement test was required. After an exhaustive search it became evident that no comprehensive achievement test specifically about the construction industry was available. Therefore, it was necessary to develop a representative achievement test with questions about management, production, and personnel practices in the construction industry.

The researcher reviewed test construction references in order to determine the appropriate test construction procedure and the type of validity needed for an instructor-developed achievement test. The appropriate concept of validity in achievement test construction is content validity. Content validity of an achievement test can be assessed by allowing experts in that area of instruction to critique the questions and response stems. A select committee, to be described later, was used to review the questions and response stems.

One approach to writing multiple-choice test items, described by Remmers, et al. (1965, pg. 232), is to:

(1) Draw up an outline or table of specifications, indicating in terms of subject matter and mental processes the instructional objectives whose achievement is to be evaluated.

(2) Compose the individual items or questions so that they correspond with specific items in the table of specifications.
(3) Arrange these items in proper order and form, prepare directions for the pupils taking the test, prepare the scoring key, and arrange other mechanical features of the test.

With these suggested guidelines in mind, the items for the construction industry achievement test were written, edited and evaluated in terms of grammatical correctness, format, consistency, and adherence to accepted principles of test construction. The final pool contained over seventy-five (75) tentative test items for the total test. After duplicate questions were eliminated, the first draft was reduced to sixty (60) items.

The sixty items in the achievement test were randomly arranged (using Snedecor's randomization table, 1962, p. 12), and the first draft was administered to ninety-eight (98) junior high school students at Dominion Junior High School, Columbus, Ohio. The average time for completing the test was 16.3 minutes. Test administrators' notes and student comments found on the test were used to revise the instrument.

The second draft containing fifty-four (54) items was administered to forty-one (41) members of the investigator's college class at Western Carolina University. These students were asked to criticize the questions and mark irregularities found in the test. Also, select members of the Industrial Education Staff of Western Carolina University who had knowledge of the construction industry provided an estimate of the content validity. As a result of these two reviews, four items were deleted from the second draft, resulting in a fifty (50) item, 4-choice, multiple-choice achievement examination (see Appendix C).

While assembling the questions for this achievement test, three distinct areas of knowledge about construction industry practices were
included. These were: (1) construction management practices, (2) construction production practices, and (3) construction personnel practices. Table 8 identifies the numberical listing of each sub-scale item used in the Construction Industry Achievement Test. The disproportionate number of items devoted to production practices is proportionate to the occupational significance of that section. The vast majority of construction personnel do work in production. The table is included here for descriptive purposes.

**TABLE 8**

**CONSTRUCTION INDUSTRY ACHIEVEMENT TEST**

**SUB-SCALE ITEMS**

<table>
<thead>
<tr>
<th>Scale</th>
<th>No. of Test Items</th>
<th>Test Item Number</th>
<th>Percent of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Management Practices</td>
<td>6</td>
<td>7,18,29,37,39,41</td>
<td>12%</td>
</tr>
<tr>
<td>Construction Production Practices</td>
<td>39</td>
<td>1,2,3,5,6,8,9,10,11,12,13,14,15,16,17,19,20,21,22,23,25,26,27,28,30,31,32,33,34,35,36,42,43,44,45,46,47,48,49</td>
<td>78%</td>
</tr>
<tr>
<td>Construction Personnel Practices</td>
<td>5</td>
<td>4,24,38,40,50</td>
<td>10%</td>
</tr>
</tbody>
</table>

No attempt was made to determine sub-scale scores of effects. A single achievement test score for each subject was used for all analyses in the study.
Construction Industry Interest Inventory

In order to accomplish the second objective of this research it was necessary to determine student interest in the construction industry prior to and again following the treatments. To measure student interest an interest inventory was required. After a comprehensive search the researcher found a suitable interest inventory which was developed by Young as a doctoral dissertation at The Ohio State University (1968, pg. 206). The interest inventory, entitled Construction Industry Interest Inventory, has a Kuder-Richardson reliability of 0.910 and an Odd-Even split half reliability of 0.910 (See Appendix E).

This interest inventory is unique in that students' interest can be assessed in three distinct areas of construction. These areas are: (1) construction management practices, (2) construction production practices, and (3) construction personnel practices. Students' responses to any one or all of the sub-areas can provide guidance counselors and other educators with specific knowledge about their interests in the construction field. The interest inventory contains 131 item phrases. These are short descriptive phrases designed to describe the various construction industry practices. The first sub-scale contains eighteen phrases (14 percent) dealing with construction management practices. The second sub-scale contains one-hundred phrases (76 percent) dealing with construction production practices. The third sub-scale contains thirteen phrases (10 percent) dealing with construction personnel practices. Table 9 shows the numerical listing of each sub-scale of the instrument (exact order as developed by the previous researcher).
TABLE 9

CONSTRUCTION INDUSTRY INTEREST INVENTORY
SUB-SCALE ITEMS

<table>
<thead>
<tr>
<th>Scale</th>
<th>No. Inventory Items</th>
<th>Inventory Item Number</th>
<th>Percent of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>18</td>
<td>17,22,24,27,35,41,42,47,50,53,54,66,68,76,80,82,107,121</td>
<td>14%</td>
</tr>
<tr>
<td>Management Practices</td>
<td>100</td>
<td>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,18,19,20,21,23,25,26,28,29,30,32,33,34,36,38,39,40,43,44,45,46,48,49,51,52,55,56,57,60,61,62,63,64,65,67,69,70,71,72,73,74,75,77,78,79,81,83,84,85,86,89,90,91,92,93,94,95,96,98,99,100,101,102,104,105,106,108,112,114,115,116,117,118,119,120,122,123,124,125,126,127,128,129,131</td>
<td>76%</td>
</tr>
<tr>
<td>Personnel Practices</td>
<td>13</td>
<td>31,37,58,59,87,88,97,103,109,110,111,113,130</td>
<td>10%</td>
</tr>
</tbody>
</table>

The scores on each sub-scale were analyzed to determine the effects of the study treatments on the particular interests measured by each of these scales. Total scores on the interest inventory for treatment groups were also analyzed in the study.

Using the two initial instruments described above, the researcher conducted two major pilot studies for the purpose of refining the CIAT. The first comprehensive pilot study was conducted in a public secondary school in western North Carolina. Tests were administered to 112 eighth grade students at Canton Junior High School, Canton, North Carolina,
during the first week of May, 1971.

The response sheets of the researcher-developed achievement exam, containing fifty, four-choice items, were scored by an IBM optical scanner at the Test Development Center, The Ohio State University. An item-analysis program, developed and maintained by the Center for Measurement and Evaluation, The Ohio State University, was utilized to determine the statistics related to the achievement instrument. Table 10 shows the summary statistics from the item-analysis of the first pilot test data.
### TABLE 10

RESULTS OF THE ITEM-ANALYSIS
OF THE FIRST PILOT TEST DATA
- ON THE "CONSTRUCTION INDUSTRY ACHIEVEMENT TEST"

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Treatment Groups</th>
<th></th>
<th></th>
<th></th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>A. Number of items on test</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>B. Number of students taking test</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>112</td>
</tr>
<tr>
<td>C. Range:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>45</td>
<td>43</td>
<td>44</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>Minimum</td>
<td>31</td>
<td>22</td>
<td>29</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>D. Mean Test Score</td>
<td>39.93</td>
<td>36.07</td>
<td>37.32</td>
<td>33.07</td>
<td>36.60</td>
</tr>
<tr>
<td>E. Median</td>
<td>40.00</td>
<td>36.00</td>
<td>38.00</td>
<td>33.00</td>
<td>36.75</td>
</tr>
<tr>
<td>F. Mode</td>
<td>43.00</td>
<td>35.00</td>
<td>39.00</td>
<td>33.00</td>
<td>39.00</td>
</tr>
<tr>
<td>G. Standard Deviation</td>
<td>3.50</td>
<td>4.80</td>
<td>3.63</td>
<td>4.34</td>
<td>4.07</td>
</tr>
<tr>
<td>H. Skewness</td>
<td>-0.68</td>
<td>-0.97</td>
<td>-0.43</td>
<td>-0.86</td>
<td>0.76</td>
</tr>
<tr>
<td>I. Kurtosis</td>
<td>-0.25</td>
<td>0.79</td>
<td>-0.59</td>
<td>0.42</td>
<td>0.37</td>
</tr>
<tr>
<td>J. Group Statistics</td>
<td>mean</td>
<td>mean</td>
<td>mean</td>
<td>mean</td>
<td>mean</td>
</tr>
<tr>
<td></td>
<td>score</td>
<td>score</td>
<td>score</td>
<td>score</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>43.50</td>
<td>41.50</td>
<td>41.11</td>
<td>37.75</td>
<td>40.97</td>
</tr>
<tr>
<td>Lower</td>
<td>35.78</td>
<td>28.50</td>
<td>32.00</td>
<td>27.00</td>
<td>36.82</td>
</tr>
<tr>
<td>K. Reliability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuder-Richardson(^{20})</td>
<td>0.534</td>
<td>0.674</td>
<td>0.480</td>
<td>0.533</td>
<td>0.555</td>
</tr>
<tr>
<td>L. Mean Item Difficulty</td>
<td>.201</td>
<td>.279</td>
<td>.254</td>
<td>.339</td>
<td>.268</td>
</tr>
<tr>
<td>M. Mean Item Discrimination</td>
<td>.154</td>
<td>.260</td>
<td>.182</td>
<td>.215</td>
<td>.203</td>
</tr>
</tbody>
</table>
The mean item difficulty (.268 for the first pilot test data) is the average difficulty of the items, while the mean item discrimination (.203 for the first pilot test data) reflects the average degree to which the items discriminate between the upper and lower groups. The Kuder-Richardson$_{20}$ is an index of the internal consistency of the test and is a function of the number of items on the test, the variability of the scores, and the proportion passing and failing each item. The KR$_{20}$ for the first pilot test data was 0.555. According to the Center for Measurement and Evaluation, The Ohio State University, these results (mean item difficulty = 0.268, mean item discrimination = 0.203, and KR$_{20}$ = 0.555) were minimal and toward the lower end of the acceptable limits for an instructor developed achievement instrument.

These results indicated that the original version of the achievement test was unreliable. Therefore, a revision of the achievement test was requested by the researcher's reviewing committee and a second pilot study was made.

A review of the achievement test questions which had a relative difficulty index of .500 or greater resulted in the following:

1. Eight items had a relative difficulty index between .509 and .929.

2. Seven of the eight items had a relative difficulty index between .509 and .670, while only one item had a relative difficulty index of .929. Each of the seven items required recall of specific information.

3. The remaining item (number 10 with a relative difficulty index .929) had two very similar responses, while only one
was correct.

Dr. Donald G. Lux reviewed the test and recommended minor word changes for seven of the fifty questions to improve their clarity or understandability. Thirty-eight of the four-choice stem responses were changed either because they were noticeably long responses or because they contained poor word choices. These corrections made the revised achievement test ready for the second pilot study (Appendix E).

The second pilot study, utilizing the revised CIAT, was administered to fifty-six junior high school students in two western North Carolina public schools during the second week of September, 1971. The students who responded were members of occupational education classes.

The student response sheets were forwarded to the Center for Measurement and Evaluation, The Ohio State University, and scored by an IBM optical scanner. Statistical data from these scores were obtained by using the same item-analysis program used for the first pilot study. Table 11 shows the summary statistics of the revised construction industry achievement test.
TABLE 11

RESULTS OF THE ITEM-ANALYSIS
OF THE SECOND PILOT TEST DATA
ON THE REVISED "CONSTRUCTION INDUSTRY ACHIEVEMENT TEST"

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Number of items on test</td>
<td>50</td>
</tr>
<tr>
<td>B. Number of students taking test</td>
<td>56</td>
</tr>
<tr>
<td>C. Range</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>38</td>
</tr>
<tr>
<td>Minimum</td>
<td>7</td>
</tr>
<tr>
<td>D. Mean Test Score</td>
<td>25.54</td>
</tr>
<tr>
<td>E. Median</td>
<td>27</td>
</tr>
<tr>
<td>F. Mode</td>
<td>30</td>
</tr>
<tr>
<td>G. Standard Deviation</td>
<td>7.66</td>
</tr>
<tr>
<td>H. Skewness</td>
<td>0.69</td>
</tr>
<tr>
<td>I. Kurtosis</td>
<td>0.24</td>
</tr>
<tr>
<td>J. Group Statistics</td>
<td>Percent</td>
</tr>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Total</td>
<td>Students</td>
</tr>
<tr>
<td>Upper</td>
<td>26.79</td>
</tr>
<tr>
<td>Lower</td>
<td>26.79</td>
</tr>
<tr>
<td>K. Reliability</td>
<td></td>
</tr>
<tr>
<td>Kuder-Richardson$^{20}$ = 0.84</td>
<td></td>
</tr>
<tr>
<td>Kuder-Richardson$^{21}$ = 0.80</td>
<td></td>
</tr>
<tr>
<td>L. Mean Item Difficulty</td>
<td>.489</td>
</tr>
<tr>
<td>M. Mean Item Discrimination</td>
<td>.377</td>
</tr>
</tbody>
</table>
Analyses of the data from the second pilot study revealed that the revised construction industry achievement test mean item difficulty was .489 and the mean item discrimination was .377. The KR20 for the revised construction industry achievement test was .836 and the KR21 was .803.

Analysis of the Revised Test Item Difficulty

An analysis of each achievement test item which had a relative difficulty index of .575 or greater resulted in these findings:

(1) Fifteen items had a relative difficulty index between .575 and .946

(2) Twelve of the fifteen items had a relative difficulty index between .575 and .786. Each of the twelve required specific information which would be known by the respondee only after exposure to the occupational information.

(3) The remaining three items (numbers 12, 25, and 35) had a high relative difficulty index between .804 and .946 and required direct specific knowledge that could only be known after a thorough comprehensive study of the occupational information.

According to the Center for Measurement and Evaluation, The Ohio State University, the results (mean item difficulty = .489, mean item discrimination = .377, KR20 = .84, and KR21 = .80) were well within acceptable limits for an instructor developed instrument.

Having two reliable instruments, one to measure awareness of and the second to measure interest in the construction industry, the
researcher next developed the instructional treatments.

**Instructional Treatments**

This study involves the use of various instructional methods in the dissemination of occupational information. In order to establish current instructional procedures a visitation was made to each of four selected junior high schools in western North Carolina. Occupational education classes were visited in order to establish appropriate and current instructional procedures. The most often observed instructional procedures were: (1) teacher-lecture, (2) movies, (3) slides with discussion, (4) coordinated slides with tape recording, and (5) individual booklets. These instructional procedures were considered for use in this study along with other more innovative instructional procedures. Availability of equipment and software (booklets, slides, script) allowed the researcher to narrow the instructional procedures to: (1) coordinated slide-tape presentation, (2) individual booklets, and (3) teacher-lecture. These three instructional procedures represented methods utilized in schools in western North Carolina as well as provided flexibility for change of instructional content when needed.

The three instructional procedures are referred to throughout the remainder of the study as treatment groups. A more precise description of the above named treatment methods follows: (1) Treatment A - Coordinated Slide-tape Treatment was developed especially for this experimental study following the format of two booklets entitled "A World of Opportunity in Construction" (Appendix H) as prepared by the Construction
Industry Advancement Program of Greater Cleveland and "Construction: A Man's Work" (Appendix I) as prepared by the General Building Contractors Association, Inc., Philadelphia, Pennsylvania. Also, the format of a slide presentation and audio-tape developed by the Ohio Contractors Association was followed. A narrated description and a list of the slides developed for experimental treatment A are included in Appendices F and G.

The second procedure (Treatment B) involved the use of two individual student booklets, "A World of Opportunity in Construction" and "Construction: A Man's Work". They were selected for this experimental study because they described the total construction industry and were written in non-technical language.

The objectives of the booklet "A World of Opportunity in Construction" are threefold:

1. To acquaint secondary school and vocational teachers with construction occupations available to high school graduates.
2. To provide systems with accurate information on the manpower needs of the construction industry.
3. To better prepare the high school graduate for the work and to give him a general introduction to the opportunities in the construction industry and its various apprenticeship programs (IAP, 1970, pg. 4).

The third procedure (Treatment C) will be referred to as the teacher-lecture method. This procedure is the most typical method employed to disseminate occupational information within the educational
process. The lecture (see Appendix J), presented by a knowledgeable person, followed the format of the slide-tape (treatment A) and individual booklets (treatment B) procedures.

**Treatment-Group Assignment**

This study involves the use of four groups of eighth grade students who are enrolled in an occupational education program. Three of the four groups were randomly assigned one of the three experimental instructional procedure treatments while the fourth group served as a control group. For the purpose of clarification the combination of randomly assigned treatments to a group are herein and after referred to as Treatment-Group A (coordinated slide-tape), Treatment-Group B (individual booklets), Treatment-Group C (teacher-lecture), and Treatment-Group D (control group).

Treatment-Group D, to be referred to as the control group, was randomly selected from the four experimental groups. This group was not exposed to the occupational information about the construction industry during the experimental study period. Instead the control group was engaged in silent review of previously assigned material during the interval when the experimental treatments were administered.

These four treatment groups constitute naturally assembled collectives which helped lead to the selection of design 10, the Nonequivalent Control Group Design, for use in this study.

**Experimental Design**

The research design used in this study was a modified version of
design 10 as explained in Campbell and Stanley (1963, pg. 47). The authors described this design as one most used in educational research:

\[ \ldots \text{the Nonequivalent Control Group} \]

Design involves an experimental group and a control group both given a pre-test and a post-test, but in which the control group and experimental group do not have pre-experimental sampling equivalence. Rather, the groups constitute naturally assembled collectives such as classrooms, as similar as availability permits but yet not so similar that one can dispense with the pre-test \ldots \) (Gage, 1963, pg. 217).

In order to adapt this particular design to the study, it was necessary to modify the design as follows:

\[
\begin{array}{ccc}
\hline
0_{A1} & A & 0_{A2} \\
\hline
0_{B1} & B & 0_{B2} \\
\hline
0_{C1} & C & 0_{C2} \\
\hline
0_{D1} & & 0_{D2} \\
\hline
\end{array}
\]

\[0_{A1} = \text{Pre-test Observation} \]
\[A = \text{Treatment of group A} \]
\[0_{A2} = \text{Post-test Observation} \]

**Research Variables**

The following research variables were considered relevant for the study: (1) dependent variables, (2) independent variables, and (3) controlled variables.

The dependent variables are the subjects’ test scores on the construction industry achievement test and the construction industry interest inventory. All participants received the same achievement test and interest inventory administered as a pre-test and again as a post-
test.

The independent variable in this experimental study consists of the three previously described teaching methods. The varied methods of presenting construction industry information contained similar instructional content.

Variables over which some degree of control was attempted were:

(1) teacher influence-minimized by using specially-trained test proctors;
(2) length of treatment-class time extended to allow for completion of pre-tests, treatments, and post-tests; and
(3) physical setting-controlled by test proctors for the specific activity.

**Hypotheses**

Using the experimental design, the researcher tested four hypotheses: two each in student interest and achievement segments of the study. These objectives and hypotheses (stated in the null form) are:

Objective 1: To determine whether selected media will have a positive and differential effect upon student awareness of occupations in the construction industry.

Hypotheses:

1. There will be no significant difference in learning achievement scores within the treatment groups on a CIAT administered as a pre-test and again as a post-test.
2. There will be no significant difference in learning achievement scores between treatment groups on a CIAT administered at the conclusion of the experimental treatments.

Objective 2: To determine whether selected media will have a positive and differential effect upon student interest in the construction industry.

Hypotheses:

1. There will be no significant differences in occupational interest scores within the treatment groups on a CIII administered as a pre-test and again as a post-test.

2. There will be no significant differences in occupational interest scores between treatment groups on a CIII administered at the conclusion of the experimental treatments.

Test Administration

After the construction and revisions of the achievement test and the selection of the interest inventory, final plans were made for the study. A schedule was developed (see Appendix K) which allowed for the first and last sessions with the four groups to be used for test administration periods. These were the pre-test and post-test periods. This schedule was necessary because all four groups needed to receive the achievement test and the interest inventory on the same day at the same hour to be consistent with proper experimental testing procedures.
A fifty-minute test and treatment period was scheduled for each group for each session. Approximately fifteen (15) minutes were allowed for the achievement test, and twenty-five (25) minutes were allowed for the interest inventory.

In order to insure that the four groups experienced the same test administration procedures, test proctors were recruited, trained, and assigned to each of the four testing and treatment rooms. The four test proctors were college students enrolled at Western Carolina University. The researcher familiarized these proctors with the test and testing techniques, thus insuring that the four groups received the test under very similar conditions.

Prior to the pre-test period each participant was assigned an identification number. This number was used to identify the student in the study and on the computer print out sheet. Students in treatment Group A were identified by numbers 001 to 029; treatment Group B students were identified by numbers 030 to 058; treatment Group C students were identified by numbers 059 to 087; and control Group D students were identified by numbers 088 to 116.

Having established adequate test administration procedures for this study, the researcher proceeded to the collection of data.

Data Collection

The pre-test CIAT and CIII were given to the four experimental groups during the first session before they received any occupational information about the construction industry. A socio-economic information sheet was also administered. The student response sheets
for the CIAT were forwarded to the Center for Measurement and Evaluation, The Ohio State University, and scored by an IBM optical scanner. Statistical data from these scores were obtained by using the same item-analysis program used for the two pilot studies. Table 12 shows the summary statistics of the CIAT used as a pre-test.

Analyses of the data from the pre-test scores of CIAT revealed that the mean item difficulty was .515 and the mean item discrimination was .341. The KR$^{20}$ was .787 and the KR$^{21}$ was .758.

