DOCUMENT RESUME

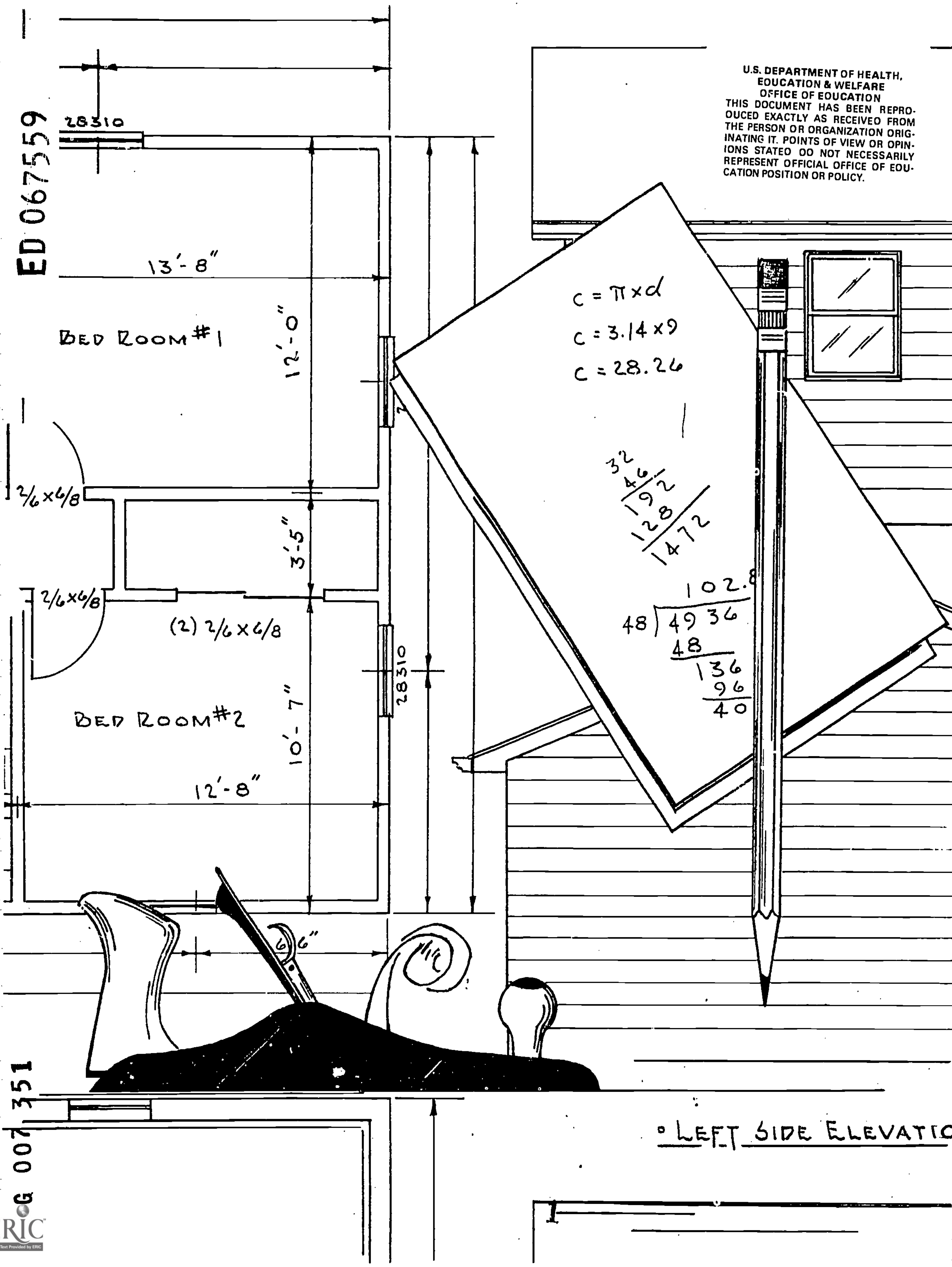
ED 067 559 CG 007 351

AUTHOR Barker, Harry; And Others
TITLE An Analysis and Assessment of the Effects of an Exploratory Orientation Program for Tenth Grade Vocational-Technical Pupils as Compared with a Traditional Approach.
INSTITUTION Alabama Univ., Huntsville.
PUB DATE 71
NOTE 35p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Career Choice; Career Education; Experimental Programs; *Occupational Choice; *Orientation; School Orientation; *Technical Education; *Vocational Education

ABSTRACT

This paper analyzes and assesses the effects of an exploratory orientation program for tenth grade vocational-technical pupils as compared with a traditional approach. The Hazelton Pennsylvania Vocational-Technical School has been placing a greater emphasis on students making more mature vocational-technical career decisions since its opening. A problem existed in developing an intensive orientation program of basic skills necessary for success in occupational choice. This was requested because of the significant percentage of students who were underachievers, lacking in basic subject matter skills. It was felt that all tenth grade pupils entering the school should experience success in this program prior to committing themselves to career choices. The purpose of this study was to investigate the possible cause-and-effect relationship of exposing all tenth-grade pupils (Experimental Group) to a treatment condition (Orientation Program) and compare the results to a control group of eleventh grade pupils. The research conducted to test the effectiveness of the experimental teaching program led to the conclusion that the experimental teaching program was significantly superior to the conventional teaching program.