The student response sheets for the CIII were hand scored by the researcher and rechecked for accuracy. The inventory, containing three sub-scales, was scored on the basis of $A=5$ (Most interest), $B=4$ (Above average interest), $C=3$ (Average interest), $D=2$ (Below average interest), and $E=1$ (Least interest). The first sub-scale (management practices) had eighteen responses with a possible high score of ninety (90) points and a low score of eighteen (18) points. The second sub-scale (production practices) had one-hundred responses with a possible high score of five-hundred (500) points and a low score of one-hundred (100) points. The third sub-scale (personnel practices) had thirteen (13) responses with a possible high score of sixty-five (65) points and a low score of thirteen (13) points. Table 13 presents the results of the pre-test CIAT, CIII, and the three sub-scales of the CIII.
### TABLE 12

RESULTS OF THE ITEM-ANALYSIS
OF THE PRE-TEST DATA ON THE
"CONSTRUCTION INDUSTRY ACHIEVEMENT TEST"

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Treatment Groups</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>A. Number of items on test</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>B. Number of students taking test</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>C. Range:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>Minimum</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>D. Mean Test Score</td>
<td>23.59</td>
<td>24.62</td>
</tr>
<tr>
<td>E. Median</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>F. Mode</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>G. Standard Deviation</td>
<td>7.48</td>
<td>6.46</td>
</tr>
<tr>
<td>H. Skewness</td>
<td>-0.11</td>
<td>0.79</td>
</tr>
<tr>
<td>I. Kurtosis</td>
<td>-1.12</td>
<td>0.12</td>
</tr>
<tr>
<td>J. Group Statistics</td>
<td>mean</td>
<td>mean</td>
</tr>
<tr>
<td></td>
<td>score</td>
<td>score</td>
</tr>
<tr>
<td>Upper</td>
<td>32.26</td>
<td>33.00</td>
</tr>
<tr>
<td>Lower</td>
<td>14.38</td>
<td>17.50</td>
</tr>
<tr>
<td>K. Reliability</td>
<td>Kuder-Richardson 20</td>
<td>Kuder-Richardson 21</td>
</tr>
<tr>
<td></td>
<td>.824</td>
<td>.754</td>
</tr>
<tr>
<td>L. Mean Item Difficulty</td>
<td>.528</td>
<td>.508</td>
</tr>
<tr>
<td>M. Mean Item Discrimination</td>
<td>.364</td>
<td>.310</td>
</tr>
</tbody>
</table>
TABLE 13

SUMMARY OF THE CIAT AND CIII
CHARACTERISTICS OF EXPERIMENTAL TREATMENT GROUPS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Treatment Groups</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Achievement Pre-test Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>23.6</td>
<td>24.6</td>
<td>24.4</td>
<td>24.4</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>7.5</td>
<td>6.5</td>
<td>7.7</td>
<td>6.0</td>
</tr>
<tr>
<td>Interest Inventory Pre-test Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>256.2</td>
<td>292.2</td>
<td>277.7</td>
<td>316.2</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>95.4</td>
<td>104.3</td>
<td>100.1</td>
<td>98.9</td>
</tr>
<tr>
<td>Management Practices Pre-test Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>43.0</td>
<td>42.2</td>
<td>42.4</td>
<td>47.6</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>17.2</td>
<td>16.8</td>
<td>15.6</td>
<td>15.4</td>
</tr>
<tr>
<td>Production Practices Pre-test Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>179.1*</td>
<td>217.0</td>
<td>201.3</td>
<td>233.4*</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>76.4</td>
<td>82.4</td>
<td>77.5</td>
<td>79.2</td>
</tr>
<tr>
<td>Personnel Practices Pre-test Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>34.1</td>
<td>33.0</td>
<td>34.0</td>
<td>35.2</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>12.5</td>
<td>11.9</td>
<td>15.4</td>
<td>12.5</td>
</tr>
</tbody>
</table>

* Indicates a significant difference in group means at the .05 level of significance.

A one-way analysis of variance program was utilized to test for differences among groups on each of the two variables (achievement and interest) for each of the four groups. Each of the sub-scales of the interest inventory were also tested for differences among groups. These analyses are shown in Tables 14-18.
### TABLE 14

**ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE—CIAT PRE-TEST SCORES**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>19.1</td>
<td>6.4</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>5624.5</td>
<td>50.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>115</td>
<td>5643.6</td>
<td></td>
</tr>
<tr>
<td><strong>F ratio</strong></td>
<td></td>
<td></td>
<td>0.13</td>
</tr>
</tbody>
</table>

### TABLE 15

**ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE—CIII PRE-TEST SCORES**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>55,297.2</td>
<td>18,432.4</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>1,114,875.7</td>
<td>9,954.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>115</td>
<td>1,170,172.9</td>
<td></td>
</tr>
<tr>
<td><strong>F ratio</strong></td>
<td></td>
<td></td>
<td>1.85</td>
</tr>
</tbody>
</table>
### TABLE 16

**ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE—CIII - SUB SCALE - MANAGEMENT PRACTICES**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>568.4</td>
<td>189.5</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>29,727.1</td>
<td>265.4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>115</td>
<td><strong>30,295.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

F ratio = 0.71

### TABLE 17

**ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE—CIII - SUB SCALE - PRODUCTION PRACTICES**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>52,923.3</td>
<td>17,641.1</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>697,001.3</td>
<td>6,223.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>115</td>
<td><strong>749,924.6</strong></td>
<td></td>
</tr>
</tbody>
</table>

F ratio = 2.83
TABLE 18

ANALYSIS OF VARIANCE, ONE-WAY
CLASSIFICATION, FOR THE VARIABLE--
CIII - SUB SCALE - PERSONNEL PRACTICES

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f.</th>
<th>Sum of squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>70.47</td>
<td>23.49</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>19,331.40</td>
<td>172.60</td>
</tr>
<tr>
<td>TOTAL</td>
<td>115</td>
<td>19,401.87</td>
<td></td>
</tr>
<tr>
<td>F ratio</td>
<td></td>
<td>0.136</td>
<td></td>
</tr>
</tbody>
</table>

No significant differences were found among participant groups in:

(a) CIAT Pre-test Scores (F.95 (3,112 df) = 2.69),
(b) CIII Pre-test Scores (F.95 (3,112 df) = 2.69),
(c) CIII Pre-test Sub-scale Management Practices (F .95 (3,112 df) = 2.69), or
(d) CIII Pre-test Sub-scale Personnel Practices (F.95 (3,112 df) = 2.69).

A significant difference between groups was found in CIII Sub-scale Production Practices (see Table 17). Based on these analyses, the participant groups were considered to be relatively similar in all aspects of the instruments except in the Production Practices Sub-scale.

All achievement test scoring was performed on an IBM test scanning machine, while the interest inventory was scored by the investigator.
Chapter Summary

In this chapter the population, sample, sample description, achievement test development, interest inventory selection, instructional treatments, and treatment group assignments were explained. The experimental design along with the research variables (dependent, independent, and controlled) were described. The hypotheses were cited in the null form, test administration techniques were explained, and the results of the pre-test were reported.
CHAPTER IV

ANALYSIS OF DATA

Introduction

This chapter presents the data obtained from the study and analyzes these in relation to each of the research hypotheses. The statistical procedures used in the data treatment were discussed in detail in Chapter III. The analysis of the data is discussed in the following order: (1) Analysis of the Construction Industry Achievement Test (CIAT) data and (2) Analysis of the Construction Industry Interest Inventory (CIII). The student scores on each instrument are shown in Appendix B.

Analysis of Achievement Data

The CIAT (described in Chapter III and shown in Appendix E) was administered as a pre-test at the first session of the experimental study and again at the last session as a post-test. Concerning the CIAT segment of the assessment, two hypotheses were stated:

$H_{01}$: There will be no significant difference in learning achievement scores within the treatment groups on a CIAT administered as a pre-test and again as a post-test.

$H_{02}$: There will be no significant difference in learning achievement scores between treatment groups on a CIAT administered...
at the conclusion of the experimental treatments.

Hypothesis $H_0$ was tested by the use of Fisher's t-test for determining difference between correlated means, as suggested by J. P. Guilford (pg. 184).

Table 19 shows the results of the t-test on $H_0$.

### Table 19
**Comparison of Participants' Achievement**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>N</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment Group A</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>23.6</td>
<td>7.5</td>
<td>29</td>
<td>3.0*</td>
</tr>
<tr>
<td>Post-test</td>
<td>30.1</td>
<td>8.4</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td><strong>Treatment Group B</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>24.6</td>
<td>6.5</td>
<td>29</td>
<td>1.9</td>
</tr>
<tr>
<td>Post-test</td>
<td>27.9</td>
<td>6.8</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td><strong>Treatment Group C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>24.4</td>
<td>7.7</td>
<td>29</td>
<td>1.5</td>
</tr>
<tr>
<td>Post-test</td>
<td>27.5</td>
<td>7.8</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td><strong>Treatment Group D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>24.4</td>
<td>6.0</td>
<td>29</td>
<td>.24</td>
</tr>
<tr>
<td>Post-test</td>
<td>24.8</td>
<td>6.2</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

* Indicates a significant difference in group means at the .05 level.

The null hypothesis ($H_0$) was rejected ($t_{.05} 55 \text{ df} = 2.00$). The difference between the correlated means of treatment group A was found to be significant, while the difference between the correlated means of the other three treatment groups was non-significant.

A one-way analysis of variance formula, as suggested by J. P. Guilford, was utilized to test hypothesis $H_0$.
Table 20 shows the analyses of the CIAT differences.

**TABLE 20**

ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE VARIABLE—CIAT POST-TEST SCORES

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>405.25</td>
<td>135.08</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>5972.33</td>
<td>53.32</td>
</tr>
<tr>
<td>TOTALS</td>
<td>115</td>
<td>6377.58</td>
<td></td>
</tr>
</tbody>
</table>

F ratio = 2.53

The null hypothesis \( (H_0^2) \) was not rejected \( (F_{.95} (3,112df) = 2.69) \). Some differences were found in students' achievement in knowledge about the construction industry as measured by the post-test CIAT, but not enough to reject the null hypothesis \( (H_0^2) \).

**Analysis of Interest Inventory Data**

The CIII (described in detail in Chapter II and shown in Appendix E) was administered as a pre-test at the first session of the experimental study and again at the last session as a post-test. Concerning the construction industry interest segment of the assessment, the following two hypotheses were stated:

\( H_0^1 \): There will be no significant differences in occupational interest scores within the treatment groups on a CIII administered as a pre-test and again as a post-test.
H₀₂: There will be no significant difference in occupational interest scores between treatment groups on a CIII administered at the conclusion of the experimental treatments.

Hypothesis H₀₁ was tested by the same t-test, for determining difference between means, as was used in the analysis of H₀₁ of the CIAT. Each sub-scale and total comparison is reported individually.

Table 21 shows the results of the t-test on the sub-scale management practices of the CIII

**TABLE 21**

**COMPARISON OF TREATMENT GROUPS ON CIII SUB-SCALE - MANAGEMENT PRACTICES**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>N</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment-Group A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>43.0</td>
<td>17.2</td>
<td>29</td>
<td>1.4</td>
</tr>
<tr>
<td>Post-test</td>
<td>49.4</td>
<td>17.9</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>42.2</td>
<td>16.8</td>
<td>29</td>
<td>0.23</td>
</tr>
<tr>
<td>Post-test</td>
<td>46.3</td>
<td>15.1</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>42.4</td>
<td>15.6</td>
<td>29</td>
<td>0.03</td>
</tr>
<tr>
<td>Post-test</td>
<td>42.5</td>
<td>13.6</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>47.6</td>
<td>15.4</td>
<td>29</td>
<td>0.03</td>
</tr>
<tr>
<td>Post-test</td>
<td>48.0</td>
<td>14.8</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

No significant differences were found in the sub-scale - management
practice scores \((t_{0.05 \; 55 \; d.f. \; 2.00})\).

Table 22 shows the results of the t-test on the sub-scale--Production Practices of the CIII.

**TABLE 22**

**COMPARISON OF TREATMENT GROUPS**  
**ON CIII SUB-SCALE--PRODUCTION PRACTICES**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>N</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment Group A</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>179.1</td>
<td>76.4</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td>209.2</td>
<td>70.6</td>
<td>28</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Treatment Group B</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>217.0</td>
<td>82.4</td>
<td>29</td>
<td>0.87</td>
</tr>
<tr>
<td>Post-test</td>
<td>235.0</td>
<td>75.0</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td><strong>Treatment Group C</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>201.3</td>
<td>77.3</td>
<td>29</td>
<td>0.83</td>
</tr>
<tr>
<td>Post-test</td>
<td>218.5</td>
<td>79.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Treatment Group D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>233.4</td>
<td>79.2</td>
<td>29</td>
<td>0.00</td>
</tr>
<tr>
<td>Post-test</td>
<td>233.4</td>
<td>76.2</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

No significant differences were found in the sub-scale production practices scores \((t_{0.05 \; 55 \; d.f. \; 2.00})\).

Table 23 shows the results of the t-test on the sub-scale Personnel Practices of the CIII.
### Table 23

**Comparison of Treatment Groups on CIII Sub-Scale--Personnel Practices**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
<th>N</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment-Group A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>34.1</td>
<td>12.5</td>
<td>29</td>
<td>1.85</td>
</tr>
<tr>
<td>Post-test</td>
<td>40.4</td>
<td>12.9</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>33.0</td>
<td>11.9</td>
<td>29</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-test</td>
<td>33.7</td>
<td>10.7</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>34.0</td>
<td>15.4</td>
<td>29</td>
<td>0.85</td>
</tr>
<tr>
<td>Post-test</td>
<td>37.3</td>
<td>14.6</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>35.2</td>
<td>12.5</td>
<td>29</td>
<td>3.56*</td>
</tr>
<tr>
<td>Post-test</td>
<td>48.0</td>
<td>14.8</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

* Indicates a significant difference in group means at the .05 level of significance.

The null hypothesis ($H_0$) was rejected ($t_{0.05} = 2.00$).

Treatment-Group D participants were found to score significantly higher on the post-test than on the pre-test.

Table 24 shows the results of the t-test on the total scores of the CIII.
**TABLE 24**

**COMPARISON OF TREATMENT GROUPS ON CIII TOTAL SCORES**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
<th>Deviation</th>
<th>N</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment-Group A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>256.2</td>
<td>95.4</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td>295.0</td>
<td>96.6</td>
<td>28</td>
<td>1.5</td>
</tr>
<tr>
<td>Treatment-Group B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>292.2</td>
<td>104.3</td>
<td>29</td>
<td>0.88</td>
</tr>
<tr>
<td>Post-test</td>
<td>315.1</td>
<td>92.7</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>277.7</td>
<td>100.1</td>
<td>29</td>
<td>0.78</td>
</tr>
<tr>
<td>Post-test</td>
<td>298.4</td>
<td>100.8</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Treatment-Group D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>316.2</td>
<td>98.9</td>
<td>29</td>
<td>0.02</td>
</tr>
<tr>
<td>Post-test</td>
<td>316.8</td>
<td>100.9</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

No significant differences were found in the total scores ($t_0.05 = 55$ d.f. 2.00).

A one-way analysis of variance formula was utilized to test hypothesis $H_02$. Differences between groups on each of the three sub-scales (management practices, production practices, and personnel practices) of the CIII and the differences between each of the groups on total scores of the CIII were analyzed. These analyses are shown in Tables 25-28.
### TABLE 25

ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE SUB-SCALE VARIABLE--MANAGEMENT PRACTICES OF THE CIII POST-TEST SCORES

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>839.26</td>
<td>279.75</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>26,173.30</td>
<td>233.69</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>115</td>
<td>27,012.56</td>
<td></td>
</tr>
</tbody>
</table>

*F ratio = 1.19*

### TABLE 26

ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION, FOR THE SUB-SCALE VARIABLE--PRODUCTION PRACTICES OF THE CIII POST-TEST SCORES

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>14,696.04</td>
<td>4898.68</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>624,465.76</td>
<td>5575.56</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>115</td>
<td>639,161.80</td>
<td></td>
</tr>
</tbody>
</table>

*F ratio = 0.89*
TABLE 27

ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION,
FOR THE SUB-SCALE VARIABLE--PERSONNEL
PRACTICES OF THE CIII POST-TEST SCORES

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>3,213.73</td>
<td>1,071.24</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>19,603.41</td>
<td>175.03</td>
</tr>
<tr>
<td>TOTAL</td>
<td>115</td>
<td>22,817.14</td>
<td></td>
</tr>
<tr>
<td>F ratio = 6.12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 28

ANALYSIS OF VARIANCE, ONE-WAY CLASSIFICATION,
FOR THE VARIABLE--TOTAL CIII
POST-TEST SCORES

<table>
<thead>
<tr>
<th>Sources of variation</th>
<th>d.f.</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>between</td>
<td>3</td>
<td>10,764.10</td>
<td>3,588.00</td>
</tr>
<tr>
<td>within</td>
<td>112</td>
<td>1,052,077.80</td>
<td>9,393.60</td>
</tr>
<tr>
<td>TOTAL</td>
<td>115</td>
<td>1,062,841.90</td>
<td></td>
</tr>
<tr>
<td>F ratio = 0.38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The null hypothesis \( H_0 \) was not rejected \( F_{.95} (3,112 \text{ df}) = 2.69 \) in:

(a) Sub-scale Management Practices,
(b) Sub-scale Production Practices, or
(c) Total CIII Scores.

The null hypothesis \( H_0 \) was rejected \( F_{.95} (3,112 \text{ df}) = 2.69 \) in sub-scale Personnel Practices. To determine which group caused the
significant difference a test developed by J. W. Tukey, as described by J. P. Guilford (pg. 276), was utilized. The test is designed to test the gaps between means. The set means in rank order are:

- Treatment Group D = 48.0
- Treatment Group A = 40.4
- Treatment Group C = 37.3
- Treatment Group B = 33.7

The within sets mean square is 175.03 (see Table 27), the best estimate of the population variance. Using the following equation

\[ d_m = \frac{2 \text{ SE of pair differences}^2}{n} = \frac{2 (\text{MS})}{n} \]

the following results were derived.

- \[ t_{.01} \quad d_m = 2.756 \times 3.474 = 7.57 \]
- \[ t_{.05} \quad d_m = 2.045 \times 3.474 = 7.04 \]

The largest gap is between the two highest means. It amounts to 7.6, which is significant at both the .01 and .05 levels. The post-test responses of Treatment Group D, Sub-scale Personnel Practices is significantly higher than the responses in the other three groups.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The concluding chapter of this study reviews the purposes, objectives, and methodology utilized along with the major findings of the study. From the findings recommendations were made, which, if properly implemented, should facilitate a more effective method of presenting occupational information.

Purpose of the Study

The basic purpose of this study was to assess the effectiveness of various teaching methods used in presenting occupational information to junior high school students. From this assessment a recommendation was made to classroom teachers and other educational personnel regarding the use of selected instructional methods for stimulating student awareness of and interest in one occupational industry - the construction industry.

Objectives of the Study

Two objectives were developed to accomplish the above stated purpose and to give specific direction to the study. They were:
Objective 1: To determine whether selected media had a positive and differential effect upon student awareness of occupations in the construction industry.

Objective 2: To determine whether selected media had a positive and differential effect upon student interest in the construction industry.

Review of Literature

A review of pertinent literature was completed. A part of this review concerned students' needs, interest classifications, the nature of interests, a definition of interests, and interest measurement devices; the remaining portion of the review dealt with the few studies and relevant research completed on student interest.

As a result of the review of literature, it became evident that little relevant work had been done in the area. Certainly no satisfactory answer was found to the question: What effect does the use of various selected instructional media have in stimulating student awareness of and interest in the construction industry? This study was designed to seek answers to the mystery of student motivational patterns, particularly as they relate to junior high students and the construction industry.

Methodology

In this study, three methods of instruction were used in disseminating occupational information about the construction industry to eighty-seven junior high school students in three separate occupa-
tional education classes. A fourth group of twenty-nine students was used as a control group. Evaluation of each method of instruction was achieved by t-tests and one-way analysis of variance on a researcher developed CIAT and the CIII.

Since randomization was not utilized in assigning participants to treatment groups, two variables (measures) on each student were analyzed to determine the relevant similarities of the groups. These variables were: (1) Iowa Basic Skills scores (Reading portion) (2) Iowa Basic Skills Test scores (total academic achievement).

Two instruments were utilized to assess the effectiveness of the presentation methods. These were a Construction Industry Achievement Test (CIAT) and a Construction Industry Interest Inventory (CIII).

The CIII was utilized because it dealt specifically with the construction industry which was consistent with the intent of this study. The reported reliability of this instrument was found to have a $KR_{20}$ of 0.910.

The investigator constructed a fifty-item (50) four-choice, multiple-choice achievement test covering occupational information about the construction industry. An item analysis program was utilized to determine the reliability and other pertinent statistics relative to the achievement test instrument. Based upon the responses of the first pilot study, the instrument was found to have a $KR_{20}$ reliability of 0.836.

The research design used in this study was a modified version of design 10 ("Non equivalent Control Group," Campbell and Stanley, 1963. pg. 47) without randomization:
Experimental Group: \( A_1 \), \( X_1 \), \( A_2 \)
\( B_1 \), \( X_2 \), \( B_2 \)
\( C_1 \), \( X_3 \), \( C_2 \)

Criterion Group: \( D_1 \), \( D_2 \)

Where: \( A_1, B_1, C_1, D_1 = \) pre-test
\( X_1, X_2, X_3 = \) treatment
\( A_2, B_2, C_2, D_2 = \) post-test

Each experimental group and criterion group was comprised of twenty-nine (29) students.

The pre-test CIAT and the pre-test CIII were administered to all groups during the first session, prior to any subject matter instructions. The experimental treatments of construction industry occupational information were administered during the second session. The post-test CIAT and the post-test CIII were re-administered during the last session at the conclusion of the experimental study.

**Findings**

There were four questions stated in Chapter I that should be answered by this study. The first question was: Were there differences in learning achievement within each treatment group as measured by scores on a "Construction Industry Achievement Test" administered as a pre-test and again as a post-test? The answer to this question is affirmative. The test of significance reveals a .05 level of significance for treatment group A. An examination of Table 19 for comparison of group achievement indicates that students who received occupational
information via different teaching procedures had varying degrees of gain in knowledge about the construction industry as indicated by test scores on an achievement test. The superiority of the coordinated slide-tape presentation method may be attributable to its multi-sensory appeal.

Question two was: Were there differences in learning achievement between treatment groups as measured by scores on a "Construction Industry Achievement Test" administered at the conclusion of the experimental study? The test of significance indicated a negative answer.

Question three was: Were there differences in occupational interest within each treatment group as measured by responses on a "Construction Industry Interest Inventory" administered as a pre-test and again as a post-test? The results of test of significance for this question are reported by sub-scales and then by the total number of responses. The test of significance indicates a negative answer to the first sub-scale Management Practices.

The test of significance indicates a negative answer to the second sub-scale Production Practices.

The test of significance of the third sub-scale Personnel Practices reveals a .05 level of significance for treatment group D, the control group. It is difficult for the investigator to account for this finding. However, it should be noted that the sub-scale in question included only thirteen of one hundred and thirty-one items and no significant differences were found on the total interest inventory scores.

The test of significance indicates a negative answer to the total
responses given in the interest Inventory.

Question four was: Were there differences in occupational interest between treatment groups as measured by responses on a "Construction Industry Interest Inventory" administered at the conclusion of the experimental study? The results of the test of significance for this question are reported by sub-scales and then by total number of responses.

The test of significance indicates a negative answer to the first sub-scale Management Practices.

The test of significance indicates a negative answer to the second sub-scale Production Practices.

The test of significance of the third sub-scale Personnel Practices reveals a .01 level of significance for treatment group D. An examination of the data and further testing through Tukey's test to determine which group score was significantly higher revealed that treatment group D was significant at the .01 level (see Table 27 and Tukey's test results on page 73).

The test of significance indicates a negative answer to the total responses on interest measured between treatment groups.

Conclusions

On the basis of the findings detailed in Chapter IV and outlined above, the following conclusions were drawn. The findings were in answer to the four specific questions suggested by the two objectives of the study. The first objective was:

To determine whether selected media had a positive and differential effect upon student awareness
of occupations in the construction industry.

From the evidence obtained in this study, it could be stated that selected media did have a positive and differential effect upon student achievement relating to knowledge of the construction industry.

Students who were taught by the individualized booklet method of presentation and the teacher-lecture method had gains in knowledge about the construction industry, but the gains were not statistically significant. These latter presentation methods were not as effective as the slide-tape method, which suggests that the slide-tape method should be a preferred method in presenting occupational information, all other things being equal.

The second objective was:

To determine whether selected media had a positive and differential effect upon student interest in the construction industry.

From the evidence obtained in this study, it could be stated that selected media did not have significant positive and differential effects upon student interest in the construction industry. This suggests that school time spent on attempting to develop occupational interests, under the conditions of this experiment, may be better allocated to other educational endeavors.

Recommendations

The recommendations offered are presented in two sections, with one grouping specifically oriented for educational researchers and the other grouping oriented for practicing educators.
Recommendations to the Researcher

From the evidence obtained in this study, it was evident that additional research needs to be conducted in this important area of student interest, particularly in the area of interest toward the construction industry. The researcher makes the following recommendations:

1. Research similar to this study should be conducted in order to further verify the findings of this investigator.

2. Research should be conducted in which the length of presentation and the presentation procedures are varied. In this study the presentations were of equal length, involving one session each. Variations of the above could include:
   a. Shorter presentations over an extended period.
   b. Utilization of additional presentation methods such as: video-tape, team teaching, movie films, field trips, and/or guest speakers.
   c. Include "hands-on" experiences in the treatments.

3. Further research is needed to determine the most effective procedures of evaluating change in student interest.

4. A longitudinal study to determine the age at which receptivity to interest change is greatest.

5. Similar research is needed in other occupational clusters in order to determine whether the findings of this study are valid for other industries.

6. Research is needed to determine readiness for occupational orientation learning in adolescents.
7. Longitudinal studies of this type should be conducted to determine the extent and kind of treatment necessary to develop occupational interests.

**Recommendations to the Practicing Educator**

From the evidence obtained in this study it is recommended that practicing educators utilize the following:

1. The instructional materials used in this study should be revised, in light of the findings, in an attempt to increase their impact in extending students' awareness of and interest in the construction occupations.

2. Until further research on the effectiveness of instructional treatments on developing interests has been completed, this researcher recommends that program time not be made available to develop occupational interests through methods and materials similar to the types used in this study.

3. Coordinated slide-tape method of instruction might be given preference over the use of lecturing or individualized study of booklets in attempting to increase occupational awareness.
SOCIO-ECONOMIC INFORMATION

Name_____________________________________________ Age______
(First) (Middle) (Last) month-year

Room Number__________________________________________

Father's Occupation_____________________________________
(Title of Job)

Mother's Occupation_____________________________________
(Title of Job)

Place an F on the blank line which indicates your father's highest completed education and place an M on the blank to indicate your mother's highest completed education.

_____ Graduate (Masters or Doctorate Degree)
_____ College Graduate (4 years)
_____ Some College Training (at least one year)
_____ High School Graduate
_____ Some High School Training
_____ Junior High School (completed to 9th grade)
_____ Less Than Seven Years of School
<table>
<thead>
<tr>
<th>Student Number</th>
<th>Age</th>
<th>Iowa Basic Reading Skills</th>
<th>Iowa Basic Skills Total</th>
<th>CIAT Pre-test</th>
<th>CIAT Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>13</td>
<td>7.2</td>
<td>83</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>002</td>
<td>13</td>
<td>9.4</td>
<td>92</td>
<td>33</td>
<td>39</td>
</tr>
<tr>
<td>003</td>
<td>15</td>
<td>6.8</td>
<td>72</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>004</td>
<td>13</td>
<td>10.8</td>
<td>96</td>
<td>32</td>
<td>41</td>
</tr>
<tr>
<td>005</td>
<td>13</td>
<td>6.1</td>
<td>69</td>
<td>21</td>
<td>28</td>
</tr>
<tr>
<td>006</td>
<td>14</td>
<td>5.4</td>
<td>58</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>007</td>
<td>14</td>
<td>7.5</td>
<td>80</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td>008</td>
<td>13</td>
<td>7.2</td>
<td>74</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>009</td>
<td>13</td>
<td>10.0</td>
<td>94</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>010</td>
<td>13</td>
<td>6.7</td>
<td>70</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>011</td>
<td>14</td>
<td>7.2</td>
<td>78</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>012</td>
<td>14</td>
<td>13.6</td>
<td>108</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td>013</td>
<td>14</td>
<td>7.6</td>
<td>85</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>014</td>
<td>13</td>
<td>8.0</td>
<td>91</td>
<td>21</td>
<td>34</td>
</tr>
<tr>
<td>015</td>
<td>14</td>
<td>7.3</td>
<td>80</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>016</td>
<td>13</td>
<td>6.2</td>
<td>68</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>017</td>
<td>13</td>
<td>4.7</td>
<td>58</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>018</td>
<td>13</td>
<td>6.3</td>
<td>65</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>019</td>
<td>14</td>
<td>8.2</td>
<td>90</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>020</td>
<td>13</td>
<td>13.1</td>
<td>104</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>021</td>
<td>14</td>
<td>7.9</td>
<td>81</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>022</td>
<td>14</td>
<td>8.5</td>
<td>86</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>023</td>
<td>13</td>
<td>6.5</td>
<td>78</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td>024</td>
<td>13</td>
<td>4.0</td>
<td>52</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>025</td>
<td>13</td>
<td>5.6</td>
<td>64</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td>026</td>
<td>14</td>
<td>8.3</td>
<td>85</td>
<td>23</td>
<td>--*</td>
</tr>
<tr>
<td>027</td>
<td>13</td>
<td>7.6</td>
<td>79</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>028</td>
<td>14</td>
<td>8.8</td>
<td>89</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>029</td>
<td>14</td>
<td>10.0</td>
<td>97</td>
<td>31</td>
<td>41</td>
</tr>
</tbody>
</table>

* Indicates student was absent during CIAT post-test.
<table>
<thead>
<tr>
<th>Student Number</th>
<th>Age</th>
<th>Iowa Basic Reading Skills</th>
<th>Iowa Basic Skills Total</th>
<th>CIAT Pre-test</th>
<th>CIAT Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>030</td>
<td>13</td>
<td>7.9</td>
<td>89</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>031</td>
<td>14</td>
<td>10.3</td>
<td>102</td>
<td>26</td>
<td>31</td>
</tr>
<tr>
<td>032</td>
<td>15</td>
<td>8.3</td>
<td>84</td>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td>033</td>
<td>14</td>
<td>6.5</td>
<td>68</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>034</td>
<td>13</td>
<td>7.1</td>
<td>82</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>035</td>
<td>14</td>
<td>6.5</td>
<td>70</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>036</td>
<td>13</td>
<td>7.5</td>
<td>83</td>
<td>40</td>
<td>41</td>
</tr>
<tr>
<td>037</td>
<td>14</td>
<td>5.4</td>
<td>64</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>038</td>
<td>14</td>
<td>7.6</td>
<td>74</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>039</td>
<td>14</td>
<td>5.6</td>
<td>68</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>040</td>
<td>14</td>
<td>7.1</td>
<td>75</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>041</td>
<td>13</td>
<td>12.3</td>
<td>105</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>042</td>
<td>14</td>
<td>6.8</td>
<td>71</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>043</td>
<td>13</td>
<td>8.3</td>
<td>86</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>044</td>
<td>14</td>
<td>7.9</td>
<td>88</td>
<td>28</td>
<td>31</td>
</tr>
<tr>
<td>045</td>
<td>13</td>
<td>6.9</td>
<td>79</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>046</td>
<td>13</td>
<td>6.5</td>
<td>72</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>047</td>
<td>14</td>
<td>5.0</td>
<td>60</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>048</td>
<td>13</td>
<td>10.5</td>
<td>101</td>
<td>23</td>
<td>37</td>
</tr>
<tr>
<td>049</td>
<td>13</td>
<td>11.9</td>
<td>106</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>050</td>
<td>13</td>
<td>8.2</td>
<td>93</td>
<td>19</td>
<td>27</td>
</tr>
<tr>
<td>051</td>
<td>14</td>
<td>7.6</td>
<td>81</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>052</td>
<td>13</td>
<td>5.4</td>
<td>62</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>053</td>
<td>13</td>
<td>6.8</td>
<td>74</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>054</td>
<td>13</td>
<td>7.6</td>
<td>90</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>055</td>
<td>14</td>
<td>6.9</td>
<td>75</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>056</td>
<td>14</td>
<td>6.9</td>
<td>78</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>057</td>
<td>14</td>
<td>6.5</td>
<td>74</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>058</td>
<td>14</td>
<td>12.3</td>
<td>107</td>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>Student Number</td>
<td>Age</td>
<td>Iowa Basic Reading Skills</td>
<td>Iowa Basic Skills Total</td>
<td>CIAT Pre-test</td>
<td>CIAT Post-test</td>
</tr>
<tr>
<td>---------------</td>
<td>-----</td>
<td>---------------------------</td>
<td>-------------------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>059</td>
<td>13</td>
<td>11.0</td>
<td>102</td>
<td>34</td>
<td>37</td>
</tr>
<tr>
<td>060</td>
<td>14</td>
<td>7.9</td>
<td>76</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>061</td>
<td>13</td>
<td>6.7</td>
<td>81</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>062</td>
<td>13</td>
<td>7.6</td>
<td>83</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>063</td>
<td>13</td>
<td>11.0</td>
<td>101</td>
<td>36</td>
<td>41</td>
</tr>
<tr>
<td>064</td>
<td>14</td>
<td>5.5</td>
<td>60</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>065</td>
<td>13</td>
<td>5.7</td>
<td>55</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>066</td>
<td>13</td>
<td>11.0</td>
<td>100</td>
<td>33</td>
<td>37</td>
</tr>
<tr>
<td>067</td>
<td>14</td>
<td>8.2</td>
<td>84</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>068</td>
<td>16</td>
<td>5.4</td>
<td>67</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>069</td>
<td>13</td>
<td>9.0</td>
<td>94</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>070</td>
<td>15</td>
<td>6.8</td>
<td>76</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>071</td>
<td>14</td>
<td>7.5</td>
<td>77</td>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td>072</td>
<td>13</td>
<td>8.0</td>
<td>85</td>
<td>21</td>
<td>27</td>
</tr>
<tr>
<td>073</td>
<td>14</td>
<td>8.5</td>
<td>93</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>074</td>
<td>13</td>
<td>8.0</td>
<td>79</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>075</td>
<td>13</td>
<td>8.8</td>
<td>96</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>076</td>
<td>14</td>
<td>11.6</td>
<td>105</td>
<td>35</td>
<td>28</td>
</tr>
<tr>
<td>077</td>
<td>15</td>
<td>5.4</td>
<td>61</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>078</td>
<td>13</td>
<td>6.9</td>
<td>71</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>079</td>
<td>14</td>
<td>14.8</td>
<td>108</td>
<td>36</td>
<td>42</td>
</tr>
<tr>
<td>080</td>
<td>13</td>
<td>9.2</td>
<td>86</td>
<td>31</td>
<td>--*</td>
</tr>
<tr>
<td>081</td>
<td>13</td>
<td>8.7</td>
<td>85</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>082</td>
<td>13</td>
<td>6.8</td>
<td>71</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>083</td>
<td>14</td>
<td>7.7</td>
<td>80</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>084</td>
<td>14</td>
<td>5.4</td>
<td>58</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>085</td>
<td>13</td>
<td>7.5</td>
<td>80</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>086</td>
<td>15</td>
<td>4.7</td>
<td>61</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>087</td>
<td>15</td>
<td>7.2</td>
<td>74</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