2830
13'-8"
BED ROOM #1
12'-0"
2/6×6/8
3'-5"
2/6×6/8
(2) 2/6×6/8
2830
BED ROOM #2
10'-7"
12'-8"
6'6"
c = π×d
c = 3.14×9
c = 28.26
32
46
192
128
1472
102.8
48) 4936
48
136
96
40
LEFT SIDE ELEVATIC

An analysis and assessment of the effects of an exploratory orientation program for tenth grade Vocational-Technical pupils as compared with a traditional approach.

Submitted to:
Mr. Paul Wensko, Director
Hazleton Area Vocational-Technical School
Hazleton, Pa.

Mr. Manfred Marotta
Project Director

Prepared by:
Dr. Harry Barker, Univ. of Alabama
Dr. Raymond Bernabei, Bucks County, Pa.
Dr. Sam Leles, Univ. of Alabama

TABLE OF CONTENTS

INTRODUCTION

Since the opening of the Hazleton Vocational-Technical School, a greater emphasis has been placed on students making a more mature vocational-technical career decision. Each fall, for the past two years, the school has experienced a loss of student enrollment. These students have expressed uncertainty towards the vocational curriculum; hence, they return to their home school only to add three additional years of career uncertainty. Other students who do remain at the vocational-technical school express concern for the future and lack of previous exposure to the trade and industrial careers.

A significant percentage of students enrolled in the Vocational-Technical School are under-achievers not able to function at the tenth grade level. One can assume if a student lacks the basic subject matter skills, he probably will encounter difficulty for success in his occupational choice. Therefore, a problem existed in developing an intensive orientation program of basic skills necessary for success in selected occupational choice.

In the present school organization, a pupil determines his educational career goal at the end of the ninth year in school. Many who determine their goal relate it to an occupation in life situations. Failure to follow a selected occupation after high school graduation has caused great concern for the educator. Importance in exploring means to alleviate this problem cannot be denied.

In the traditional approach, one assumes that once a pupil has made his career occupational choice, that the basic cognitive skills in mathematics, tool identification and use, as well as being able to read, interpret, and apply schematics to practical situations have been mastered. Students have a tendency to select a curricular program which they think will insure them success. For those who have been "tuned-out" by the academic barriers, they continually turn to a more concrete exposure curriculum. This curriculum, in many cases, is a vocational-technical program. However, many unknowingly venture into an occupational unknown lacking the skills necessary for successful application to concrete experiences.

PURPOSE AND OBJECTIVE

Based on a subjective pupil needs assessment, it was deemed imperative to explore means of developing successful experiences, contacts with people in each trade, knowledge of tools, application of tools, and a workable association with math related to the desired trade. It was felt that each tenth grade pupil entering the Hazleton Area Vocational-Technical School should experience success in this program prior to committing himself in a career choice. Because of this, the purpose of this study was to investigate the possible cause-and-effect relationship by exposing all Grade Ten pupils (Experimental Group) to a treatment condition (Orientation Program) and compare the results to the present Grade Eleven pupils (Control Group) who did not receive the treatment as Grade Ten pupils.

The objective was to investigate the effects of the orientation program on the performance level of Grade 10 pupils enrolled in the Hazleton Area Vocational-Technical School.

REVIEW OF LITERATURE

Learning the skills of language arts, mathematics, and science in the abstract, without practical application, has continually limited pupil abilities to find meaning and relevance in school work. The present system which emphasizes abstract verbal and quantitative thinking continues to separate the academic from reality. This philosophy has alienated many whose strength lies in performing from the concrete to the abstract. Schools focusing basic subject matter content around career development begin to capitalize on interests and motivational desires of its pupils. Basic skills become useful tools in working toward a career goal. Activity-centered learning makes education more relevant when abstract skills are integrated and are made meaningful.

It becomes increasingly imperative that schools function for the purpose of preparing its youth with the option of immediate employment (a salable skills) and/or the option of furthering his education.

This requires a basic rethinking for a curriculum which offers every student the opportunity to develop a salable skill. This skill becomes more meaningful when the student learns to see the relationship to his career goal. Once this relationship is made applicable, it is assumed that the pupil stands a better chance for developing self-esteem, creative technical ability, and problem-solving methods in an environmental related to industry and business.

Through individual and group intensified experiences in working with tools, basic skills, and blueprint reading, students are able to acquire knowledge, skills, and appropriate attitudes leading to meaningful decisions relating to occupational career choices. Broad-based clusters of study in diversified areas provide the student with the awareness of industry and technology, thereby giving them better opportunity for career exploration.

PROBLEM STATEMENT

This study, conducted in the Hazleton Area Vocational-Technical School, Hazleton, Pennsylvania, was an attempt to assess the effects of an experimental exploratory orientation program for tenth grade vo-tech pupils as compared to the traditional approach. The research design provided that the experimental group, N-126, be instructed in the use of (a) tools, (b) mathematics, and (c) blue-print reading as an integral part of learning four days each week for twelve weeks. One day each week, the tenth grade pupils were permitted to explore their occupational choice.

The control group, N-134, was instructed in the use of (a) tools, (b) mathematics, and (c) blue-print reading in courses (first and only choice) apart from the assigned classes. All other aspects of instruction and of programming were alike for both groups.

HYPOTHESIS

The hypothesis tested was: The experimental (E) group would produce achievement superior to that achieved by the control (C) group as measured by, (1) the Standford Achievement Test, and (2) teacher made tests (TMT) in the areas of tools, mathematics, and blue-print reading.

PROCEDURES

Program Development

This program originated from repeated subjective observations by vocational teachers concerning sophomores entering their shops. These students appeared to lack knowledge concerning tools, math, and reading blue-print designs. It also has been assumed that the vocational school student spends nine years in school preparing for a college education. At the point of entry into the vocational school, the student has either decided he has no desire to go to college or he lacks the ability to go to college. Hence, if students could obtain a better background in hand tools, math and blue-print reading, success in a vocational curriculum would be more promising.

Students taking academic subjects at the home school attend the vocational school on a one-half schedule. The home high school offers academic subjects not related directly to the world of work. It was, therefore, decided to structure semi-academic classes in tools, math, and blue-print reading to help bridge the gap from the classroom to vocational shop. The structure, known as the orientation program, was based on the philosophy of the Hazleton Area Vocational-Technical School.

At the beginning of the program, students were grouped according to occupational clusters. The groups were listed under: (1) Construction Cluster; (2) Metal Cluster; and (3) Electrical Cluster. The clusters were determined by the similarity between occupational courses offered at the school.

A difficulty encountered in beginning the program was a lack of communication between the shop teachers concerning the intent of the orientation program. Once this was resolved, a plan for curriculum development and implementation was started.

During the summer and first semester of 1971, three teachers from the Area Vocational-Technical School developed curriculum for implementing the project plan. Using each occupational cluster as the focal point, each curriculum plan included statements of objectives, pupil activities, classroom schedules, materials, supplies, and evaluation. Each teacher was instructed to gear his objectives to more concrete experiences. In September, 1971, each of the three teachers was assigned to teach basic math, tools, and blueprint reading. Shops were utilized to demonstrate various procedures with concrete experiences from the world of work. Field trips to industries and post-high school institutions served as culminating activities. Students were scheduled in the orientation program four days a week. Every Monday, the Grade Ten pupils were assigned (in terms of self-pupil interest) to twelve days. Pupils were afforded an opportunity to explore more than one area of interest. In this way, a more realistic occupation was selected by each pupil based on self-interest exploring activities within the twelve weeks. In addition, all pupils were provided with the knowledge and understandings of basic skills (math), tools, and blueprint reading as related to each occupational cluster (See Appendix A, for Course Outline.)

Each teacher had an opportunity during the twelve week program to contribute to the team. The teacher team devised a system of identifying concepts related to inter-disciplines. Many times, students learn a skill in one discipline without the opportunity to observe or transfer this learning to practical situations. An illustration of program development is described in Appendix B.

Research Design

Data Instrumentation

An initial consideration in the experiment was to examine the level of academic aptitude for the control and experimental group combined. In the period from October, 1967, through November, 1970, subjects were administered the Otis Quick Scoring IQ Test and the GATB, Form B-1002.

The GATB is used in many schools and systems to assign students to various curricula. Guidance counselors use scores derived from the 9 factors comprising the GATB, to identify a student's aptitude relative to particular factors.

According to Buro's <u>6th Mental Measurement Yearbook</u>, scores derived from the intelligence (G) factor of the GATB are a function of numerical (N), verbal (V), and spatial (S) aptitudes. The researchers were interested in determining the relationship between subjects' IQ, as measured by the Otis IQ Test, and the intelligence score (G) derived from the GATB. Occupational norms with cut-off scores are used for the GATB to predict "job success." The researchers questioned the predictive value of the GATB for scholastic or curricular placement.

Using Otis IQ and GATB G scores, a Pearson r was calculated. Correlation of IQ with G score resulted in an r of 0.424, which was significant at $p < .01$.