* Indicates student was absent during CIAT post-test.
<table>
<thead>
<tr>
<th>Student Number</th>
<th>Age</th>
<th>Iowa Basic Reading Skills</th>
<th>Iowa Basic Skills Total</th>
<th>CIAT Pre-test</th>
<th>CIAT Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>088</td>
<td>13</td>
<td>3.5</td>
<td>52</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>089</td>
<td>13</td>
<td>11.9</td>
<td>105</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>090</td>
<td>13</td>
<td>7.7</td>
<td>84</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>091</td>
<td>13</td>
<td>5.2</td>
<td>67</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>092</td>
<td>14</td>
<td>6.4</td>
<td>70</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>093</td>
<td>12</td>
<td>6.5</td>
<td>63</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>094</td>
<td>13</td>
<td>7.9</td>
<td>80</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>095</td>
<td>15</td>
<td>8.5</td>
<td>91</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>096</td>
<td>13</td>
<td>9.2</td>
<td>94</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>097</td>
<td>13</td>
<td>6.1</td>
<td>60</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>098</td>
<td>14</td>
<td>7.3</td>
<td>83</td>
<td>27</td>
<td>24</td>
</tr>
<tr>
<td>099</td>
<td>13</td>
<td>7.3</td>
<td>81</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td>100</td>
<td>13</td>
<td>9.2</td>
<td>92</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>101</td>
<td>14</td>
<td>6.1</td>
<td>74</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>102</td>
<td>15</td>
<td>8.8</td>
<td>87</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>103</td>
<td>13</td>
<td>8.7</td>
<td>90</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>104</td>
<td>13</td>
<td>6.1</td>
<td>75</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>105</td>
<td>13</td>
<td>4.1</td>
<td>69</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>106</td>
<td>13</td>
<td>5.1</td>
<td>65</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>107</td>
<td>13</td>
<td>9.2</td>
<td>95</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td>108</td>
<td>13</td>
<td>7.3</td>
<td>83</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>109</td>
<td>13</td>
<td>11.0</td>
<td>101</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>110</td>
<td>13</td>
<td>9.8</td>
<td>96</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>111</td>
<td>14</td>
<td>6.0</td>
<td>74</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>112</td>
<td>13</td>
<td>7.9</td>
<td>81</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>113</td>
<td>12</td>
<td>7.5</td>
<td>80</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>114</td>
<td>13</td>
<td>6.2</td>
<td>82</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>115</td>
<td>13</td>
<td>12.3</td>
<td>105</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>116</td>
<td>12</td>
<td>8.2</td>
<td>86</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>-------</td>
<td>----------------------</td>
</tr>
<tr>
<td>001</td>
<td>26</td>
<td>121</td>
<td>15</td>
<td>162</td>
<td>40</td>
</tr>
<tr>
<td>002</td>
<td>23</td>
<td>143</td>
<td>13</td>
<td>179</td>
<td>31</td>
</tr>
<tr>
<td>003</td>
<td>18</td>
<td>104</td>
<td>15</td>
<td>137</td>
<td>22</td>
</tr>
<tr>
<td>004</td>
<td>28</td>
<td>103</td>
<td>42</td>
<td>173</td>
<td>35</td>
</tr>
<tr>
<td>005</td>
<td>47</td>
<td>150</td>
<td>37</td>
<td>234</td>
<td>55</td>
</tr>
<tr>
<td>006</td>
<td>33</td>
<td>174</td>
<td>26</td>
<td>233</td>
<td>32</td>
</tr>
<tr>
<td>007</td>
<td>23</td>
<td>119</td>
<td>23</td>
<td>165</td>
<td>29</td>
</tr>
<tr>
<td>008</td>
<td>39</td>
<td>104</td>
<td>56</td>
<td>199</td>
<td>47</td>
</tr>
<tr>
<td>009</td>
<td>70</td>
<td>195</td>
<td>28</td>
<td>293</td>
<td>80</td>
</tr>
<tr>
<td>010</td>
<td>46</td>
<td>162</td>
<td>45</td>
<td>253</td>
<td>49</td>
</tr>
<tr>
<td>011</td>
<td>40</td>
<td>218</td>
<td>37</td>
<td>295</td>
<td>50</td>
</tr>
<tr>
<td>012</td>
<td>58</td>
<td>146</td>
<td>39</td>
<td>243</td>
<td>65</td>
</tr>
<tr>
<td>013</td>
<td>51</td>
<td>273</td>
<td>41</td>
<td>365</td>
<td>52</td>
</tr>
<tr>
<td>014</td>
<td>48</td>
<td>178</td>
<td>41</td>
<td>267</td>
<td>63</td>
</tr>
<tr>
<td>015</td>
<td>64</td>
<td>128</td>
<td>56</td>
<td>248</td>
<td>70</td>
</tr>
<tr>
<td>016</td>
<td>25</td>
<td>106</td>
<td>15</td>
<td>146</td>
<td>28</td>
</tr>
<tr>
<td>017</td>
<td>74</td>
<td>250</td>
<td>51</td>
<td>375</td>
<td>80</td>
</tr>
<tr>
<td>018</td>
<td>41</td>
<td>110</td>
<td>31</td>
<td>182</td>
<td>49</td>
</tr>
<tr>
<td>019</td>
<td>61</td>
<td>331</td>
<td>41</td>
<td>433</td>
<td>65</td>
</tr>
<tr>
<td>020</td>
<td>62</td>
<td>329</td>
<td>50</td>
<td>441</td>
<td>62</td>
</tr>
<tr>
<td>021</td>
<td>62</td>
<td>317</td>
<td>46</td>
<td>425</td>
<td>70</td>
</tr>
<tr>
<td>022</td>
<td>40</td>
<td>255</td>
<td>32</td>
<td>327</td>
<td>60</td>
</tr>
<tr>
<td>023</td>
<td>25</td>
<td>179</td>
<td>28</td>
<td>232</td>
<td>30</td>
</tr>
<tr>
<td>024</td>
<td>55</td>
<td>296</td>
<td>41</td>
<td>392</td>
<td>58</td>
</tr>
<tr>
<td>025</td>
<td>27</td>
<td>100</td>
<td>22</td>
<td>149</td>
<td>25</td>
</tr>
<tr>
<td>026</td>
<td>55</td>
<td>117</td>
<td>41</td>
<td>213</td>
<td>--</td>
</tr>
<tr>
<td>027</td>
<td>24</td>
<td>130</td>
<td>22</td>
<td>176</td>
<td>36</td>
</tr>
<tr>
<td>028</td>
<td>65</td>
<td>252</td>
<td>35</td>
<td>352</td>
<td>74</td>
</tr>
<tr>
<td>029</td>
<td>18</td>
<td>104</td>
<td>21</td>
<td>143</td>
<td>26</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>-------</td>
<td>----------------------</td>
</tr>
<tr>
<td>031</td>
<td>39</td>
<td>261</td>
<td>38</td>
<td>338</td>
<td>43</td>
</tr>
<tr>
<td>032</td>
<td>70</td>
<td>215</td>
<td>56</td>
<td>341</td>
<td>75</td>
</tr>
<tr>
<td>033</td>
<td>36</td>
<td>190</td>
<td>38</td>
<td>264</td>
<td>42</td>
</tr>
<tr>
<td>034</td>
<td>49</td>
<td>213</td>
<td>38</td>
<td>300</td>
<td>50</td>
</tr>
<tr>
<td>035</td>
<td>51</td>
<td>327</td>
<td>44</td>
<td>422</td>
<td>60</td>
</tr>
<tr>
<td>036</td>
<td>72</td>
<td>381</td>
<td>36</td>
<td>489</td>
<td>75</td>
</tr>
<tr>
<td>037</td>
<td>22</td>
<td>262</td>
<td>19</td>
<td>303</td>
<td>29</td>
</tr>
<tr>
<td>038</td>
<td>22</td>
<td>146</td>
<td>21</td>
<td>189</td>
<td>31</td>
</tr>
<tr>
<td>039</td>
<td>28</td>
<td>314</td>
<td>51</td>
<td>417</td>
<td>56</td>
</tr>
<tr>
<td>040</td>
<td>53</td>
<td>213</td>
<td>27</td>
<td>268</td>
<td>37</td>
</tr>
<tr>
<td>041</td>
<td>34</td>
<td>138</td>
<td>33</td>
<td>205</td>
<td>36</td>
</tr>
<tr>
<td>042</td>
<td>38</td>
<td>117</td>
<td>28</td>
<td>183</td>
<td>41</td>
</tr>
<tr>
<td>043</td>
<td>71</td>
<td>265</td>
<td>38</td>
<td>374</td>
<td>70</td>
</tr>
<tr>
<td>044</td>
<td>19</td>
<td>101</td>
<td>15</td>
<td>135</td>
<td>25</td>
</tr>
<tr>
<td>045</td>
<td>36</td>
<td>209</td>
<td>25</td>
<td>270</td>
<td>34</td>
</tr>
<tr>
<td>046</td>
<td>49</td>
<td>199</td>
<td>50</td>
<td>298</td>
<td>55</td>
</tr>
<tr>
<td>047</td>
<td>43</td>
<td>185</td>
<td>39</td>
<td>267</td>
<td>47</td>
</tr>
<tr>
<td>048</td>
<td>57</td>
<td>267</td>
<td>36</td>
<td>360</td>
<td>63</td>
</tr>
<tr>
<td>049</td>
<td>28</td>
<td>106</td>
<td>19</td>
<td>153</td>
<td>29</td>
</tr>
<tr>
<td>050</td>
<td>30</td>
<td>158</td>
<td>18</td>
<td>206</td>
<td>40</td>
</tr>
<tr>
<td>051</td>
<td>69</td>
<td>311</td>
<td>47</td>
<td>427</td>
<td>75</td>
</tr>
<tr>
<td>052</td>
<td>33</td>
<td>195</td>
<td>26</td>
<td>254</td>
<td>38</td>
</tr>
<tr>
<td>053</td>
<td>18</td>
<td>100</td>
<td>13</td>
<td>131</td>
<td>27</td>
</tr>
<tr>
<td>054</td>
<td>24</td>
<td>120</td>
<td>23</td>
<td>167</td>
<td>38</td>
</tr>
<tr>
<td>055</td>
<td>51</td>
<td>347</td>
<td>36</td>
<td>434</td>
<td>54</td>
</tr>
<tr>
<td>056</td>
<td>18</td>
<td>119</td>
<td>17</td>
<td>154</td>
<td>29</td>
</tr>
<tr>
<td>057</td>
<td>55</td>
<td>311</td>
<td>46</td>
<td>412</td>
<td>50</td>
</tr>
<tr>
<td>058</td>
<td>58</td>
<td>326</td>
<td>44</td>
<td>428</td>
<td>40</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>--------------------</td>
<td>-------</td>
<td>----------------------</td>
</tr>
<tr>
<td>059</td>
<td>35</td>
<td>172</td>
<td>26</td>
<td>36</td>
<td>194</td>
</tr>
<tr>
<td>060</td>
<td>18</td>
<td>100</td>
<td>13</td>
<td>20</td>
<td>130</td>
</tr>
<tr>
<td>061</td>
<td>49</td>
<td>270</td>
<td>46</td>
<td>52</td>
<td>254</td>
</tr>
<tr>
<td>062</td>
<td>57</td>
<td>296</td>
<td>59</td>
<td>412</td>
<td>317</td>
</tr>
<tr>
<td>063</td>
<td>52</td>
<td>267</td>
<td>35</td>
<td>354</td>
<td>284</td>
</tr>
<tr>
<td>064</td>
<td>60</td>
<td>316</td>
<td>51</td>
<td>427</td>
<td>354</td>
</tr>
<tr>
<td>065</td>
<td>40</td>
<td>294</td>
<td>39</td>
<td>373</td>
<td>291</td>
</tr>
<tr>
<td>066</td>
<td>23</td>
<td>102</td>
<td>17</td>
<td>142</td>
<td>109</td>
</tr>
<tr>
<td>067</td>
<td>60</td>
<td>191</td>
<td>51</td>
<td>302</td>
<td>253</td>
</tr>
<tr>
<td>068</td>
<td>39</td>
<td>173</td>
<td>30</td>
<td>242</td>
<td>189</td>
</tr>
<tr>
<td>069</td>
<td>57</td>
<td>327</td>
<td>46</td>
<td>430</td>
<td>346</td>
</tr>
<tr>
<td>070</td>
<td>24</td>
<td>148</td>
<td>15</td>
<td>187</td>
<td>160</td>
</tr>
<tr>
<td>071</td>
<td>27</td>
<td>142</td>
<td>32</td>
<td>201</td>
<td>137</td>
</tr>
<tr>
<td>072</td>
<td>18</td>
<td>100</td>
<td>13</td>
<td>131</td>
<td>129</td>
</tr>
<tr>
<td>073</td>
<td>67</td>
<td>129</td>
<td>58</td>
<td>254</td>
<td>185</td>
</tr>
<tr>
<td>074</td>
<td>35</td>
<td>199</td>
<td>20</td>
<td>254</td>
<td>194</td>
</tr>
<tr>
<td>075</td>
<td>56</td>
<td>117</td>
<td>55</td>
<td>228</td>
<td>185</td>
</tr>
<tr>
<td>076</td>
<td>55</td>
<td>247</td>
<td>50</td>
<td>352</td>
<td>275</td>
</tr>
<tr>
<td>077</td>
<td>42</td>
<td>266</td>
<td>32</td>
<td>340</td>
<td>286</td>
</tr>
<tr>
<td>078</td>
<td>47</td>
<td>250</td>
<td>28</td>
<td>325</td>
<td>267</td>
</tr>
<tr>
<td>079</td>
<td>26</td>
<td>113</td>
<td>29</td>
<td>168</td>
<td>112</td>
</tr>
<tr>
<td>080</td>
<td>67</td>
<td>278</td>
<td>45</td>
<td>390</td>
<td>---</td>
</tr>
<tr>
<td>081</td>
<td>28</td>
<td>140</td>
<td>26</td>
<td>194</td>
<td>157</td>
</tr>
<tr>
<td>082</td>
<td>26</td>
<td>132</td>
<td>13</td>
<td>171</td>
<td>142</td>
</tr>
<tr>
<td>083</td>
<td>30</td>
<td>150</td>
<td>15</td>
<td>195</td>
<td>151</td>
</tr>
<tr>
<td>084</td>
<td>27</td>
<td>112</td>
<td>17</td>
<td>156</td>
<td>143</td>
</tr>
<tr>
<td>085</td>
<td>47</td>
<td>204</td>
<td>25</td>
<td>276</td>
<td>201</td>
</tr>
<tr>
<td>086</td>
<td>66</td>
<td>312</td>
<td>44</td>
<td>422</td>
<td>363</td>
</tr>
<tr>
<td>087</td>
<td>52</td>
<td>291</td>
<td>55</td>
<td>398</td>
<td>311</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------</td>
<td>-------------------------------------</td>
<td>----------------------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>088</td>
<td>35</td>
<td>240</td>
<td>29</td>
<td>304</td>
<td>42</td>
</tr>
<tr>
<td>089</td>
<td>76</td>
<td>401</td>
<td>50</td>
<td>527</td>
<td>72</td>
</tr>
<tr>
<td>090</td>
<td>52</td>
<td>244</td>
<td>38</td>
<td>334</td>
<td>48</td>
</tr>
<tr>
<td>091</td>
<td>45</td>
<td>281</td>
<td>39</td>
<td>365</td>
<td>60</td>
</tr>
<tr>
<td>092</td>
<td>49</td>
<td>264</td>
<td>40</td>
<td>353</td>
<td>48</td>
</tr>
<tr>
<td>093</td>
<td>49</td>
<td>252</td>
<td>42</td>
<td>343</td>
<td>53</td>
</tr>
<tr>
<td>094</td>
<td>50</td>
<td>202</td>
<td>50</td>
<td>302</td>
<td>55</td>
</tr>
<tr>
<td>095</td>
<td>33</td>
<td>115</td>
<td>13</td>
<td>161</td>
<td>31</td>
</tr>
<tr>
<td>096</td>
<td>43</td>
<td>119</td>
<td>35</td>
<td>197</td>
<td>57</td>
</tr>
<tr>
<td>097</td>
<td>59</td>
<td>274</td>
<td>49</td>
<td>382</td>
<td>64</td>
</tr>
<tr>
<td>098</td>
<td>32</td>
<td>136</td>
<td>18</td>
<td>186</td>
<td>31</td>
</tr>
<tr>
<td>099</td>
<td>38</td>
<td>181</td>
<td>22</td>
<td>241</td>
<td>35</td>
</tr>
<tr>
<td>100</td>
<td>56</td>
<td>320</td>
<td>30</td>
<td>406</td>
<td>55</td>
</tr>
<tr>
<td>101</td>
<td>64</td>
<td>306</td>
<td>34</td>
<td>404</td>
<td>60</td>
</tr>
<tr>
<td>102</td>
<td>29</td>
<td>134</td>
<td>22</td>
<td>185</td>
<td>25</td>
</tr>
<tr>
<td>103</td>
<td>65</td>
<td>214</td>
<td>57</td>
<td>336</td>
<td>60</td>
</tr>
<tr>
<td>104</td>
<td>52</td>
<td>293</td>
<td>36</td>
<td>381</td>
<td>54</td>
</tr>
<tr>
<td>105</td>
<td>46</td>
<td>253</td>
<td>39</td>
<td>338</td>
<td>40</td>
</tr>
<tr>
<td>106</td>
<td>44</td>
<td>343</td>
<td>35</td>
<td>422</td>
<td>40</td>
</tr>
<tr>
<td>107</td>
<td>73</td>
<td>289</td>
<td>49</td>
<td>411</td>
<td>75</td>
</tr>
<tr>
<td>108</td>
<td>26</td>
<td>137</td>
<td>33</td>
<td>196</td>
<td>29</td>
</tr>
<tr>
<td>109</td>
<td>19</td>
<td>105</td>
<td>13</td>
<td>137</td>
<td>18</td>
</tr>
<tr>
<td>110</td>
<td>59</td>
<td>230</td>
<td>50</td>
<td>339</td>
<td>60</td>
</tr>
<tr>
<td>111</td>
<td>37</td>
<td>208</td>
<td>27</td>
<td>272</td>
<td>40</td>
</tr>
<tr>
<td>112</td>
<td>66</td>
<td>269</td>
<td>24</td>
<td>359</td>
<td>60</td>
</tr>
<tr>
<td>113</td>
<td>20</td>
<td>108</td>
<td>17</td>
<td>145</td>
<td>23</td>
</tr>
<tr>
<td>114</td>
<td>58</td>
<td>343</td>
<td>46</td>
<td>447</td>
<td>63</td>
</tr>
<tr>
<td>115</td>
<td>50</td>
<td>295</td>
<td>35</td>
<td>380</td>
<td>51</td>
</tr>
<tr>
<td>116</td>
<td>54</td>
<td>214</td>
<td>50</td>
<td>318</td>
<td>44</td>
</tr>
</tbody>
</table>
APPENDIX C
CONSTRUCTION INDUSTRY
ACHIEVEMENT TEST

Directions:

1. The items on this test are multiple choice items designed to see how much you know about construction technology.

2. You will record your answers to the questions on a separate answer sheet. The answer sheet will be sent to Western Carolina University, for scoring. Be sure you have filled in the information on the answer sheet as follows:
   a) On your answer sheet PRINT your name, (last name first), today's date, the name of your teacher, and your signature.
   b) Leave the blanks entitled course, number, and campus blank.

3. Read the directions on the answer sheet carefully. In marking your answer sheet, use ONLY a No. 2 pencil. Be careful to notice that the blanks for answering questions are arranged ACROSS the page: Items 1, 2, 3, 4, 5, 6, 7, and 8 are on the first line from left to right. Items 9, 10, 11, 12, 13, 14, 15 and 16 are on the next line, etc. When you have chosen the answer you think is correct, BLACKEN the appropriate blank neatly and fully. If you change your mind about an answer, erase your first mark completely and make a new one.

4. Make no stray marks on the answer sheets, and do not wrinkle, fold, or tear the answer sheet.

5. Be sure you answer all questions on the test. Your score will be determined by the number of items you have answered correctly.

When you finish the test, sit quietly and wait until your teacher collects the answer sheet and test booklet.
Construction Industry Achievement Test

1. A definition of plumbing is:
   a. a system of pipes that convey water and liquid waste
   b. water pipes and water movement
   c. conduit and its uses
   d. sewer line installation

2. A pipefitter is a craftsman who:
   a. works with little or no supervision
   b. draws plumbing designs
   c. cuts pipe to length
   d. installs and maintains pipes to carry liquids

3. The roofer is a craftsman who:
   a. is the last person to work on a house
   b. is the first person to work on a house
   c. is supposed to roof the house before the walls are completed
   d. specializes in putting roofs on buildings and other structures

4. The commercial plumber is mainly concerned with:
   a. charging enough for his work to give him a happy life
   b. getting his work done quickly, disregarding accuracy
   c. doing his work with great accuracy and as quickly as possible
   d. none of the above

5. A bricklayer works with any material put together with:
   a. nails
   b. mortar
   c. cement
   d. terra cotta

6. The basic brick laying tools are:
   a. plumb rule, trowel, & paintbrush
   b. trowel, plumb rule, and level
   c. brick hammer, & carpenter's hammer
   d. pencil, string, & trowel
7. A personnel manager's job would most nearly be concerned with:
   a. production
   b. hiring and firing workers
   c. tool and machinery maintenance
   d. purchasing materials

8. A person entering the pipefitting trades should be able to:
   a. drive heavy equipment
   b. understand detailed, written, and verbal instructions
   c. plan new building construction
   d. complete a typical house plumbing job

9. A bricklayer is involved in a variety of duties which require:
   a. fairly close tolerances, limits or standards
   b. ability to use a paint brush
   c. working indoors with machinery
   d. working from blueprints

10. A plumber must be well skilled in:
    a. hanging pipelines
    b. reading a blueprint of the plumbing design
    c. getting the correct drainage to get the desired effect
    d. all of the above

11. A bricklayer may also be known as a (an):
    a. architect
    b. draftsman
    c. carpenter
    d. mason

12. A pipefitter must be in good physical condition because his work requires him to:
    a. work on a ladder, in a trench, or in unfinished sections of new buildings
    b. work on a double shift
    c. run between jobs
    d. do a great deal of walking, standing, reaching, lifting, and working in cramped areas

13. The three primary tools used to apply coatings of paint are:
    a. roller, cloth, and broom
    b. brush, pressurized cans, and cloth
    c. brush, roller, and spray gun
    d. spray gun, ladder, and scraper
14. A person roofing a house usually becomes well acquainted with the use of:
   a. hammers & saws
   b. power tools
   c. ladders and scaffolds
   d. Accurate measuring devices

15. The sheet-metal worker builds products from:
   a. terra cotta
   b. sheets of metal
   c. composition shingles or tile
   d. masonry materials

16. The tools most used by the plumber is:
   a. screwdrivers
   b. pliers
   c. pipe cutters
   d. ball pein hammers

17. The carpenter must be familiar with:
   a. fastening wood and similar materials
   b. aspects of plumbing
   c. all aspects of building homes
   d. using a paint brush

18. At the end of an apprenticeship training period, the worker becomes:
   a. a supervisor
   b. a project superintendent
   c. an applicant
   d. a journeyman

19. Heavy equipment operators are likely to operate a (an):
   a. car
   b. truck
   c. earth grader
   d. front end loader

20. One of the most physical dangers a painter faces is:
   a. working long hours
   b. wet or cold weather
   c. dissatisfied customers
   d. falling from ladders
21. One would most likely see an electrician:
   a. building a house
   b. digging ditches
   c. wiring a house
   d. selling electrical supplies

22. A concrete finisher is one who:
   a. mixes concrete
   b. places concrete foundations
   c. smooths and adds finishing touches to concrete structures
   d. lays brick & cement block

23. A carpenter must know how to read a:
   a. map
   b. plan
   c. blueprint
   d. sketch

24. Recommended high school courses to help one enter the sheet-metal trades are:
   a. English, art, and music
   b. academically oriented courses
   c. some general courses
   d. geometry, mechanical drawing, physics, and general sciences

25. The material used in roofing a building is:
   a. paneling
   b. brick
   c. composition shingles, tile, or tin
   d. none of these

26. A tool commonly used by an electrician is a (an):
   a. wire cutter
   b. adjustable wrench
   c. ball pein hammer
   d. light bulb

27. The work of a painter involves:
   a. standing, bending, and climbing
   b. sitting, resting, and stretching
   c. bending, squatting, and reclining
   d. climbing, resting, and stretching
28. An iron worker is a craftsman who:
   a. operates an overhead crane
   b. erects, assembles, or installs structural metal products
   c. builds houses
   d. hires and fires workers

29. An apprentice is:
   a. one who is looking for a job
   b. a worker who is learning the trade
   c. a supervisor of work
   d. a journeyman

30. Some of the principle tools that a carpenter might use on a building site would be:
   a. a rule, hammer, saw marking gauge and hand plane
   b. thickness planer, jointer, table saw, drill press and sander
   c. a compass, T-square, triangles and other drafting instruments
   d. shop hammer, anvil and cold chisel

31. A job that would most likely require a plumber would be:
   a. digging a well
   b. repairing a leaky pipe
   c. wiring a house
   d. laying brick

32. Concrete is a mixture of:
   a. cement and sand
   b. cement and rock
   c. sand, crushed rock or gravel, cement, and water
   d. cement and crushed rock

33. An efficient roofer is able to:
   a. drive nails correctly
   b. use a hammer in the correct manner
   c. obtain the correct coverage
   d. stand up on any roof regardless of its steepness

34. The electrician must be in good physical condition because his work requires him to:
   a. stand, reach, bend, and stoop
   b. run from one job to the next
   c. hold a second job
   d. work on a 24-hour shift
35. A person entering the sheet-metal trades must be able to:
   a. design and construct objects out of sheet metal
   b. cut sheet metal accurately
   c. read a blueprint
   d. all of the above

36. Heavy equipment operators would probably operate:
   a. lawn mowers
   b. portable hand equipment
   c. garden tractors
   d. cranes

37. Which of the following is a major function of managements:
   a. planning
   b. driving a truck
   c. writing letters
   d. manual labor

38. Recommended high school courses for a bricklayer are:
   a. music, art, and algebra
   b. general science, social science, mechanical drawing
   c. algebra, general science, mechanical drawing
   d. mechanical drawing, art, physical education

39. Construction apprentices are employed from the ranks of:
   a. high school graduates
   b. high school dropouts
   c. professional personnel
   d. journeyman

40. The minimum education to enter an apprenticeship as an ironworker is:
   a. high school dropout
   b. high school graduate or equivalent
   c. technical school graduate
   d. college graduate

41. A manager needs to know how to get along with:
   a. figures
   b. construction materials
   c. machines
   d. people
42. Heavy equipment operators would expect to work:
   a. inside a building
   b. outside in the open air
   c. in an enclosed facility
   d. none of the above

43. The electrician must wear protective clothing because:
   a. it keeps him warm
   b. the union requires it
   c. it protects him against the hazards of working
   d. his insurance company requires it

44. The smoothing of concrete areas would be done by a:
   a. carpenter
   b. floor layer
   c. cement finisher
   d. brickmason

45. The nearest example to a heavy equipment operator would be:
   a. bus driver
   b. bulldozer operator
   c. ship's captain
   d. tractor-trailer driver

46. A concrete worker is most likely to use a:
   a. saw
   b. hammer
   c. level
   d. screw driver

47. More often than not an iron worker must:
   a. enjoy working with math problems
   b. operate a front end loader
   c. work while standing on the ground
   d. work out of doors

48. Carpentry is the art and trade of:
   a. building houses
   b. driving bulldozers
   c. cutting, working, and joining timber into structures
   d. drawing house plans
49. A bricklayer is well skilled in:
   a. building wooden frames
   b. building brick walls
   c. building scaffolding
   d. reading blueprints

50. While painters work both indoors and out, most painters prefer outside work during:
   a. early spring
   b. mild weather
   c. hot and humid weather
   d. late autumn
CONSTRUCTION INDUSTRY
ACHIEVEMENT TEST

Directions:

1. The items on this test are multiple choice items designed to see how much you know about construction technology.

2. You will record your answers to the questions on a separate answer sheet. The answer sheet will be sent to Western Carolina University for scoring. Be sure you have filled in the information on the answer sheet as follows:
a) On your answer sheet PRINT your name, (last name first), today's date, and the name of your teacher. Sign your name.
b) Do not mark in the blanks beside course, number, and campus.

3. Read the directions on the answer sheet carefully. Use ONLY a No. 2 pencil to mark the answer sheet. Be careful to notice that the blanks for answering questions are arranged ACROSS the page: Items 1,2,3,4,5,6,7, and 8 are on the first line from left to right. Items 9,10,11,12,13,14,15 and 16 are on the next line, etc. When you have chosen the Answer you think is correct, BLACKEN the appropriate blank neatly and fully. If you change your mind about an answer, erase your first mark completely and make a new one.