TABLE 1

COMPARISON OF MEANS AND STANDARD DEVIATIONS FOR IQ (OTIS) AND G SCORES (GATB)

Measure	x	SD
IQ	100.80	9.49
G	89.04	10.28

Table 1 indicates that in terms of IQ, the combined E and C groups appear to be normal, whereas the mean for the G score was lower than normal. In view of these and previous considerations, the decision was made to use IQ rather than G scores to establish E and C groups composed of matched pairs.

Sample

The two groups (E and C) were made identical in IQ through the following procedure. First, subjects for whom data were missing for the SAT and/or TMT (teacher made tests) were discarded, leaving 82 E and 60 C subjects. Second, from the remaining 142 subjects, it was possible, on the basis of IQ, to exactly match 46 E and 46 C subjects. Third, these matched pairs were rank ordered in terms of IQ and assigned to three IQ levels; upper third, middle third and lower third.

Data Analysis

The preceding three steps produced a data structure which is amendable to the very sensitive and powerful Lindquist Type I analysis of variance design. The data structure based on N=46 matched pairs is shown in Table 2.

TABLE 2

MATCHED PAIRS (N-46) FOR LINDQUIST TYPE - I DESIGN

Levels	IQ Range of Scores	E Group	G Group
Upper Third	104-120	15	15
Middle Third	98-103	16	16
Lower Third	87-97	15	15
		46	46

The Lindquist Type - 1 design permits one to process data in terms of the following:

1. to determine the significance of differences as measured by dependent variables (derived from SAT and TMT scores) for different IQ levels,

2. to determine whether or not the differences between E and C groups are dependent on IQ levels, and

3. to determine if the E and C groups differ without regard to IQ level.

The principal advantage of this design is that it determines if there is a significant interaction between the IQ levels and the experimental treatment. If not, it evaluates the experimental treatment effects without regard to IQ level.

FINDINGS

All SAT comparisons showed significant differences between IQ levels for each of the four SAT measures. The pattern was consistent for all four SAT measures; the higher the IQ level, the higher the SAT score. Table 3 describes comparisons of means for each of the four SAT measures:

TABLE 3

COMPARISON OF MEANS FOR DIFFERENT IQ LEVELS
FOR EACH OF 4 SAT MEASURES

Paragraph Meaning

	C	E	
Hi	41.6	38.7	40.2
Mid	36.1	35.3	35.7
Lo	30.2	28.6	29.4
	36.0	34.2	

Arithmetic Comprehension

	C	E	
Hi	26.1	28.5	27.3
Mid	22.4	22.8	22.6
Lo	18.1	21.1	19.6
	22.2	23.4	

Arithmetic Concepts

	C	E	
Hi	23.9	23.5	23.7
Mid	20.8	19.8	20.3
Lo	16.4	17.9	17.2
	20.4	20.4	

Arithmetic Application

	C	E	
Hi	18.3	16.7	17.5
Mid	16.9	15.3	16.1
Lo	13.5	12.3	12.9
	16.2	14.8	

The pattern of higher IQ levels corresponding with higher SAT scores was not, however, unexpected. The SAT is a commercial instrument whose use is based on regional and national norms. It was not expected, therefore, to tap achievement in highly specific instructional settings composed of students not necessarily representative of populations found in establishing national norms.

The principal question related to the difference between E and C groups at different IQ levels and irrespective of IQ levels. Results were consistent in indicating no significant differences between E and C groups for any of the SAT measures.

In contrast, mean scores derived from Teacher Made Tests (TMT) showed overall significant differences in favor of the E over the C group, regardless of IQ level. Table 4 shows comparisons of means for each of the 3 TMT measures:

TABLE 4

COMPARISON OF MEANS FOR DIFFERENT IQ LEVELS FOR EACH OF 3 TEACHER-MADE-TESTS

	Tools			Math			Blue-Print Reading		
	C	E		C	E		C	E	
Hi	18.7	32.5	25.6	22.3	30.0	26.2	14.1	22.5	18.3
Mid	19.6	27.9	23.7	19.3	23.7	21.5	12.8	18.4	15.6
Lo	17.3	26.3	21.8	19.6	21.7	20.7	14.5	20.0	17.2
	18.6	28.8		20.4	25.1		13.8	20.3	

Differences between the E and C groups were significant at levels $< .01$ for all 3 TMT measures; tools, math, and blue-print reading. However, especially interesting was the difference for the measure on tools between E and C groups for the upper third IQ level. This difference was not only in favor of the E group, but was significantly greater than the differences found at middle third and lower third IQ levels for the tools test.

CONCLUSION

This research was conducted to test the effectiveness of an experimental teaching program. The findings clearly support two conclusions; first, the 4 measures of the SAT are not suited to uses in instructional settings based on non-conventional procedures, practices, and programs. This is especially the case if the SAT measures are used with sample groups not representative of populations used to establish regional and national norms. Furthermore, two SAT measures, paragraph meaning and arithmetic application, fail to differentiate conventional treatments from experimental treatments at any of the 3 IQ levels. Second, the experimental teaching program used for this research was significantly superior to the conventional teaching program.

RECOMMENDED FURTHER RESEARCH

The findings leave little doubt that the experimental orientation program used for this study should be replicated and continued. Another dimension recommended for study would be the change in attitudes of tenth grade area vocational-technical pupils have toward subject area and school. It would also seem important to assess the teachers attitudes toward pupils in the experimental program versus the traditional program.

Appendix A

MATHEMATICS

A. Common Fractions

1. Reduction
2. Addition
3. Subtraction
4. Multiplication
5. Division
6. Complex

B. Decimal Fractions

7. Reducing a Decimal Fraction to a Common Fraction
8. Reducing a Common Fraction to a Decimal
9. Addition
10. Subtraction
11. Multiplication
12. Division
13. Table of Decimal Equivalents

C. Percentage

14. Finding the Percentage, Given The Base & The Rate
15. Finding the Rate, Given The Percentage & The Base
16. Finding the Base, Given The Percentage & The Rate

D. Ratio & Proportion

17. Reduction of Ratio To Lowest Terms
18. Proportion
19. Averages

E. Rectangles & Triangles

20. Area of Surfaces
21. Units of Area
22. Perimeter of a Rectangle
23. Finding The Width & Length of a Rectangle
24. Squares
25. Square Roots
26. Finding Square Roots
27. Application of Square Roots
28. Triangles
29. Area of Isosceles Triangles
30. Angles In Triangles

F. Regular Polygons & Circles

MACHINE & AUTO GROUP

Handtool Outline

A. Measurement

1. Types Of Rules
2. Reading The Rule
3. Care Of The Rule
4. Types Of Micrometers
5. How To Read The Micrometer
6. How To Use The Micrometer
7. How To Read An Inside Micrometer
8. Care Of The Micrometer
9. Types Of Gauges
10. Calipers

B. Layout

11. Scribes
12. Dividers & Trammel
13. Surface Gauge
14. Squares, Types
15. Use Of Squares
16. Measuring Angles
17. Punches
18. Making A Layout

C. Striking Tool

19. Hammers, Types
20. Softface Hammers, Types

D. Chisels

21. Chisels, Types
22. Use of Chisels

E. Sawing Metals By Hand

23. Hacksaws & Blades
24. Use of Hacksaw

F. Drills & Drilling

25. Types Of Drills
26. Drill Sizes - How To Measure Drills
27. Parts Of A Drill
28. How To Hold Drill In A Drill Press

G. Hand Reaming

29. Types Of Reamer
30. Use Of Reamer

H. Hand Threading

31. Thread Size & Types
32. Taps, Types
33. Tap Holders
34. Cutting Internal Threads
35. Broken, Taps
36. Die & Die Stocks
37. Cutting External Threads

I. Pliers

38. Types & Uses

J. Clamping Devices

39. Vices, Types
40. Clamps

K. Wrenches

41. Types
42. Uses & Care Of

L. Screw Drivers

43. Types
44. Use & Care Of

M. Files

45. Classification & Kinds
46. Use & Care Of Files

N. Sheet Metal Cutting

47. Types Of Shears
48. Use & Care Of Shears

O. Fastners

49. Types

P. Abrasives

50. Types, Sizes, & Uses

CONSTRUCTION GROUP - OUTLINE HANDTOOLS

Lessons

A. Measurement

1. Types of Rules & Care Of
2. Reading The Rule
3. Types of Gauges
4. Calipers

B. Layout

5. Scribes, Dividers, & Trammel
6. Squares, Types & Uses (A,B)
7. T-Bevel, Testing Angles
8. Levels - Straight Edge
9. Plumb Bob - Chalk Line
10. Punches
11. Making A Layout