4. Make no stray marks on the answer sheets, and do not wrinkle, fold, or tear the answer sheet.

5. Be sure you answer all questions on the test. Your score will be determined by the number of items you have answered correctly.

When you finish the test, sit quietly and wait until your teacher collects the answer sheet and test booklet.
CONSTRUCTION INDUSTRY ACHIEVEMENT TEST

1. A definition of plumbing is:
   A. a system of pipes used for liquid distribution
   B. water pipes and water movement
   C. conduit and its uses
   D. sewer line installations

2. A pipefitter is a craftsman who:
   A. works with little or no supervision
   B. draws plumbing designs
   C. cuts and threads pipe
   D. installs and maintains pipes

3. The roofer is a craftsman who:
   A. is the last person to work on a house
   B. is the first person to work on a house
   C. is supposed to roof the house before the walls are completed
   D. specializes in putting roofs on buildings and other structures

4. The commercial plumber is mainly concerned with:
   A. charging enough for his work to give him a happy life
   B. getting his work done quickly, disregarding accuracy
   C. doing his work with great accuracy and efficiency
   D. none of the above

5. A bricklayer works with any material put together with:
   A. fasteners
   B. mortar
   C. cement
   D. terra cotta

6. The basic brick laying tools are:
   A. plumb rule, trowel, and paintbrush
   B. trowel, plumb rule, and level
   C. brick hammer, and carpenter's hammer
   D. pencil, string, and trowel
7. A personnel manager's job would most nearly be concerned with:
   A. production planning and supervision
   B. hiring and firing workers
   C. tool and machinery maintenance
   D. purchasing materials

8. A person entering the pipefitting trades should be able to:
   A. operate trenching equipment
   B. understand detailed instructions
   C. plan new building construction
   D. complete a house plumbing job

9. A bricklayer is involved in a variety of duties which require:
   A. fairly close tolerances, limits or standards
   B. ability to use precision tools
   C. working indoors with machinery
   D. working from blueprints

10. A plumber must be well skilled in:
    A. hanging pipelines
    B. reading a blueprint of the plumbing design
    C. getting the correct drainage to get the desired effect
    D. all of the above

11. A bricklayer may also be known as a:
    A. wallsetter
    B. molder
    C. carpenter
    D. mason

12. A pipefitter must be in good physical condition because his work requires him to:
    A. work on a ladder, in a trench, or in unfinished sections of new buildings
    B. work on a double shift
    C. work out of doors
    D. do much walking, standing, and working in cramped areas
13. The three primary tools used in construction for painting are:
   A. roller, cloth, and brush  
   B. brush, pressurized cans, and cloth  
   C. brush, roller, and spray gun  
   D. spray gun, ladder, and speedflower

14. A person roofing a house usually becomes well acquainted with the use of:
   A. hammers and saws  
   B. power tools  
   C. scaffolds  
   D. measuring devices

15. The sheet-metal worker works with:
   A. terra cotta  
   B. heating, cooling, and ventilating systems  
   C. composition materials and punches  
   D. masonry materials

16. A tool most used by the plumber is a:
   A. screwdriver  
   B. pliers  
   C. reamer  
   D. ball pein hammer

17. The carpenter must be familiar with:
   A. fastening wood and similar materials  
   B. contracting and assembling  
   C. assembling and finishing  
   D. using a paintbrush

18. At the end of an apprenticeship training period, the worker becomes a:
   A. supervisor  
   B. project superintendent  
   C. foreman  
   D. journey man

19. Heavy equipment operators are likely to operate a:
   A. hydraulic stamping press  
   B. heavy dump truck  
   C. bulldozer  
   D. vibrator
20. One of the greatest physical dangers a painter faces is:
   A. explosions
   B. wet or cold weather
   C. dissatisfied customers
   D. falling from ladders

21. One would most likely see an electrician:
   A. building a house
   B. digging ditches
   C. installing circuits
   D. selling electrical supplies

22. A concrete finisher is one who:
   A. mixes concrete
   B. places concrete foundations
   C. floats and trowels concrete
   D. lays brick and cement block

23. A carpenter must know how to read a:
   A. map
   B. plan
   C. blueprint
   D. sketch

24. Recommended high school courses to help one enter the sheetmetal trades are:
   A. English, art, and music
   B. academically oriented courses
   C. geometry, mechanical drawing, and science
   D. none of the above

25. The most common material used in roofing a building is:
   A. paneling
   B. layering
   C. asphalt
   D. all of these
26. A tool commonly used by an electrician is a (an):
   A. side-cutting pliers
   B. adjustable wrench
   C. ball pein hammer
   D. ground

27. The work of a painter involves:
   A. standing, bending, and climbing
   B. sitting, resting, and stretching
   C. bending, squatting, and reclining
   D. climbing, resting, and stretching

28. An iron worker is a craftsman who:
   A. operates an overhead crane
   B. erects structural steel
   C. builds sheet metal ducts
   D. does all the above

29. An apprentice is:
   A. one who is looking for a job
   B. one who is learning a trade
   C. a supervisor of workers
   D. a journeyman

30. Some of the principal tools that a carpenter might use on a building site would be a:
   A. rule, hammer, saw, and plane
   B. thickness planer, jointer, table saw and drill press
   C. compass, T-square, triangles and drafting instruments
   D. hammer, cold chisel, connector and leveler

31. A job that would most likely require a plumber would be:
   A. digging a well
   B. repairing a leaky pipe
   C. wiring a house
   D. laying block

32. Concrete is a mixture of water and:
   A. cement, sand, and thickener
   B. mortar, rock, and crushed brick
   C. sand, gravel, and cement
   D. cement, crushed rock, and gravel
33. An efficient roofer is able to:
   A. drive nails correctly
   B. choose the proper hammer
   C. obtain the correct coverage
   D. stand up on any roof regardless of its steepness

34. The electrician must be in good physical condition because his work requires him to:
   A. stand, reach, bend, and stoop
   B. continually lift heavy objects
   C. climb power line poles
   D. operate heavy equipment

35. A person entering the sheet-metal trades must be able to:
   A. design and construct objects out of sheet metal
   B. cut sheet metal accurately
   C. read a blueprint
   D. none of the above

36. Heavy equipment operators are also called:
   A. machinists
   B. apprentices
   C. equipment maintainers
   D. operating engineers

37. Which of the following is a major function of management:
   A. planning
   B. hiring and firing workers
   C. writing letters
   D. production operations

38. Recommended high school courses for one planning to be a bricklayer are:
   A. music, art, algebra
   B. general science, social science, mechanical drawing
   C. algebra, general science, mechanical drawing
   D. mechanical drawing, art, physical education
39. Construction apprentices are employed from the ranks of:
   A. high school graduates
   B. high school dropouts
   C. professional personnel
   D. journeymen

40. The minimum education to enter an apprenticeship as an ironworker is:
   A. high school dropout
   B. high school graduate or equivalent
   C. technical school graduate
   D. college graduate

41. A manager needs to know how to get along with:
   A. figures
   B. construction materials
   C. machines
   D. people

42. Heavy equipment operators would expect to work:
   A. inside a building
   B. out of doors
   C. in an enclosed facility
   D. none of the above

43. The electrician must wear protective clothing because:
   A. it keeps him warm
   B. the union requires it
   C. it reduces accidents
   D. his insurance company requires it

44. The smoothing of concrete areas would be done by a:
   A. carpenter
   B. screeder
   C. cement finisher
   D. mason
45. The nearest example to a heavy equipment operator would be:
   A. bus driver
   B. bulldozer driver
   C. ship's captain
   D. tractor-trailer driver

46. A concrete worker is most likely to use a:
   A. saw
   B. hammer
   C. straightedge
   D. screw driver

47. More often than not an iron worker must
   A. enjoy working math problems
   B. operate a front end loader
   C. work while standing on the ground
   D. not mind heights

48. Carpentry is the art and trade of:
   A. building houses
   B. driving bulldozers
   C. building wooden structures
   D. drawing plans

49. A bricklayer is well skilled in:
   A. building forms
   B. masonry work
   C. building scaffolding
   D. reading blueprints

50. While painters work both indoors and out, most painters
    prefer outside work during:
    A. early spring
    B. mild weather
    C. hot and humid weather
    D. late autumn
APPENDIX E
Instructions For Administering The Inventory

Pass out the booklets. Pass out the response sheets and special scoring pencils. Make sure that each student has a booklet and a response sheet. (OPTIONAL: If time permits, response sheets could be placed inside the booklet for greater ease in administering.) Tell each student to be sure to use the lead pencil provided to mark the response sheet.

Have the students fill in the cover page and heading on the response sheet. Specify: last name first, first name, and then middle name or initial; grade; date the inventory is being given; age of student; school; city and state; sex (NOTE: Students should mark the initial in the box provided and, also, mark the space between the two dotted lines under the proper initial.); and form number. The "Name of Test" blank is not applicable and may be left blank.

Read the inventory directions to the students at the same time that they are reading them silently. Answer any and all questions as they arise while you are reading the directions. After reading the directions, re-emphasize the relationship of A for most interesting and E for least interesting responses. (OPTIONAL: It might be advisable to write the letter, A - most interesting, and the letter, E - least interesting on the chalkboard. You might encourage the students to write this down in notes so that the students can glance at the notes if the question arises while they are taking the inventory.) Re-emphasize that the statements in the inventory
booklets are in columns while the numbered responses on the response sheet are in rows. Instruct the students not to write in the booklet and to keep going on to the next page until the inventory is completed. In this research study it is important that all students complete the inventory and that they mark one response for each item. Ask students if there are any questions.

When the students return the materials, make sure they have marked all the numbered responses. If they have changed a mark, the first response must be erased well. Collect the booklets and response sheets.

Once you have collected all the response sheets, place them in the envelope provided.

Your effort in participating in this research study is appreciated.
This Construction Industry Interest Inventory is an inventory of your interests in the construction industry. It is not a test and will not have any effect on your classroom grade. There are no answers which are right or wrong. The response you select is only true for you. Please carefully follow the directions stated below.

DIRECTIONS:

On each page of the booklet you will find statements describing the various practices occurring in the construction industry. Read each statement carefully before making your response.

You have been given a separate sheet for indicating your degree of interest. Look at the response sheet. The responses are numbered across the page, not down as in the booklet, and the spaces have letters from A to E. They should be marked as follows:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most</td>
<td>Above</td>
<td>Average</td>
<td>Below</td>
<td>Least</td>
</tr>
<tr>
<td>Interest</td>
<td>Interest</td>
<td>Average</td>
<td>Interest</td>
<td>Interest</td>
</tr>
</tbody>
</table>

Use the soft lead pencil provided for you and make a heavy black mark in the space between the dotted lines. Mark only one space for each response. The following examples are marked in the proper manner.

<table>
<thead>
<tr>
<th>Most Interest</th>
<th>Average Interest</th>
<th>Least Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overseeing construction work crews</td>
<td>[A]</td>
<td>[B]</td>
</tr>
<tr>
<td>Removing concrete forms</td>
<td>[A]</td>
<td>[B]</td>
</tr>
<tr>
<td>Making out checks for workers' wages</td>
<td>[A]</td>
<td>[B]</td>
</tr>
</tbody>
</table>

As you mark the response sheet, it is important that you remember which letters indicate the amount of your interest. For instance, the number 1 represents the most interesting, and the number 5, the least interesting. Please indicate your degree of interest to the statement.

If you want to change your mind, carefully erase the first response, and mark your new choice.

USE THE SPECIAL PENCIL to mark your responses on the IBM scoring sheet.

Please open the booklet, and go ahead with the activities on the next page.
Construction Industry Interest Inventory

1. bolting structural steel sections together
2. building porches
3. shoveling sand, gravel and cement
4. transporting concrete with a wheelbarrow
5. removing wall partitions from buildings
6. painting structure surfaces
7. building stairs
8. drilling holes in rock for blasting
9. preparing the soil for planting
10. excavating earth for a swimming pool
11. constructing fireplaces in buildings
12. sandblasting stone buildings
13. cutting glass and installing windows
14. repairing broken water and gas pipes
15. transporting concrete with a transit-mix truck
16. welding steel gas pipes
17. buying construction materials and equipment
18. installing water pipes in structures
19. constructing temporary gravel roads
20. digging ditches with a power trencher
21. spraying concrete with curing compounds
22. consulting with other companies about construction problems
23. moving piles of earth with a bulldozer
24. inspecting completed construction jobs
25. building fences around structures
26. bending electrical conduit
27. making working drawings of structures
28. digging canals with power shovels
29. hoisting steel "I" beams with a crane
30. laying subflooring
31. giving workers aptitude tests
32. assembling steel television towers
33. placing steel beams in structures with a derrick
34. constructing outdoor barbecue pits
35. consulting with a lawyer about legal problems
36. hanging doors
37. taking care of employee records
38. sanding wooden floors
39. laying bricks and concrete blocks
40. leveling road beds with a grader
41. analyzing soil characteristics
42. designing future structures
43. installing drain gutters and downspouts
44. removing snow from highways with a snow plow
45. planting trees and shrubs around structures
46. applying siding to outside walls
47. overseeing construction progress
48. setting reinforcing steel in concrete forms
49. shaking or vibrating fresh concrete
50. overseeing construction work crews
51. sawing and fitting roof rafters
52. sifting sand and gravel for concrete mixes
53. reading construction reports and blueprints
54. representing construction workers in a union
55. placing concrete in forms
56. constructing docks for boats
57. applying insulation materials in wall sections
58. interviewing future workers
59. teaching and instructing new construction workers
60. hanging wall paper
61. building room dividers
62. cutting and fitting wallboard materials
63. hoisting roof trusses into position
64. aligning walls with a level
65. patching plastered walls
66. bargaining with workers on strike
67. finishing concrete with a trowel
68. surveying future construction sites
69. installing electrical wiring in structures
70. cutting and fitting wall paneling
71. waterproofing foundation walls
72. replacing old electrical wiring
73. breaking up concrete with a jack hammer
74. building hydro-electric dams
75. sawing and fitting floor joists
76. choosing new sites for construction
77. burning trees and brush on construction sites
78. planting lawns
79. repainting houses with a spray gun
80. making models of structures
81. installing built-ins
82. bidding on future construction projects
83. blasting rocks and tree stumps
84. surfacing concrete highways
85. installing furnaces in structures
86. installing underground lawn sprinklers
87. firing or laying off workers
88. assigning new workers to their jobs
89. constructing small dams to divert rivers
90. building interior wall partitions
91. conducting tests on fresh concrete
92. removing concrete forms
93. salvaging usable building materials
94. bracing the walls of tunnels
95. cutting steel beams with oxyacetylene torches
96. installing air conditioners
97. paying workers
98. installing electrical switches and lights
99. making foundation forms
100. wrecking buildings with a crane and steel ball
101. erecting steel suspension bridges
102. constructing additional rooms
103. disciplining workers
104. hauling sand and gravel in a dump truck
105. applying caulking compound in wood joints
106. laying floor materials
107. arranging finances for construction projects
108. plastering walls
109. promoting construction workers to better jobs
110. rewarding construction workers
111. hiring construction workers
112. building carports
113. choosing workers for construction crews
114. trimming trees and hedges
115. applying ceiling materials
116. fitting wall baseboards and moldings
117. fitting and assembling heating and cooling ducts
118. making lily ponds in front of buildings
119. installing electrical high power lines
120. mixing concrete
121. making topographical maps for highways
122. nailing joists to sills
123. installing kitchen appliances
124. waxing and polishing stone floors
125. laying steel rails for railroads
126. fitting and soldering copper water pipes
127. cutting reinforcing steel
128. cutting grass around structures
129. paving asphalt streets and roads
130. giving safety equipment to workers
131. constructing patios
(Slide No.1) I just graduated from high school last year and was very uncertain as to what I wanted to do in my life's work. One thing that I was interested in was the construction industry. I remembered my first erector set and the many hours of enjoyment I got as a young kid building things. I never cared for office work and liked to be out-of-doors a lot. My investigation of the future in this business led to many interesting facts and may be helpful to some of you.

(Slide No.2) This country of ours needs a lot of construction. (Slide No.3) Some experts say that ninety percent of the country will need rebuilding by the year two thousand (2000).

The anticipated building boom in the United States is estimated to require 400 thousand additional workers each year from now until 1975. Present programs train only 16,000 a year, so the chances of getting a good job in the construction field are good - if you have some kind of technical background or a skill that can be developed.

Like a lot of my classmates, I was sort of a nut about automobiles and this gave me the idea of looking into the highway construction field. (Slide No.4) My father said he can remember when roads and streets were built with a pick and shovel as the major items of equipment. (Slide No.5) The hauling of dirt was a major problem. (Slide No.6) Horses and small trucks were frequently used. Early
highways followed the lines of least resistance. It was easier to
go around a natural barrier than through or over it (sic). (Slide No.
7) Today North Carolina's highways and streets lead to every nook
and corner of the state. (Slide No. 8) In fact, North Carolina
highways lead everywhere. They no longer wind and weave around
natural barriers such as streams and hills but go right over them or
even through them. The large hill or even the mountain is no longer
the barrier it used to be. Nationwide, more than 100 million cars,
trucks, and buses are using our streets and roads. The estimate is
that this will increase to 144 million by 1985. Taking care of this
forty-four percent increase is going to be a major source of business
for as long as anyone cares to predict. Congress recently authorized
the addition of fifteen hundred miles to the Interstate System and set
1974 for the completion of the present forty-one thousand mile system.
After the Interstate System is completed, there still will be tens of
thousands of miles of primary roads to be rebuilt. Road building
extends into the future as far as anyone can see.

The old time equipment of just thirty or forty years ago has
been replaced with new modern complex machinery. (Slide No.9) Scrapers
and graders of today make the building of roads look easy, although it
is not as easy as it appears. (Slide No. 10) New equipment does the
work of many men but requires the knowledge of a modern engineer.
(Slide No.11) The drainage of water and melted ice had escaped my
thoughts until I had talked with several people in the business of
construction. The necessity of putting sewer and water lines,
(Slide No.12) electrical power lines, and other services, especially in
our North Carolina cities, also seemed to escape my thoughts. If you want to be a top man in the construction business, whether it be in highways or buildings, a degree in civil engineering is all essential. Four years of study in any one of several universities or colleges will lead to a Bachelor of Science degree in Civil Engineering. Several schools have just recently reduced their civil engineering courses from five to four years.

However, if you consider the equipment and construction needed in the industry, you can't over-look the need for planners, architects, mechanical and electrical engineers, as well as many scientific and industrial personnel required in all facets of the business. Just as in most industries secretaries and office personnel are necessary in the construction business. As it was put in one of the booklets I read, the construction industry is a brawny, hardy giant, stretching to embrace all kinds of construction activities. It includes the (Slide No.13) erection of towering sky scrapers, (Slide No.14) the construction of an interstate highway, and the (Slide No.15) establishment of a massive dam on a wilderness river.

The need for civil engineers and other types of engineers is obvious if you look at the help wanted ads in any large North Carolina newspaper, and the pay isn't bad either. I found out that the construction industry, when dollar volume is considered, is far and away the largest business in the United States. (Slide No. 16) And this guy who thought of using a helicopter to land necessary materials on top of a building under construction must have had a lot of imagination.
I took time out one afternoon to visit the office of a contractor near my home. The general manager himself took the time to show me around. I was surprised at the number of people required just to get a job ready for actual on-the-site construction. Blueprints were being prepared in one office, while in another several men were making estimates as to just what would be needed and how much the contractor should bid in a project soon to be let to the lowest bidder. The contractor suggested (Slide No.17) I accompany one of his foreman to the site of an interstate highway then under construction. When you see all of the equipment, the materials, and the manpower together at one spot, at a certain time, you realize just how important is the job of the engineer and the contractor who have the responsibility to complete the job.

The project superintendent told me that he comes up against a new problem almost everyday. He seemed eager to take personal responsibility for this particular job and was anxious to learn more about the construction business.

Back at the contractor's office I learned that the contractors generally specialize in one of four types of construction. (Slide No. 18) The first is general building construction, which may include a skyscraper office building, an apartment, a school or a church. The second is highway construction, which includes (Slide No. 19) bridges, grade separations, culverts, earth moving, traffic control, and land-scaping. The third type is heavy construction which also is frequently controlled by the highway contractor. (Slide No.20) It includes towers, dams, tunnels, airports, missle
bases, railroads, and flood control projects. Utility construction is the fourth type which installs pipelines, sanitation facilities, waterworks, or other utilities needed by a county, city, or community.

Yes, I agree, there are countless opportunities in construction—so many different jobs, so many chances to get ahead. Each job has its advantages and rewards for the man who can fill it. Your salary will depend on you, your abilities, efforts, initiative, and dedication. But all of the jobs in construction do not require a college degree in engineering.

Have you ever watched a jet airliner landing, a rocket launching? Ever seen the antenna of a radar set rotating, ever watched modern farm machinery moving across a field? I am sure that you have seen modern automobiles moving swiftly down a new highway. These are all the result of modern technology. The keystone of America's technological world is the engineering team. The team includes scientists, engineers, engineering technicians, and skilled craftsmen. The construction industry requires a lot of engineering technicians and skilled craftsmen. Obviously they are not all civil engineers.