C. Striking Tools

12. Hammers, Types (A,B)
13. Soft Face Hammer
14. Hatchets & Axes

D. Chisels

15. Types (Wood)
16. Types (Metal & Masonry)
17. Use of Chisels (A,B)

E. Planes

18. Types & Uses
19. Parts Of
20. Sharpening

F. Saws

21. Hacksaws & Blades
22. Hand Saws, Kind & Use
23. Use of Hacksaw
24. Use of Handsaw

G. Drilling & Boring

25. Types Of Drills
26. Drill Sizes
27. Parts Of A Drill
28. Bit Brace

29. Wood Bits
30. Boring With a Brace & Bit
31. Hand Drill & Use

H. Hand Threading

32. Taps, Types
33. Cutting Internal
34. Die & Die Stocks
35. Cutting External Threads

I. Pliers

36. Types & Uses

J. Clamping Devices

37. Vises, Types
38. Clamps

K. Wrenches

39. Types
40. Uses & Care Of

L. Screw Drivers

41. Types
42. Uses & Care Of

M. Files

43. Classification & Kinds
44. Use & Care Of

N. Sheet Metal Cutting

45. Type of Shears
46. Use & Care Of Shears

O. Masonry Tools

47. Trowels & Floats
48. Use & Care Of Trowels & Floats

P. Fastners

49. Types & Uses

Q. Abrasives

50. Types & Uses

ELECTRONIC-ELECTRICAL

Group - Hand Tools Outline

A. Measurement

1. Types of Rules & Care Of
2. Reading A Rule
3. Wire Gauges & Use

B. Layout

4. Scribes, Dividers
5. Squares
6. Punches

C. Striking Tools

7. Hammers, Types
8. Soft Face Hammers, Types

D. Chisels

9. Chisels, Types
10. Use Of Chisels
11. Metal Hole Punches
12. Use of Metal Hole Punches

E. Sawing Metal By Hand

13. Hacksaws & Blades
14. Use of Hacksaw

F. Drills & Drilling

15. Types Of Drills
16. Drill Sizes
17. Chucking A Drill
18. Hand Drills
19. How To Drill

G. Hand Reaming

20. Types Of Reamers
21. Use Of Reamers

H. Hand Threading

22. Taps & Dies
23. Cutting Internal Threads
24. Cutting External Threads
25. Removing Broken Taps

I. Pliers

26. Types Of Pliers
27. Uses Of Pliers

J. Clamping Devices

28. Vises, Clamps

K. Wrenches

29. Types
30. Uses & Care Of

L. Screw Drivers

31. Types
32. Uses & Care Of

M. Files

33. Classification & Kinds
34. Uses & Care Of

N. Sheet Metal Cutting

35. Types of Shears
36. Use & Care Of Shears

O. Fastners

37. Types
38. Uses Of

P. Abrasives

39. Types
40. Uses Of

Blue Print Reading (Machine & Metals)

(Electrical & Electronics)

1. The Working Drawing
2. Detailed Drawings
3. Three View Projections
4. Visible Outlines & Demensions
5. Visable Edges & Location of Demension
6. Invisible Edges
7. Measurement of Angles
8. Scale Drawings
9. Fillets & Rounds
10. Projection of Cylindrical Work
11. Demensioning of Cylindrical Work
12. Invisible Circles
13. Decimal Demensions & Tolerances
14. Drilled Holes
15. Angular Demension & Tolerances
16. One View Projection
17. Necking & Grooving
18. Taper & Finish Marks
19. Fall Section
20. Materials in Section
21. Half Section
22. Sections of Aluminum & Brass
23. Countersunk & Counterbored Holes
24. Chamfering

25. Conventional Representation

26. Simplified Representation

27. Class of Fit

28. Types of Bolt Hands

29. Tapped Holes

30. Fine & Coarse Thread Series

31. American Standard Thread Series

32. Bevels

33. Drilled Holes for Tapping

34. Specifications

35. Change Notes

Blue Print Reading (Construction Group)

A. Basic Blue Print Reading

1. The Working Drawing
2. Placement of Views
3. Demensioning a Working Drawing
4. Invisible Edges
5. Circles and Arcs
6. Views in Section

B. Trade Sketching

7. Tools for Sketching
8. Sketching Straight Lines
9. Sketching Circles, Arcs, Irregular Shapes
10. Making A Working Sketch
11. Isometric Sketching
12. Demension an Isometric Sketch
13. Sketching Circles and Arcs in Isometric
14. Sketching an Irregular Shape in Isometric
15. Obligue Projection

C. Reading Construction Blue Prints

16. Structual Members of a Frame Structure
17. Roof Framing Members
18. Frame Buildings
19. Doors, Windows, and Exterior Walls
20. Framing Plans and Elevations
21. Rough Opening, Roofs and Roof Framing
22. Plans Elevations and Sections
23. Details and Sections

Appendix B

Topic: Blueprint Reading

Concept: Measurement

Behavior: Using a ruler, compass, protractor and a sketch of a teacher-made object, the 10th grade pupil is able to reconstruct a sketch of the object on graph paper.

Topic: Tool Use

Concept: Measurement

Behavior: Using a combination square, dividers, center punch, scribe, ball-pin hammer, etc., the 10th grade pupil is able to take the drawing specifications and construct a layout design of the object on masonite.

Topic: Basic Math Skills

Concept: Measurement

Behavior: Using the sketch, lay-out design, and the produced model, the 10th grade pupil is able to convert decimals to fractions, compute areas, calculate measures, equivalent weights, and calculate costs related to the object produced.