The highway contractor I visited had job superintendents, an office manager, two estimators, and expediter, a purchasing agent, a draftsman, accountants, bookkeepers, a foreman, and journeymen. A few of the people working for the highway contractors have come directly from technical schools (either junior colleges or special technical training classes that usually require only two years of
study instead of four for a degree). The construction industry derives a great benefit from the technical education offered in North Carolina. Technical education is growing to meet the demands of our state and nation. But the need for persons with technical skills and supportive scientific and engineering knowledge in the construction field is growing faster than new schools and old schools can supply them. Some of these programs in North Carolina are in the beginning stage. A technical school graduate can become an assistant expediter or an assistant engineer in the construction industry and from there move up to better things. Contractors warn that the ambitious young technician must be prepared to work hard, long hours. He must be willing to go to many different job sites. He may experience travel and even reside in foreign lands, but his progress depends for the most part on him.

There are several excellent two year courses available for those wishing to enter construction through the contractor's office. These programs give a good general background to the construction practices and procedures. They include courses in surveying, plan reading, engineering mathematics, basic estimating, drafting, building techniques, and business administration.

(Slide No. 21) I visited a job site where I watched one man operate a crane, (Slide No. 22) another a grader, (Slide No. 23) and still others operating big complicated equipment. How does one get these jobs? Most of the workers on the job I visited got their start through apprentice training. One such program is that developed by the International Union of Operating Engineers and Participating
Contractors in the state of North Carolina. In North Carolina apprenticeship applications are accepted in offices located in Charlotte, Raleigh, Greensboro, Durham, and Asheville. Applicant requirements will be described later for each of the various construction trades. One nice thing about apprenticeship training is that you get paid while you are learning your job. I found out that it is no push over. At their training grounds all the starting apprentices get some actual experience under the guidance and instruction of top personnel. (Slide No.24) I was surprised to learn that apprentices must attend regular classes which are held at least one night per week. Field trips are scheduled regularly during the winter months. They don't have much time to fool around. Most of the trades are giving more and more attention to apprenticeship programs as demands for skills grow. Whether you want to become an apprentice, a civil engineer, and engineering technician, or to prepare for some other job in the construction industry, indications are that the demand for your services will be great. Your pay will be good, and your chances for advances will be most attractive. The opportunity is there, but it is up to you. Although there are extreme shortages in many construction jobs, it still requires a lot of work. It takes real hard work if you want to make construction your life's work.

Building construction, like highway construction, requires new apprentices each year in a variety of trades. On the screen you will see a series of pictures depicting the various jobs often found in the general building construction industry that apprentices perform. The pictures show the type of tools he works with, some of the working
conditions he faces, and the actual activity that he must perform. The trades are: bricklaying, carpentry, cement masonry, electrical, iron working, heavy equipment operating, painting, pipefitting, plumbing, roofing and sheet metal working.

(Slide No.25) The first trade depicted describes bricklayers (or brickmasons). They are craftsmen who construct walls, partitions, fireplaces, chimneys, and other structures from brick. (Slide No.26) They also use other masonry materials such as: concrete, cinder, or gypsum block; precast panels made of brick, cement, tile, stone, or marble; or structural tile or terra cotta (a hard-baked brick used for ornamental purposes). (Slide No.27) They install the brick linings of industrial kilns and furnaces. The term of training that is necessary for this apprenticeship is three years. (Slide No.28) During these years, in addition to the work experience, each apprentice shall enroll and attend related instruction classes for a minimum of 144 clock hours each year. (Slide No. 29) The average hourly wage that he can expect a journeyman is between $4.50 and $5.45, subject to local demand. (Slide No.30) The requirements for entrance into this apprenticeship are: to be between 17 and 25; to pass a medical examination; and to show proof of successful completion of grade 12. (Slide No.31) Recommended high school courses are algebra, geometry, blueprint reading, and general science.

(Slide No.32) Carpenters, the largest group of building trades workers, are employed in almost every type of construction activity. (Slide No. 33) They erect the wood framework in buildings, including subflooring, sheathing, partitions, floor joists, studding, and
rafters. (Slide No.34) They install molding, wood paneling, cabinets, window sashes, doorframes, doors, and hardware, as well as build stairs and lay floors. (Slide No.35) They may also be designated according to specialty as carpenter (construction or maintenance- any industry) or mold maker. (Slide No.36) The term of training that is necessary for this apprenticeship is four years. (Slide No.37) During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. (Slide No.38) The average hourly wage that he can expect after reaching journeyman is between $4.15 and $5.50 per hour. (Slide No.39) Eligibility requirements for entrance into the apprenticeship is that the applicant be between 17 and 25 years of age, pass a medical examination, and present a high school transcript showing successful completion of grade 12 (Slide No.40) Recommended high school courses are algebra, advanced math, geometry, exploratory and advanced woods, and two semesters of drafting.

(Slide No.41) The principal work of cement masons is finishing the exposed concrete surfaces on many types of construction projects. These projects range from small jobs, such as the finishing of patios, floors, and sidewalks, to work on huge dams, miles of concrete highways, foundations and walls of large buildings, airport runways, and missile launching sites. (Slide No.42) On small projects, a cement mason, assisted by one or two helpers, may do all the concrete work; on large projects, crews of several cement masons and many helpers may be employed. The term of training that is necessary for this apprenticeship is three years. During these years, in
addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. (Slide No.43) The average hourly wage of a journeyman is between $3.50 and $4.50. Eligibility requirements for entrance into the apprenticeship are: 18 to 30 years of age; a medical examination; and in most states successful completion of grade 12. Recommended high school courses are general math, algebra I, geometry, blue print reading, and mechanical drawing.

(Slide No.44) Construction electricians lay out, assemble, install, and test electrical fixtures, apparatus, and wiring used in electrical systems on construction projects. (Slide No.45) These systems are used to provide heat, light, power, air conditioning, and refrigeration in residences, office buildings, factories, hospitals, schools, and other structures. (Slide No.46) Construction electricians also install and connect electrical machinery, equipment, controls, and signal communications systems. (Slide No.47) They may be designated according to specialty as electrician wireman, experimental facilities electrician, lineman (outside-light, heat and power), power-house engineer, and signal electrician. (Slide No.48) The term of training that is necessary for this apprenticeship is four or five years. During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. (Slide No.49) The average hourly wage of a journeyman is between $4.50 and $5.50. The eligibility requirements for entrance into the apprenticeship are: (Slide No.50) to be between 17 and 24 years of age; to pass a medical examination; and to
show a transcript of successful completion of grade 12. In some states the apprentice must have been a resident of the area for at least one year. (Slide No.51) The recommended high school courses are two courses of algebra, trigonometry, physics, blue print reading, exploratory electricity, and mechanical drawing.

(Slide No.52) Iron Workers are members of a group that raises and places fabricated structural steel such as girders, plates, and columns, and unites them permanently to form a completed structure or the framework of a structure. They may also perform the duties of ornamental iron-worker. (Slide No.53) Ornamental iron workers install metal stairways, catwalks, gratings, fences, and decorative iron-work. They may be designated according to specialty as repairman, or welding equipment specialist. The term of training that is necessary for this apprenticeship is two to four years. (Slide No.54) During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. The average hourly wage of a journeyman is between $4.00 and $5.25. (Slide No.55) The eligibility requirements for entrance into this apprenticeship are: to be between 18 and 30 years of age; to complete a medical examination; to show a high school transcript of successful completion of grade 12; and to have the ability to work at heights. The recommended high school courses are algebra I and II, physics, blue print reading, advanced metals I and II, and welding I and II.

(Slide No.56) The operating engineer manipulates several types of power construction equipment such as compressors, pumps, hoists,
derricks, cranes, shovels, tractors, scrapers, or motor graders. He excavates and grades earth, erects structural and reinforcing steel, and pours concrete. He turns valves to control air and water output of compressors and pumps and adjusts handwheels and presses pedals to drive machines and control attachments. He may be designated according to specialty as Grade and Paving Machine Operator or Heavy Duty Repairmen. The term of training that is necessary for this apprenticeship is three to four years. (Slide No.57) During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. The average hourly wage of a journeyman is between $3.50 and $4.00. Eligibility requirements for entrance into the operating engineer apprenticeship are: to be between 18 and 30 years of age; to complete a medical examination; and to present a high school transcript of successful completion of grade 12. The recommended high school courses are algebra I, geometry, general science, earth science, physics, and exploratory engines. (Slide No.58)

Painting and paperhanging are separate skilled building trades, although many craftsmen in these trades do both types of work. Painters prepare the surface of buildings and other structures and then apply paint, varnish enamel, lacquer, and similar materials to these surfaces with rollers, brushes, or spray equipment. Paper hangers cover room interiors with paper, fabric, vinyls, or other materials. (Slide No.59) Painters are designated according to specialty as automobile painter, furniture finisher, or stained glass painter. The term of training that is necessary for this apprentice-
ship it two to three years. During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours. (Slide No.60) The average hourly wage of a journeyman is between $4.05 and $4.50. The eligibility requirements for entrance into the painter apprenticeship are: to be between 16 and 25 years of age; to complete a medical examination; and in most states, to show a high school transcript of successful completion of grade 12. The recommended high school courses are general math, chemistry, blue print reading, and exploratory woods.

(Slide No.61) Pipefitters lay out, fabricate, assemble, install, and maintain piping and piping systems, fixtures, and equipment for steam, hot water, heating, cooling, lubricating, and industrial processing systems, on the basis of knowledge of system operation. They also study building plans and working drawings. The pipefitter selects the type and size of pipe related materials according to job specifications. (Slide No.62) He also cuts pipe, using hacksaw, pipe cutters, hammer and chisel, and cutting torch. He may be designated according to specialty as Gas Fitter, Sprinkler Fitter, or Steamfitter. The term of training that is necessary for this apprenticeship is four to five years. During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. (Slide No.63) The average hourly wage of a journeyman is between $4.00 and $5.00. The eligibility requirements for entrance into the pipefitters apprenticeship are: to be between 18 and 26 years of age; to complete a medical examination; and to show a high school transcript of courses
taken through grade 12. The recommended high school courses are algebra I and II, geometry, trigonometry, and physics.

(Slide No. 64) A plumber determines defects in and maintains heating, water, and drainage systems in industrial, commercial, and private establishments. His job requires him to assemble, install, and repair pipes, fittings, and fixtures of heating according to specifications and plumbing code. He inspects systems to ascertain the cause of malfunction. He repairs and maintains plumbing by replacing washers on leaky faucets, mends or replaces leaky pipes, and opens clogged drains. (Slide No.65) He also measures, cuts, threads, bends, and installs pipe and pipe fittings. The term of training that is necessary for this apprenticeship is four to five years. During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. The average hourly wage of a journeyman is between $4.50 and $5.50. (Slide No.66) The eligibility requirements for entrance into the plumber apprenticeship are: to be between 18 and 26 years of age; to complete a medical examination; and to present a high school transcript of successful completion of grade 12. The recommended high school courses are advanced math, algebra I, and geometry, blue print reading, mechanical drawing, general physics, and welding I.

A roofer covers roofs to make them water proof with roofing materials such as composition shingles, roll roofing wood shingles, or asphalt and gravel. He cuts roofing paper to size and nails or staples it to the roof in overlapping strips to form base for roofing
materials. He fastens composition shingles or sheets to roof with asphalt cement or nails. He may be designated according to specialty as a Composition Roofer, Damper-waterproofer, or Slate-and-Tile Roofer. The term of training that is necessary for this apprenticeship is two to three years. During these years, in addition to the work experience, each apprentice attends related instruction classes for a minimum of 144 hours each year. The average hourly wage of a journeyman is between $4.00 and $5.00. The eligibility requirements for entrance into the roofing apprenticeship are: to be between 18 and 35 years of age; to present a high school transcript of successful completion of grade 10; and to complete a medical examination. The recommended high school courses are algebra I, general math, physics, blue print reading, mechanical drawing, and welding I.

(Slide No.67) The last description of the apprentice trades as described here is that of a sheet metal worker. He is engaged in construction-related work. He fabricates and installs ducts that are used in ventilating, air conditioning, and heating systems. (Slide No.68) He also fabricates and installs a wide variety of other products made from thin metal sheets such as roofing and siding, partitions, store fronts, and metal framework for display signs. (Slide No.69) In heating or air conditioning duct work, the sheet metal worker lays out and plans the job and determines the size and type of sheet metal to be used. (Slide No.70) His job titles may be designated according to specialty as Aircraft Metal-smith, Metal Spinner or Sheetmetal Worker. The term of training that is necessary for this apprenticeship is three to four years. During these years, in addition to the
work experience, each apprentice attends related instruction classes for a minimum of 144 clock hours each year. (Slide No.71) The average hourly wage of a journeyman is between $4.00 and $5.00. The eligibility requirements for entrance into the sheet metal workers' apprenticeship are: to be between 18 and 26 years of age; to complete a medical examination; and to present a high school transcript of successful completion of grade 12. (Slide No.72) The recommended high school courses are algebra I and II, geometry, trigonometry, blue print reading, advanced metals I and II, mechanical drawing, and welding I and II. (Slide No.73). END
TITLES OF SLIDES USED IN
COORDINATED SLIDE-TAPE PRESENTATION

1. Careers in Construction (Title)
2. Roads, Bridges and Buildings
3. Drawing of Futuristic Man-made World
4. Road Gang
5. Horsedrawn Road Equipment
6. Crane and Horsedrawn Wagon
7. Interstate Highway.
8. Maze of Roadways and Modern Buildings
9. Earth Moving Scrapers and Graders
10. Heavy Equipment Operator
11. Drainage Line Installation
12. Electrical Lineman on Site
13. Construction of Skyscraper
14. Concrete Placing
15. Construction of Large Dam
16. Helicopter Raising Building Materials on Site
17. Preparation of Roadbed for New Highway
18. Modern Building Complex
19. Bridge Spanning River
20. Massive Tower
21. Crane Operator on Site
22. Road Grader Operator on Site
23. Boom Operator
24. Apprenticeship Class in Session
25. Blockmasons on Job Site
26. Brickmason on Job Site
27. Mixing Mortar on Site
28. Carrying Brick on Site
29. Placing Mortar on Mortar Board
30. Apprentice Laying Brick
31. Journeyman Laying Brick
32. Carpenters Placing Floor Joist
33. Carpenters Cutting Floor Joist
34. Erecting Stud Wall Section
35. Graded Homesite
36. Transporting Modular House
37. Modular House Ready for Foundation
38. Modular House Placed on Foundation
39. Leveling Modular House
40. Finished View of Modular House
41. Smoothing Poured Concrete Wall
42. Placing Concrete
43. Placing Concrete Bridge Beam
44. Electrician on Construction Site
45. Temporary Electrical Service Installation
46. Electrician Apprentice
47. Electrical Control Panel Installation
48. Electrical Control Panel Service Check
49. Wiring Electrical Control Panel
50. Electrician on Job Site
51. Electrical Lineman
52. Steel Bridge Erection
53. Bridge Girder Placement
54. Steelworkers on Site
55. Welder Operator
56. Heavy Equipment Operator
57. Crane Operators
58. Painter on Job Site
59. Painting Crew Moving Ladder
60. Painting from Extended Ladder
61. Pipefitter on Job Site
62. Wrapping Insulation on Steam Pipes
63. Thread Cutting Operation
64. Plumbing Installation
65. Pipefitter Preparing a Weld Joint
66. Pipefitter Welding
67. Sheetmetal Equipment
68. Sheetmetal Journeyman
69. Duct-work Installation
70. Sheetmetal Installers
71. Sheetmetal Building Fabrication
72. Journeyman Working from Swinging Scaffold
73. Careers in Construction (End)
A WORLD OF OPPORTUNITY IN CONSTRUCTION

TABLE OF CONTENTS

Introduction
What is an apprentice?
Wage increases
Advancement
Training is good insurance
Joint Apprenticeship Committees
How to prepare for apprenticeship
How to enter apprenticeship
Apprenticeship training supervised by government agencies
Bricklayer
Carpenter
Cement Mason
Electrician
Ironworker
Operating Engineer
Painter
Pipefitter
Plumber
Roofer
Sheet Metal Worker
INTRODUCTION TO CONSTRUCTION

The future of our cities, our hospitals, our schools, our churches, our homes and our nation depends on the construction industry and the youth it trains today to meet the needs of tomorrow. The Guidance Counselors of our secondary schools are the source which the community and the industry must rely on to counsel and advise our youth as to the educational preparation they must have for entry into the greatest industry in the world - construction. The construction industry offers a wonderful world of opportunity to a young man with an urge to create and to use the tools of mind and body to become a future builder of our cities and country.

The objective of this booklet is threefold:

To acquaint high school and vocational teachers with construction occupations available to high school graduates.

To provide school systems with accurate information on the manpower needs of the construction industry.

To better prepare the high school graduate for the world of work and to give him a general introduction to the opportunities in the construction industry and its various apprenticeship programs.

WHAT IS AN APPRENTICE?

An apprentice is a worker who learns to become a skilled craftsman through planned, supervised work on the job, plus related classroom instruction. The apprentice, when working on the job, is a regular part of the work force who earns high wages while he acquires an important skill.

The apprenticeship training period of skilled occupations ranges from two to five years. Apprentices are taught the proper use, care, and safe handling of the tools and equipment used in connection with their work. Classroom work is required in subjects related to the trade to round out his training.

Apprentices attend Max S. Hayes Vocational School for related instruction. The classroom instruction generally covers eight hours every two weeks. The time spent in the classroom is paid for by the employer just as if he were working. Classes are taught by competent instructors with practical experience in the craft.
APPRENTICES GET REGULAR WAGE INCREASES

The apprentice earns while he learns. The more he learns the higher the pay. Apprentices are paid near 50% of a journeyman's wage to start. As he climbs the ladder to the journeyman status, the wages are increased at regular intervals. At the end of his term of apprenticeship he becomes a journeyman and draws full pay for his skill.

WHAT ABOUT ADVANCEMENT?

Apprenticeship in construction has been described as "the doorway to opportunity." The apprentice - at no cost to himself - learns skills and talents he can use the rest of his life. Training gained through apprenticeship has enabled many workers to advance to better jobs.

Apprentices of today are the foremen, superintendents, and contractors of tomorrow. The ambitious young man needn't stop advancing once he becomes a skilled tradesman. Supervisory positions become available as the journeyman improves his skills, knowledge and his ability to direct and guide other craftsmen. Advancement, of course, depends on the merits of the individual. Those individuals who have extra drive can advance to job estimator, project superintendent, vice president and even president of a company.

TRAINING IS GOOD INSURANCE

Training in the skilled construction trades is good insurance. In addition to opportunities for promotion and steady employment, it gives you something that no one can ever take away from you - a lifelong increased earning capacity which will enable you to get and keep a well-paying job anywhere in the country. Skilled hands and a trained mind give the owner a strong feeling of security which, in some ways, is better than money in the bank.

JOINT APPRENTICESHIP COMMITTEES

The actual selection of apprentices in every skilled building trade is done by members of a Joint Apprenticeship Committee. These are men with considerable experience representing both management and labor. Committee men do all selecting of applicants. The committees are assisted by the Labor Department's Bureau of Apprenticeship and Training and the Cleveland School Board.

The Joint Apprenticeship Committee determines the need for apprentices and sets the minimum standards of education, experience and training. Generally, apprentices are required to be between the ages of 17 and 25. A high school education, or its equivalent, with courses in mathematics and science is very desirable. Often applicants are given tests by the Committee to determine their
aptitude for a particular occupation. More specific requirements are described later in this booklet under each trade.

HOW TO PREPARE FOR APPRENTICESHIP TRAINING

Today construction tradesmen are drawn from the ranks of high school graduates. The importance of staying in school and learning all you can cannot be overemphasized. The smart young fellow of today stays in school as long as he can. In the stiff competition of today's industry, a person must be able to do jobs requiring more than a few weeks' experience. A high school education is a must preparation for a young man interested in becoming a skilled journeyman. The term "journeyman" is an old one, dating back to Medieval Times when the skilled craftsman had to travel from place to place to practice their trade. Thus, they became known as "journeymen". The word now refers to the man who has served his apprenticeship.

HOW TO ENTER APPRENTICESHIP

The only way that a young man can enter an apprenticeship program is through indentureship. Indentureship is basically a written agreement to train for a craft as a learner, or apprentice. Agreements generally are with the Joint Apprenticeship Committee for the full term of apprenticeship - from 2 to 5 years. An agreement can also be with an employer who can provide the variety of work experience necessary to give the apprentice all around instruction in the craft and relatively continuous employment.

APPRENTICESHIP TRAINING IS SUPERVISED BY GOVERNMENT AGENCIES

To be certain the apprentice gets proper training both federal and state governments establish rules which supervise the progress of the trainee. Every construction apprenticeship program must adhere to regulations and standards which are registered with the Ohio Apprenticeship Council. The U.S. Department of Labor's Bureau of Apprenticeship and Training assists in the formulation of and the carrying out of the standards.
BRICKLAYER

WHAT HE DOES

Bricklaying is one of the oldest crafts dating back to biblical times. Bricklaying was known in ancient Babylonia over 6000 year ago.

The work of the modern Bricklayer touches almost all aspects of building - industrial and commercial buildings, apartments and homes. He constructs walls, partitions, fireplaces, chimneys and other structural forms from brick or other masonry materials such as firebrick, concrete, cinder or gypsum block, structural tile and terracotta. He works with any materials put together with mortar using the trowel, chisel, jointer, brick hammer for cutting bricks and power brick cutting saws. He understands and works from blueprints. He also uses measuring, leveling and aligning tools to check his work.

WORKING CONDITIONS

Much of his work is out of doors and generally depends on suitable weather conditions. Modern construction methods along with heaters and plastic enclosures stretch the season for bricklaying construction making it less dependent on good weather. A Bricklayer is on his feet all day and does considerable stooping and bending. At times work is done from scaffolding which may be high above the ground.

INTEREST AND TEMPERAMENT

A person interested in this field would be involved in a variety of duties requiring fairly close tolerances, limits or standards. Bricklaying requires careful, accurate work by the craftsman. He should enjoy working with his hands and accept working outside under many different weather conditions. Good eyesight is especially important to quickly determine lines and level. Manual dexterity is also important.

GENERAL QUALIFICATIONS

Age-at least 17 and not over 24 years. The committee shall have the authority to waive the maximum age limit in the case of an honorably discharged veteran who makes application within 6 months of discharge.

Minimum education-high school graduate or equivalent.

Good physical condition-must be able to perform the work of the trade.

American citizenship or declaration of intent.
ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Transcript of high school record may be required.

Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship - 3 years.

Minimum hours of related classroom instruction - 144 each year.

Indentured to - contractor employer of bricklayers.

Length of probationary period - 30 working days.

Pre-apprenticeship courses may be required.

RECOMMENDED HIGH SCHOOL COURSES

Algebra I, Geometry, General Science, Mechanical Drawing.

WHERE APPLICATIONS ARE AVAILABLE

Bricklayers' Joint Apprenticeship Committee
2105 East 21st Street
Cleveland, Ohio 44115
Telephone: 771-1918
WHAT HE DOES

Carpenters are probably the most widely known of the building trades craftsmen for two reasons: They are the largest group of building trades workers and they are employed in almost every type of construction activity. Through home building, their work touches the lives of more people than any other craft. Carpenters cut, shape, fasten wood and similar materials. They erect wood framework in buildings including subflooring, partitions and rafters. They install molding, wood paneling, cabinets, window sashes, door frames, doors, and hardware, as well as build forms for concrete work, build stairs and lay floors. They use a wide variety of power and hand woodworking tools.

WORKING CONDITIONS

Since much of the work is done outdoors, working conditions are governed by the weather. The Carpenter does a great deal of standing, lifting, carrying and stooping - some climbing and balancing varying with the job and his particular assignment. Many hazards exist, including possible severe cuts and the possibility of falls.

INTEREST AND TEMPERAMENT

The Carpenter should enjoy doing precision work, should have pride of craftsmanship, must be able to work without close supervision and be able to adapt to a wide variety of working conditions.

GENERAL QUALIFICATIONS

A person age 17 through 27 years may be admitted to membership as a beneficial member; provided, however, that an apprentice with previous military service may be admitted between the ages of 17 through 32.

Minimum education - high school graduate or equivalent.

Good physical condition - must be physically able to perform the work of the trade.

Manual dexterity and the ability to solve arithmetic problems quickly and accurately.

American citizenship or declaration of intent.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Medical examination.
Transcript of high school record.

Aptitude test - administered by The Ohio State Employment Service.

Written examination by the Joint Apprenticeship Committee.

Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship - 4 years.

Minimum hours of related classroom instruction - 144 each year.

Indentured to - Joint Apprenticeship Committee and assigned to contractor employer of carpenters.

Length of probationary period - 60 days.

RECOMMENDED HIGH SCHOOL COURSES


WHERE APPLICATIONS ARE AVAILABLE

Carpenters' Joint Apprenticeship Committee
3615 Chester Avenue
Cleveland, Ohio 44114
Telephone: 391-0337
WHAT HE DOES

The principal work of the Cement Mason is finishing the exposed concrete surfaces on many types of construction projects. These projects range from small jobs such as finishing patios, floors and sidewalks to work on huge dams, miles of concrete highways, foundations, walls of large buildings, airport runways and missile launching sites. The Cement Mason levels, smooths and shapes surfaces of freshly poured concrete. Although he is involved in home building with basement and driveway work, the bulk of his work is commercial and industrial building. The Cement Mason's basic tools are the trowel, float, jointer, edger and spirit level. To finish concrete surfaces he uses either hand or power-driven carborundum stones to rub out formed marks. He also sets forms for sidewalks and waterproofs concrete walls.

The Cement Mason's knowledge of his materials is essential to the quality of work. He must know the working characteristics of various cement and concrete mixes. In addition, because of the effects that heat, cold, and wind have on the curing of cement, the skilled mason must recognize by sight and touch what is occurring in the cement mixture so that he may be able to prevent defects.

WORKING CONDITIONS

Since most of the work is done outdoors, working conditions are governed by the weather. The work is active and strenuous with most of the work done on the ground or the floor level. The worker is required to stoop, bend or kneel. Cement Masons work under more pressure, probably, than any other building tradesman. Once cement is poured, it must be worked before it sets regardless of the time of day or climatic conditions.

INTEREST AND TEMPERAMENT

Persons entering this occupation should receive satisfaction of tangible results from a job well done. They must be able to work without close supervision and be able to adapt to a wide variety of working conditions and must be willing to stay on the job until it is finished once the cement is poured.

GENERAL QUALIFICATIONS

Age - not less than 18 years or more than 24 years of age (exception-veterans). Proof of age is required.

Minimum education - high school graduate.

Good physical condition - must be physically capable of
performing the work of the trade.

Manual dexterity.

American citizen or declaration of intent.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Aptitude test - administered by the Ohio State Employment Service.

Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship - 3 years.

Minimum hours of related classroom instruction - 144 each year.

Indentured to Joint Apprentice Committee and assigned to a general contractor or a cement finishing contractor.

Length of probationary period - not less than 240 hours.

RECOMMENDED HIGH SCHOOL COURSES

General Math, Algebra I, Geometry, Mechanical Drawing.

WHERE APPLICATIONS ARE AVAILABLE

Cement Masons' Joint Apprenticeship Committee
1414 East 26th Street
Cleveland, Ohio 44114
Telephone: 771-3929
ELECTRICIAN

WHAT HE DOES

An Electrician lays out, installs and tests electrical fixtures, and installs electrical wire systems, systems used to provide heat, light, power, air conditioning and refrigeration in homes, office buildings, factories, hospitals, and schools. He also installs conduit, greenfield and other materials, and connects electrical machinery, equipment and controls. The electrician uses a wide variety of hand tools to perform his various tasks. The journeyman electrician must master both mechanical and technical skills. He must understand the use of meters and specialized testing equipment, be adept at trouble shooting and understand the theory behind the transmission of electrical energy.

WORKING CONDITIONS

In new construction, electricians move onto the job as soon as the structure begins to take form, installing grounding and temporary lights and power. The work is active and strenuous with much of the work done in awkward positions and frequently in cramped quarters. They must do considerable standing, reaching, bending, stooping, climbing, carrying and lifting in order to install electrical conduit and equipment. They must wear protective clothing to guard against the hazards of working with electricity. They may work in all kinds of weather. The work is interesting and diversified. Electricians may be called upon to work in new and old buildings, new and old homes, also commercial and industrial construction.
INTEREST AND TEMPERAMENT

A person interested in becoming an electrician must enjoy working with math problems and be able to work to fairly close tolerances. He must also be able to work much of the time without close supervision. He must have steady nerves and a great deal of patience.

GENERAL QUALIFICATIONS

Age—must not be over 21 year of age; with honorable military service not over 24 years of age.

Minimum education—high school graduate or equivalent.

Good physical condition—must be physically able to perform the work of the trade.

American citizenship.

Resident of union jurisdiction for 1 year.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Intelligence and aptitude test—administered by the Ohio State Employment Service or other person or persons as designated by the committee.

Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship—4 years.

Minimum hours of related classroom instruction 288 each year.

Indentured to Joint Apprenticeship Committee and assigned to an electrical contractor.

Probationary period—6 months.
RECOMMENDED HIGH SCHOOL COURSES

Algebra, Geometry, Trigonometry, Mechanical Drawing, related Sciences.

WHERE APPLICATIONS ARE AVAILABLE

Electricians' Joint Apprenticeship Committee
1590 East 23rd Street
Cleveland, Ohio 44114
Telephone: 621-3090
Ironworkers are craftsmen who erect, assemble, or install fabricated structural metal products, usually large metal beams, in the erection of industrial, commercial or large residential buildings. Structural Ironworkers erect the steel framework of bridges, buildings, and other structures including metal storage tanks and overhead crane runways that support heavy equipment. Reinforcing ironworkers (rodmen) set steel bars or steel mesh in concrete forms to strengthen concrete in buildings and bridges. Ornamental ironworkers install metal stairways, catwalks, gratings, grills, screens, fences and decorative ironwork.

**WORKING CONDITIONS**

With the exception of some ornamental ironwork, remodeling and repair work, and the occasions where temporary shelters can be set up, most of the work is done out of doors. Most iron work can be carried on year round except in instances of very severe weather. Because Ironworkers risk injury from falls from great heights, safety devices such as nets, safety belts and scaffolding are used. They do a great deal of climbing, balancing and reaching.

**INTEREST AND TEMPERAMENT**

Ironworkers must receive satisfaction from tangible productive results. They must be able to work to prescribed close tolerances and rigid standards. Naturally, a person cannot be afraid of working in high places. He must also have an acute awareness of the danger
to himself and be willing to assume responsibility for the safety of his fellow workers.

GENERAL QUALIFICATIONS

Age 18 through 30.

Minimum education—High school graduate or equivalent.

Good physical condition—since the materials used in the ironworking trades are heavy and bulky, above average physical strength is necessary. Agility and a good sense of balance are also required.

American citizenship.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Medical examination.

Aptitude test.

Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship—3 years.

Minimum hours of related classroom training—144 hours each year.

Indentured to the Joint Apprenticeship Committee and assigned to a general contractor or a contractor employer of ironworkers.

Length of probationary period—6 months.

RECOMMENDED HIGH SCHOOL COURSES

General Math, Algebra, Geometry, Physics, Mechanical Drawing, Welding.

WHERE APPLICATIONS ARE AVAILABLE

Ironworkers' Joint Apprenticeship Committee
1544 East 23rd Street
Cleveland, Ohio 44114
Telephone: 771-5558
OPERATING ENGINEER

WHAT HE DOES

An Operating Engineer operates and maintains various types of power-driven construction machines, such as bulldozers, cranes, pile drivers, power shovels, derricks, earth graders, and tractors which dig, scrape, and move great amounts of earth or hoist large quantities of building supplies. Some machines require the operator to turn valves, adjust hand wheels and press pedals to drive the machines and control the attachments. Other machines, such as cranes, require the constant use of both hands and both feet. An Operating Engineer may also be required to service his machines and move the machine from one construction site to another.

WORKING CONDITIONS

All the work is performed in the open, except for a few machines equipped with enclosed cabs. Earth-excavating and grading-equipment operators and road building equipment operators generally work from early spring until the fall freeze and shut down only when it rains. The work might be dusty and dirty.

INTEREST AND TEMPERAMENT

An Operating Engineer should enjoy working with machines and equipment and be mechanically inclined. He must be able to do routine, repetitive work and work either with a team on large projects or alone. He should be able to withstand the jolting and vibration of the machines and must have an interest in and the ability to learn correct of handling the powerful equipment in a safe manner. The job demands a man with good eyesight, muscular
coordination and depth perception.

GENERAL QUALIFICATIONS

- Age-at least 18 and not over 30 years.
- Minimum education-high school graduate or equivalent.
- Good physical condition, must be able to perform the work of the trade.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

- Medical examination.
- Aptitude test-written examination.
- Personal interview.

TERMS OF APPRENTICESHIP TRAINING

- Length of indentureship-4 years.
- Minimum hours of related classroom instruction-144 each year.
- Indentured to Operating Engineers' Joint Apprenticeship Committee.
- Length of probationary period-60 days.

RECOMMENDED HIGH SCHOOL COURSES

- General Math, General Science.

WHERE APPLICATIONS ARE AVAILABLE

Operating Engineers' Joint Apprenticeship Committee
3515 Prospect Avenue
Cleveland, Ohio 44115
Telephone: 432-3131
PAINTER

WHAT HE DOES

The art of painting has been with us since the dawn of history. From the time man first learned that colored material dissolved in liquids could be used to decorate his dwellings, his possessions, and his body, painting has been an important factor in the development of civilization. Painting today serves many purposes besides decoration alone. Modern chemical plants produce paints for the protection of almost any material against any type of weather or chemical corrosion. Today's Painter must know how to mix paints and to prepare the surfaces of buildings and other structures and then apply paint, varnish, lacquers, shellac and similar materials to the surfaces. The painter uses three primary tools to apply coatings: brush, roller, and spray gun. He determines the use of each on every job by virtue of his knowledge and experience. In addition to setting up ladders and erecting scaffolds and safety barriers, painters make proper application of vinyls, fabrics, foils, and wallpapers of different manufacturing processes and characteristics.

WORKING CONDITIONS

Painters work both indoors and out. Outside work is done in relatively mild weather. In some jobs, especially maintenance and redecoration of offices and buildings, the Painter may be required to work evenings or weekends. Work is seasonal; however, new materials and methods tend to give more steady employment throughout the year. Physical and health hazards include the dangers of poisoning, falling from ladders and scaffolds, breathing paint fumes and dust. Of course,
following reasonable safety rules reduces these dangers. The work
involves standing, bending, climbing and working with arms over the
head much of the time.

INTEREST AND TEMPERAMENT

The Painter must have manual dexterity as well as steady nerves
to work in high places. He should not be allergic to or bothered by
paint fumes, toxic materials and spray dust. He should have a certain
artistic sense in order to do a first-class painting job. Good eye-
sight and sense of color is especially important to properly mix paints
to specific colors.

GENERAL QUALIFICATIONS

Age-18 through 26.
Minimum education-high school graduate or equivalent.
Good physical condition-must be able to perform the work of the
trade.

ADMISSION REQUIREMENTS BY THE JOINT APPRENTICESHIP COMMITTEE

Aptitude Test-administered by the Ohio State Employment Service.
Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship-3 years.
Minimum hours of related classroom instruction-144 each year.
Indentured to the Joint Apprenticeship Committee and assigned
to a painting contractor.
Length of probationary period-90 days.

RECOMMENDED HIGH SCHOOL COURSES

General Science, Chemistry, General Math, Mechanical Drawing.
WHERE APPLICATIONS ARE AVAILABLE

Painters' Joint Apprenticeship Committee
1280 West Third Street
Cleveland, Ohio 44113
Telephone: 771-4896
PIPEFITTER

WHAT HE DOES

Pipefitters are craftsmen who assemble, install and maintain pipes to carry liquids, steam, compressed air, gases, and fluids needed for processing, manufacturing, heating or cooling. The journeyman Pipefitter must be able to adapt and repair pipe systems and install boilers, heating equipment and refrigeration units and do all types of pipe welding. Pipefitters work with both high and low pressure systems mostly in industrial and commercial buildings. For example, they install ammonia-carrying pipe lines in refrigeration plants, complex pipe systems in oil refineries and chemical and food processing plants and automatic sprinkler systems. They know how to prevent corrosion, clogging, and breaking of pipe lines and know how to test pipes for proper operation.

WORKING CONDITIONS

Pipefitters work both inside and out depending on the job. In new construction, Pipefitters move onto the job after the basic structure is erected. The work is active and strenuous. They do a great deal of walking, standing, reaching, lifting, and working in cramped areas. They are subject to the hazards of working with and around high pressure gas, steam and chemical lines.

INTEREST AND TEMPERAMENT

A person wishing to enter this type of work should be able to understand detailed, written and verbal instructions and the ability to plan ahead and visualize completed projects. He should enjoy working with his hands and accept working outside sometimes under
adverse weather conditions. He must have the ability to solve arithmetic problems quickly and accurately.

GENERAL QUALIFICATIONS

Age 18 through 22.

Minimum education-high school graduate or comparable education.

Good physical condition-must be physically able to perform the work of the trade.

American citizenship.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Aptitude and I.Q. Tests.

Transcript of high school record.

Personal interview.

Consideration given for military service.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship-5 years.

Minimum hours of related classroom instruction-288 for the first year and 144 thereafter.

Indentured to Joint Apprenticeship Committee and assigned to contractor employer of pipefitters.

Length of probationary period-6 months.

RECOMMENDED HIGH SCHOOL COURSES

General Math, Algebra, Geometry, Trigonometry, General Science, Physics, Mechanical Drawing.

WHERE APPLICATIONS ARE AVAILABLE

Pipefitters' Joint Apprenticeship Committee

1435 East 14th Street

Cleveland, Ohio 44114

Telephone: 861-1027
WHAT HE DOES

Plumbers install pipes for water, gas, sewage, and drainage systems. They also install sanitary facilities such as lavatories, toilets, tubs, bathroom fixtures, showers, kitchen fixtures, drinking fountains and laundry equipment. Although most plumbers work at construction sites, some work for public utilities, and industrial plants. Plumbers use a variety of skills to install pipe systems. They use both hand and power tools in their work of cutting, bending, and threading pipes and making welded and soldered joints. Plumbers must also run tests on their installations to assure that the system is functioning properly and meets the plumbing code. They are often called upon to clear pipe lines and drains and make repairs on faucets, valves, and leaky pipes.

WORKING CONDITIONS

Their work is active and sometimes strenuous. Usually they work indoors, but sometimes outdoors, sometimes on a ladder or scaffold, in trenches, and in unfinished sections of new buildings. Often, work is done in cramped, wet or dirty locations. Frequently, it is necessary to stand for long periods. Occasionally, they work in uncomfortable positions in relatively inaccessible places.

INTEREST AND TEMPERAMENT

A person wishing to enter this type of work should be able to understand detailed, written and verbal instructions and should be able to plan ahead and visualize completed projects. He should enjoy working with his hands and accept working outside and be able to
solve arithmetic problems quickly and accurately.

GENERAL QUALIFICATIONS

Must be between the ages of 17 - 21, plus credit for military service.

Minimum education-high school graduate.

Good physical condition-must be physically able to perform the work of the trade.

American citizen or declaration of intent.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Medical examination may be required.

Aptitude test-administered by the Joint Apprenticeship Committee.

Personal interview.

Veterans-must have honorable discharge. In case of returning veteran desiring to enter this trade through apprenticeship, the J.A.C. may take into consideration any unusual qualifications or a physical handicap the applicant may possess.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship-5 years

Minimum hours of related classroom instruction-144 hours per year.

Indentured to the Joint Apprenticeship Committee.

Length of probationary period-6 months.

RECOMMENDED HIGH SCHOOL COURSES

General Math, Algebra, Geometry, Trigonometry, General Science, Physics, Mechanical Drawing, Welding.
WHERE APPLICATIONS ARE AVAILABLE

Plumbers' Joint Apprenticeship Committee
1720 East 30th Street
Cleveland, Ohio 44114
Telephone: 771-7767
ROOFER

WHAT HE DOES

Roofers are the craftsmen who specialize in putting roofs on buildings and other structures to make them waterproof and weatherproof. They apply composition shingles, tile, slate, and composition roofs, which consist of numerous layers of saturated felt cemented together with asphalt or pitch and sometimes surfaced with stone or chips or marble. They use modern equipment to handle their materials thereby lessening the physical exertion which was formerly required. Roofers are also called upon to waterproof and damp-proof walls and other building surfaces.

WORKING CONDITIONS

With the exception of waterproofing of some walls, the Roofers work out-of-doors in all kinds of weather and only shut down operations when the weather becomes too severe. Most of the time they work on the top of buildings installing roofing materials. In their work they do a great deal of climbing, kneeling, standing and walking.

INTEREST AND TEMPERAMENT

Roofers must have no fear of height, have a good sense of balance and a better-than-average sense of safety for themselves and their co-workers. A person wishing to enter this type of work should enjoy working with his hands and accept working outside, sometimes under unpleasant weather conditions. However, much satisfaction is derived from a job well done, since the roof keeps the entire building and its contents dry.
GENERAL QUALIFICATIONS

Age 18-30.
Minimum education-high school graduate or equivalent.
Good physical condition-must be physically able to perform the work of the trade.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship-3 years.
Minimum hours of related classroom instruction-144 each year.
Indentured to Joint Apprenticeship Committee and assigned to a roofing contractor.

RECOMMENDED HIGH SCHOOL COURSES

General Math, General Science.

WHERE APPLICATIONS ARE AVAILABLE

Roofers' Joint Apprenticeship Committee
4527 Lorain Avenue
Cleveland, Ohio 44102
Telephone: 961-0044
WHAT HE DOES

The Sheet Metal Worker is a vital part of the construction team. The man in this trade builds products from flat sheets of metal and then installs the finished product. He is responsible for the heating, air conditioning, ventilation, and exhaust system ducts in a modern building. He is also responsible for the heating, air conditioning, electronic air cleaning, and humidification duct work in new homes. His trade includes the application of all outside architectural sheet metal. Commercial and residential items such as facia, chimney flashing, valleys, gutters, downspouts, and metal roofs are made from metal of various thickness depending on how it is to be used. Another category of sheet metal work is the making and installation of kitchen equipment, counters, hoods, tables, cabinets, and related exhaust systems.

WORKING CONDITIONS

The Sheet Metal Worker does a great deal of shop work compared to other construction tradesmen. He fabricates sheet metal in the shop. It is then delivered to the job for installation. On a new structure a craftsman works both inside and out at the construction site. Much of this work, done on the job, requires the ability to climb ladders, and work from scaffolds to erect these sheet metal ducts. A Sheet Metal Worker must always be safety conscious. He can be cut by the tools he uses or by the sharp edges of the metal with which he works.
INTEREST AND TEMPERAMENT

People interested in becoming Sheet Metal Workers must have the ability to follow instructions. The apprentice always works with a journeyman. A good working knowledge of math along with mechanical drawing is always an asset. The understanding of blueprints and the ability to work to close tolerances are necessary. He must also enjoy working with his hands and have the desire to think for himself without constant supervision.