LESSON TITLE: Measuring (Combination Square--Micrometer and Gauges)

COURSE : Basic Handtools

OBJECTIVES : At the completion of this unit, you will be able to describe the tools used in measuring depth of holes, inside and outside diameters of stock, and tools used to measure flat stock.

TIME ALLOWED: 240 minutes

EQUIPMENT & AIDS :

1. Micrometers
2. Combination square
3. Depth; hole, screwpitch, and wire gauges
4. Vernier caliper

REFERENCES : Basic Handtools Navpers 10085-A, pg. 95-99

INTRODUCTION: Give brief explanation of properly obtaining measurements using tools in this lesson.

PRESENTATION:

1. Measuring the depth of a slot with a combination square.
2. Measuring the depth of a slot with a depth gauge.
3. Measuring the diameter of a hole with a small hole gauge.
4. Measuring the diameter of a hole with a telescoping gauge.
5. Measuring the diameter of a hole with an inside micrometer caliper.
6. Measuring the distance between outside surfaces with a vernier caliper.
7. Measuring the distance between inside surfaces with a vernier caliper.
8. Measuring a flat surface with a micrometer caliper.
9. Measuring round stock with a micrometer.
10. Correct micrometer zero setting.
11. Measuring the pitch of a thread.

12. Measuring the gauge of sheet metal

13. Importance of accurate measurements

SUMMARY: Summarize by having students describe measuring tools and methods of measuring taught in this lesson.

LESSON TITLE : Wrenches

COURSE : Basic Handtools

OBJECTIVES : Upon completion of this lesson, you will be able to describe types and uses of the wrench.

TIME ALLOWED : 180 minutes

EQUIPMENT & AIDS :
1. Various types of tools covered in the lesson.
2. Overhead projector.
3. Blackboard

REFERENCES : Basic Handtools Navpers 10085-A, pg. 4-9
Stanley Tool Catalog #60
Snapon Tool Catalog

INTRODUCTION : Give general description of wrench construction and uses.

PRESENTATION :
A. Open End Wrenches
B. Box End Wrenches
C. Socket Wrenches
D. Torque Wrenches
E. Adjustable Wrenches
F. Spanner Wrenches
G. Hex Allen Wrenches
H. Pipe Wrenches
I. Rules for Wrenches

SUMMARY : Summarize with students providing the following information:
1. Why chromevandium steel wrenches are the best?
2. How size of any wrench used on nut or bolt heads is determined?
3. Purpose of tappet wrench.

4. The disadvantage of the box wrench.

5. Why actual practice is most important in using a wrench.

6. Purpose of a "slugging" wrench.

LESSON TITLE : Metal Cutting (Chisels)

COURSE : Basic Handtools

OBJECTIVES : You will know how to identify and use various types of chisels.

TIME ALLOWED : 60 minutes

EQUIPMENT & AIDS :
1. Various types of chisels
2. Transparencies and Projector
3. Blackboard

REFERENCES : Basic Handbook Navpers 10085-A; pps. 155-158
Shop Tool, John Deere pg. 12-13
Stanley Tool Catalog #60