GENERAL QUALIFICATIONS

Age 18 through 23.
Minimum education-high school graduate (or equivalent).
Good physical condition-must be able to perform the work of the trade.

ADMISSION REQUIREMENTS OF THE JOINT APPRENTICESHIP COMMITTEE

Medical examination may be required.
Aptitude test-administered by The Joint Apprenticeship Committee.
Credit for Armed Service-Subject to review by the committee.
Personal interview.

TERMS OF APPRENTICESHIP TRAINING

Length of indentureship-4 years (fourth year requires evening classes in gas and electric welding).
Minimum hours of related classroom instruction-144 per year.
Indentured to The Joint Apprenticeship Committee.
Length of probationary period-1,000 hours.
RECOMMENDED HIGH SCHOOL COURSES

General Math, Geometry, Trigonometry, Mechanical Drawing,

Physics, General Science.

WHERE APPLICATIONS ARE AVAILABLE

Sheet Metal Workers' Joint Apprenticeship Committee
3515 Prospect Avenue
Cleveland, Ohio 44103
Telephone: 391-1645
APPENDIX I
The construction industry is a brawny, hearty giant, stretching to embrace all kinds of building activity, from major maintenance and alterations, to the erection of towering skyscrapers, or the establishment of a massive dam on a wilderness river.

A construction project may take many forms: a vast new plant for a manufacturer, or a simple one-story office building; a new church or school, or a family residence; a sprawling missile site with a complexity of buildings and service installations, or perhaps a new road. Large or small, whatever the undertaking, the project is built -- carefully and capably built -- by men with the ingenuity and skill to create a structure on what once was barren ground.

It is this opportunity to combine ingenuity and skill which attracts so many ambitious young men to a career in construction. For here is a real chance to use your head as well as your hands to create. And each creation -- each structure -- improves the land, helps people to a better way of life ... contributes to the growth of the nation.

There are few greater satisfactions than returning to the site of a completed project, with your family or friends, and saying, "That's one of ours -- I helped build it."
Construction's amazing rate of growth means more chances to get ahead! In considering your future, you will want to know about the future of the industry you choose. Take a look at construction! Buildings built in the last ten years alone are equal in value to all the buildings erected since our nation was founded. By dollar volume, the construction industry is far and away the largest business in the country, and it's growing at a fantastic rate. Experts say that by 1975 building activity will double, and will grow to four times its present size by the year 2000 . . . just when today's young men will reach their most productive years. Here's a real chance to get in on the ground floor, in a business that must get bigger . . . and therefore must promote capable young men at an accelerated pace, to keep up with the demands of our expanding population.

CONSTRUCTIONEER: WHAT KIND OF MAN? WHAT KIND OF LIFE?

The man who builds does a man's work and enjoys it. He finds plenty of action and variety in the construction industry . . . and takes pride in his skills, and in making them grow.

Every day presents a new challenge to the man alert enough to learn -- or work out for himself -- a new way to use his head and his hands. He needs teamwork -- the ability to get along with other men -- but he must be eager, too, for the chance to take personal responsibility for a job, and ready to do just a little bit extra to make sure the job is right.

What other qualities does a constructioneer possess? The best men have these traits in common: They're active, like to be outdoors, and enjoy seeing the immediate results of what they've done.
They're mentally alert, skillful in their jobs, and reliable. Most important, they like working with tools, machinery and men . . . and take pride in what -- together -- they can accomplish.

A constructioneer leads a man's life -- healthy, active, useful. Whether you wake in Philadelphia or Pakistan, if you're a true constructioneer, you wake up feeling good. You look forward to the activity, the atmosphere, the accomplishments that you'll find on the job. You are eager to see what new things will develop, what problems you'll be called upon to solve. You know how much it means to work with a group of men you really respect.

Construction is a good life, with many satisfactions. As each job is completed, and you move on to the next, you'll find a new environment, new experiences, new people -- and plenty of new things to learn. Then, too, there's the pleasure taken in a good job well done . . . and in the knowledge that your work is necessary and important.

Variety, usefulness, vitality: these are the rewards -- along with good pay and good working conditions -- that the men who are cut out for a career in construction find in their work.

CONSTRUCTION: HOW MANY DIFFERENT JOBS WHAT EACH JOB IS LIKE

There are countless opportunities in construction. So many different jobs, so many chances to get ahead. And each job has its own advantages and rewards for the man who can fill it. Let's look more closely at this giant industry.

Construction can be divided into several categories. The usual breakdown is:

To simplify this discussion, let's concentrate on the opportunities in General Building Construction.

Here are the positions you can shoot for in a general building contractor's organization. They are listed by job title, and include a summary of typical duties and responsibilities, and the weekly salary rates for the Philadelphia area. Your salary will depend on you -- your abilities, efforts, initiative, and dedication.

POSITIONS WITH A GENERAL BUILDING CONTRACTOR

Project Manager ($209-$400): Directs all construction functions on very large projects; establishes and develops methods, procedures, schedules, and policies; coordinates the work of all units and divisions; and performs such administrative duties as are required for proper completion of the project.

General Superintendent ($175-$400): Directs all construction functions for large projects, according to established schedules, specifications, methods, and procedures; supervises job superintendents on very large projects or on a variety of smaller projects.

Job Superintendent ($150-$279): Directs all construction functions on small or medium size projects, or on specific phases of large projects. Responsible for maintaining proper schedule,
budget, methods, and procedures.

Office Manager ($86-$300): Performs or supervises variety of services incident to primary operations of Construction business, such as keeping books, making up payroll, billing clients, handling mail.

Engineer ($115-$425): A sampling of the technical responsibilities of the Construction Engineer includes: design, testing, analysis, planning, surveying, materials handling, research, and other technical aspects of the building process.

Estimator ($90-$300): Obtains basic data about a proposed construction project (usually from architect's plans), and computes cost of construction plus overhead and profit, to arrive at a competitive bid for the job, or at a complete estimate for a client.

 Expediter ($93-$209): Maintains construction schedules by reviewing deliveries, scheduling arrival of materials and men at job sites, establishing priorities, obtaining clearances, etc.

Purchasing Agent ($95-$300): Determines most economical source for materials, stores, supplies, equipment, and parts. Assures purchase at lowest price consistent with required delivery schedules.

Business Solicitor ($175-$279): Maintains contact with owners, architects, engineers, public officials and businessmen, seeking opportunities to be considered for selection as builder.

Draftsman ($115-$200): Prepares working plans, drawings and diagrams for engineering and construction purposes. Makes necessary engineering computations on strength of materials, etc.

Foreman (Union Scale): Supervises all journeymen of his particular trade on a project. Plans work, maintains schedules,
assures proper procedures. Maintains close contact with Superintendent.

Journeyman (Union Scale): Carpenter - Cement Mason - Laborer - Millwright, etc. The craftsman. As a member of one of the 26 building trades he is engaged in, and performs, the actual construction of the building.

Accountant, Bookkeeper, Clerk, Stenographer, Telephone Operator: Duties and salaries similar to those in other industries.

CONSTRUCTION: YOUR FIRST JOB HOW FAR YOU CAN GO

You start fast, and move up fast in construction. How far you go in this rapidly expanding industry depends only on how well you prepare yourself for each job, and how well you do it. Responsibilities come early -- and with them, the chance to show what you can do, and the opportunity to advance toward your ultimate goal.

Men come into construction at three levels: (1) from high school directly into the trades; (2) from a technical course after high school into the contractor's office; and (3) from engineering college into the office, in a somewhat higher position. Advancement after entering the industry depends on the efforts of the man, and the needs of his employer. But remember! Construction activity is increasing rapidly every year . . . and that means more and more jobs of every kind are opening up daily.

Some typical job progressions. There is no way to show all the paths that may be open to you in the construction industry, for there are far too many possibilities to set down. But you may get a very rough idea of how men move up in their jobs, from these common progressions:
CONSTRUCTION: WHAT KIND OF TRAINING?  HOW TO BEGIN NOW

Here are the three roads to success in the construction industry:

1. High School Followed by Apprentice Training. For men who want to enter construction through the trades, apprentice training programs have been established to prepare for journeyman work. These programs -- which are 3 to 4 years in duration -- combine on-the-job training with basic instruction in the tools and procedures of the trade. In some cases the apprentice will actually go to school one day each week for practical classroom and shop instruction. In every instance -- whether on the job or in class -- the apprentice receives a regular hourly wage, which is a percentage of the journeyman's rate . . . and this percentage increases every six months that he is in the program. (Example: In one program, apprentices now receive $2.33 per hour the first six months, $2.60 the next six months, then $2.92, $3.24, $3.56, $3.88, $4.20, $4.52, and finally, full journey-
2. High School Followed by Technical School. There are several excellent two-year courses available to young men wishing to enter the industry through the contractor's office. These programs -- such as the one offered locally by The Spring Garden Institute -- give a good general background in construction practices and procedures, and include courses in Surveying, Plan Reading, Engineering Mathematics, Basic Estimating, Drafting, Business Administration, and Building Techniques. Several tuition awards are usually available to assist qualified high school graduates in completing this technical training. Consult your Guidance Counselor for details.

3. High School Followed by College Engineering. Naturally, when all other things are equal, the men who rise the fastest and go the farthest in construction are those with the most complete training. For young men interested in management positions, the best program begins with four years' study at a qualified Civil or Architectural Engineering college. During this period, undergraduates who plan to enter construction should include ample courses in Surveying, Structural Design and Analysis, Strength of Materials, Business Administration, Engineering Mathematics, English, Business Law, and Construction Methods and Techniques. Graduate engineers are always in demand, but the construction industry places particular emphasis on adequate business and practical training.

Engineering scholarships have been established at several local universities, and are awarded periodically to qualified high school graduates who want complete preparation for a construction career.
Consult your Guidance Counselor for details.

The first step! No matter which path to a career in construction you choose, you must finish high school to be able to take full advantage of the many opportunities which lie ahead. This is as true for the apprentice-to-be as it is for the future engineer, and the fact cannot be emphasized too strongly! Young men who want to get ahead will study hard, paying special attention to Math and English, and graduate from high school with good grades. All roads begin at this point. From here on, your future in Construction is up to you.
CONSTRUCTION: QUESTIONS/ANSWERS

Q. Isn't construction pretty seasonal? What about layoffs?
A. Not many years ago, construction activity was pretty seasonal. However, rapid technological advances coupled with a large amount of interior work in general construction, have reduced layoffs because of weather to a considerable degree.

Q. Is it possible to transfer from one part of the country to another?
A. Yes. With the largest companies, there are branch offices in other cities. But even if you are working for a smaller concern, the demand for trained men is so great everywhere, that the chances are you could land a good job almost anywhere in the country . . . or in the world.

Q. Suppose I start in a trade—are there ways I can get training for a better job?
A. There are several courses available to foremen and superintendents to help them in their work. In addition, several local schools offer good evening technical programs for the man who wants to get ahead. Your Guidance Counselor can give you details.

Q. What about working hours?
A. Members of the trades usually work an eight hour day, five days a week. However, when it is necessary to work outside such hours, overtime is paid. As in other industries, management personnel work the hours required to direct the operations of their firms.
Q. Where can I get college training for the building construction industry?

A. Here are a dozen representative universities which offer curricula to prepare students for management and supervisory careers in the building construction industry. Your Guidance Counselor is well qualified to help you obtain more complete information.

Auburn University Auburn, Alabama

School of Architecture and the Arts, Department of Building Technology

Building construction curricula leading to degree of Bachelor of Building Construction and Master of Building Construction.

Bradley University Peoria, Illinois

Bennett College

Construction curriculum leading to degree of Bachelor of Science in Building Construction Technology.

Colorado State University Fort Collins, Colorado

College of Science and Arts

Industrial Construction Management curriculum leading to degree of Bachelor of Science.

University of Florida Gainesville, Florida

College of Architecture and Fine Arts

Building construction curricula leading to degrees of Bachelor of Building Construction and Master of Science in Building Construction.

Georgia Institute of Technology Atlanta, Georgia

School of Architecture

Building construction curriculum leading to degree of Bachelor of
Science in Building Construction.

University of Michigan

Department of Civil Engineering

Civil engineering curriculum with a construction option leading to degree of Bachelor of Science in Engineering. Graduate curriculum leads to degree of Master of Science in Construction Engineering.

University of Missouri Columbia, Missouri

College of Engineering

Civil engineering curriculum with construction group electives leading to degree of Bachelor of Science in Civil Engineering.

North Carolina State College Raleigh, North Carolina

School of Engineering

Civil engineering curriculum with a construction option in 2nd, 3rd, and 4th years, leading to degree of Bachelor of Science in Civil Engineering.

Rensselaer Polytechnic Institute Troy, New York

School of Architecture

Curriculum leading to degree of Bachelor of Science in Building Construction. Graduate program in the field of the building sciences leads to degree of Master of Science.

Stanford University Stanford, California

Department of Civil Engineering

Engineering curriculum with construction option leading to degree of Bachelor of Science in Civil Engineering. Graduate curriculum leads to degree of Master of Science in Civil Engineering Construction.
Virginia Polytechnic Institute Blacksburg, Virginia

School of Engineering and Architecture

Building construction curriculum leading to degree of Bachelor of Science in Building Construction.

University of Wisconsin Madison, Wisconsin

College of Engineering

A combined 5-year curriculum (Department of Civil Engineering and the School of Commerce) leading to the degree of Bachelor of Science in Civil Engineering and Light Building Construction.
APPENDIX J
THE CONSTRUCTION INDUSTRY
(TEACHER-LECTURE OUTLINE)

I. Introduction To The Construction Industry
   A. Need
   B. Opportunity

II. What Is An Apprentice?
   A. Definition
   B. Wages
   C. Opportunities

III. How To Prepare for Apprenticeship Training
   A. Schooling
   B. Progress of Trainee

IV. Major Categories
   A. Highway Construction
   B. General Building Construction
   C. Home Building
   D. Heavy Construction

V. Trades
   A. Bricklayer
      1. What He Does
      2. Working Conditions
      3. Interest and Temperament
      4. General Qualifications
      5. Terms of Apprenticeship Training
6. Recommended High School Courses

B. Carpenter

1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

C. Cement Mason

1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

D. Electrician

1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

E. Ironworker

1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

F. Operating Engineer
1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

G. Painter
1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

H. Pipefitter
1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Course

I. Plumber
1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

J. Roofer
1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

K. Sheet Metal Worker
1. What He Does
2. Working Conditions
3. Interest and Temperament
4. General Qualifications
5. Terms of Apprenticeship Training
6. Recommended High School Courses

L. Management Practices
1. Introduction
2. Opportunities
## CLASS SCHEDULE
### (FIRST SESSION)

<table>
<thead>
<tr>
<th>Class Time*</th>
<th>Student Activity</th>
<th>Test Proctor Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes</td>
<td>Settling Down</td>
<td>Seat Class-Check Roll</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Listen</td>
<td>Read Instructions</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Receive: Achievement Examination, Interest Inventory and Information Sheet</td>
<td>Distribution of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: Scoring Pencil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2: Achievement Examination and Response Sheet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3: Interest Inventory and Response Sheet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4: Information Sheet</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Complete Information Sheet</td>
<td>Instruct students to complete Information sheets and then start</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction Industry Interest Inventory</td>
</tr>
<tr>
<td>15 minutes</td>
<td>Complete CIAT</td>
<td>Observe students and respond to organization-al questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Call time at 15 minutes</td>
</tr>
<tr>
<td>23-25</td>
<td>Complete CIII</td>
<td>Observe students and respond to organization-al questions</td>
</tr>
<tr>
<td>minutes</td>
<td></td>
<td>Call time at 25 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collect CIAT response sheets and information sheets</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Return Achievement Examination &amp; Pencils</td>
<td>Collect CIII, Response Sheets, and Pencils.</td>
</tr>
</tbody>
</table>

* designed for a fifty-minute class
## CLASS SCHEDULE
(SECOND SESSION)

<table>
<thead>
<tr>
<th>Class Time*</th>
<th>Student Activity</th>
<th>Test Proctor Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes</td>
<td>Settling Down</td>
<td>Seat Class-Check Roll</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Listen</td>
<td>Introduce Activity</td>
</tr>
<tr>
<td>40 minutes</td>
<td>Listen</td>
<td>Group A-Coordinated Slide-Tape Presentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group B-Reading of Booklets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group C-Teacher Lecture on Construction Trades</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group D-Normal Class lessons-(No special treatment)</td>
</tr>
<tr>
<td>5 minutes</td>
<td>Write down questions pertaining to treatment</td>
<td>Allow students time to write out questions pertaining to treatment collect Booklets from Group B</td>
</tr>
</tbody>
</table>

* designed for a fifty-minute class
### CLASS SCHEDULE
(THIRD SESSION)

<table>
<thead>
<tr>
<th>Class Time*</th>
<th>Student Activity</th>
<th>Teacher Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes</td>
<td>Settling Down</td>
<td>Seat Class-Check Roll</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Listen</td>
<td>Read Instructions</td>
</tr>
<tr>
<td>2 minutes</td>
<td>Receive: Achievement Examination, Interest Inventory, and Response sheets.</td>
<td>Distribution of: 1: Scoring Pencil 2: Achievement Examination and Response Sheet 3: Interest Inventory and Response Sheet</td>
</tr>
<tr>
<td>15 minutes</td>
<td>Complete CIAT</td>
<td>Observe students and respond to organizational questions. Call time at 15 minutes</td>
</tr>
<tr>
<td>23-25 minutes</td>
<td>Complete CIII</td>
<td>Observe students and respond to organizational questions. Collect CIAT and response sheet. Call time at 25 minutes</td>
</tr>
<tr>
<td>4 minutes</td>
<td>Return Achievement Examination &amp; Pencils</td>
<td>Collect CIII, Response Sheets, and Pencils.</td>
</tr>
</tbody>
</table>

* designed for a fifty-minute class
March 1, 1971

Mr. Barkby, Principal
Canton Junior High School
Canton, North Carolina 28716

Dear Mr. Barkby:

I am contacting your office in order to obtain authorization to:

1. Conduct a field study in the Canton Junior High School.
2. Use four selected eighth grade student classes.
3. Obtain data from permanent records.

I would like to assure you that all data will be treated in confidence. No comparison of teachers will be made in this study as they will have only a minimal amount of input to this study. Students will be reported in the study by number only.

Your immediate assistance will be appreciated.

Sincerely yours,

George W. Reeser
Assistant Professor
P.O. Box 1196
Cullowhee, North Carolina 28723

GWR:jsk
March 6, 1971

Mr. George W. Reeser
Assistant Professor
Western Carolina University
Cullowhee, North Carolina 28723

Dear Mr. Reeser:

Thank you for your letter of March 1, which you prepared in response to my request for certain specific information pertaining to your study. I have reviewed the material and I have discussed the study with members of my staff and they have agreed to work with you on your behalf. I am pleased to say that you have my approval to proceed as outlined.

Please contact us a few days prior to your anticipated date.

Sincerely,

[Signature]

Barkby, Principal
Canton Junior High School
Dr. Darius R. Young  
University of Alberta  
Edmonton, Canada  

Dear Dr. Young:

As a result of the literature search in preparation for my dissertation, I have reviewed a copy of your dissertation, entitled, "The Development of a Construction Industry Interest Inventory." In this I found the developed inventory that I would like to use in helping me to gather data for my dissertation. Since it has a copyright 1968, I am requesting permission to use this inventory. My dissertation has a tentative title of, "The Effectiveness of Multimedia Instruction In Changing or Effecting the Interest or Lack of Interest That Students Have About the Construction Industry." I would like to use the inventory as a before and after evaluation instrument.

In the instruction sheets you refer to booklets, by chance would you happen to have a copy of the booklet and answer sheet that I could review providing permission is granted by you for use of same? I would appreciate any other suggestions that you might have about the use of the inventory.

Thank you for your attention to this most urgent concern and request, I remain

Respectfully,

George W. Reeser  
Graduate Student

Donald G. Lux  
Major Advisor
7 October, 1970

Mr. George W. Reeser
5736 F Pinetree West
COLUMBUS, OHIO 43229
U.S.A.

Dear Mr. Reeser:

Your letter of 25 September, is at hand. I have no objection to you using the "Construction Industry Interest Inventory" for your stated purposes. I would like to point out the fact that this instrument was designed to assess student interests and may not be the most suitable devise to evaluate change or awareness between a pre and post period. However, I will leave this decision with you.

I do not have extra copies of the inventory booklets but I can explain procedures used. First the booklet mentioned in the instruction sheet pp. 192-193 are actually the final form inventory items pp. 206-211. These items were of course, derived and representative of the Production, Personnel, and Management taxonomies of IACP. If you combine pp. 192-193 and pp. 206-211 you will have the entire booklet as it was used in my study. I used the IBM answer sheets which are mark sensitive to lead pencil. These sheets can be coded and optically scored with punched IBM cards for each response sheet. As you probably know there is no right answer for each inventory item. Therefore, I merely use a preference index to indicate the student's responses.

If you need additional information please let me know and I will try to further explain questions you may have concerning this instrument.

Sincerely,

Darius R. Young, Ph.D.
Associate Professor

DRY/pmg
BIBLIOGRAPHY


Goode, Omar S. "Item Analysis," Columbus, Ohio: The Ohio State University Center for Human Resources Research, 1967. (Mimeographed).


National Conference on Research in Industrial Arts. The Center for Vocational and Technical Education, The Ohio State University, Leadership Series No. 20. 1900 Kenny Road, Columbus, Ohio. 1969.


Resumes of Exemplary Programs in the States, Third Annual Leadership Development Seminar for State Directors of Vocational Education. The Center for Research and Leadership in Vocational and Technical Education, The Ohio State University, Columbus, Ohio, September 16-18, 1970.