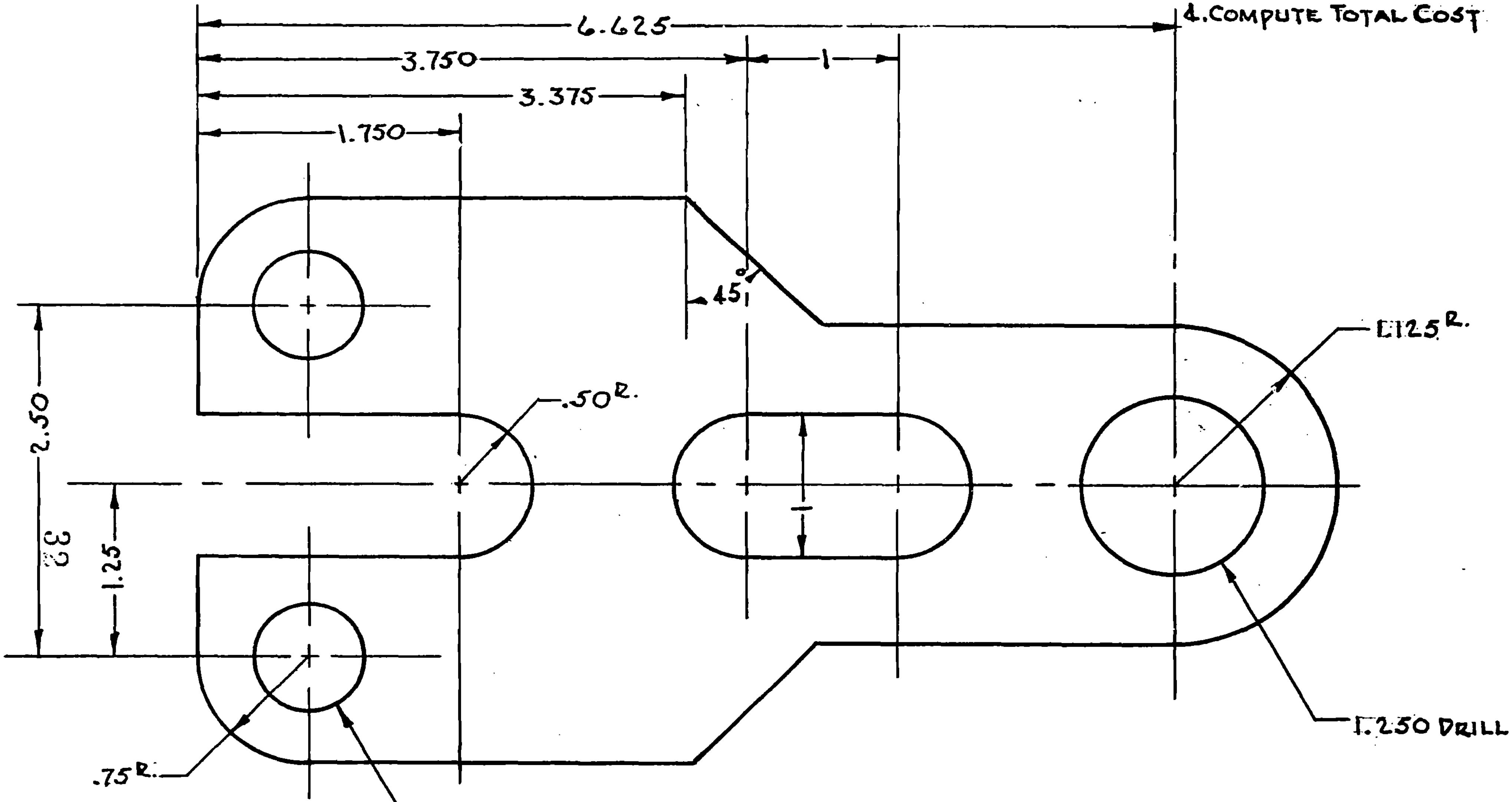
INTRODUCTION : Give brief general description of Chisels

PRESENTATION :
A. Types and Uses of:
   1. Cold Chisel
   2. Cape Chisel
   3. Round Nose Chisel
   4. Diamond Point Chisel
B. Proper Care of Chisel

SUMMARY : Summarize by having students provide the following information:
1. How are chisels classified according to the shape of their points?
2. Match the chisel with the proper size hammer.
3. Describe the types of work that can be done with cold chisels.

STEEL WEIGHT PER CU. IN. .284 = 3.41 LBS. 3/8 STEEL PLATE
ALUMINUM " " " " .092 = 1.104 "
BRASS " " " " .296 = 3.552

1. COMPUTE TOTAL LENGTH
2. COMPUTE TOTAL WIDTH
3. COMPUTE TOTAL VOLUME
4. COMPUTE TOTAL COST



LAYOUT 1/2 HR @ 6.50
DRILL 10 MIN. @ 1.75
CUT 10 MIN. @ 2.25

KLUGE

BASIC MATH TEST IV

Do the following examples. All answers are to be in decimal fractions. Round off all answers to three decimal places.

ADD

1. 0.513 + 1/8	2. 3/4 + 1.007	3. 1.06 + 0.391
4. 6 1/2 + 0.762	5. .83 + 4.205	6. 1.07 + 3.6121
7. .0006 + 7	8. 3.217 + 15.3928	

SUBTRACT

9. 1 5/16 - 0.3125	10. 0.362 - 1/8	11. 1.71 - 0.007
12. 8.62 - 1.317	13. 15.73 - 9.635	14. 8.6 - 0.082
15. 97 - 9.708	16. 0.438 - 0.099	

MULTIPLY

17. 6.2 x 1/16	18. 1 1/2 x 0.079	19. 0.03 x 0.07
20. 8.6 x 0.43	21. 1 2/3 x 6.21	22. 1.27 x 6.33
23. 4.81 x 0.0162	24. 0.625 x 1/16	

DIVIDE

25. 1 ÷ 16	26. 3.2 ÷ 1/8	27. 0.01 + .7
28. 8.6 ÷ 3.21	29. 1.2 ÷ 0.63	30. 10 + 1.63

MULTIPLY THE FOLLOWING FRACTIONS:

1. 1/3 x 5 2. 1/2 x 6 3. 3/4 x 8 4. 5/8 x 16

5. 1/2 x 2/3 6. 2/5 x 10/11 7. 3/4 x 5/16 8. 3/8 x 16/17

9. 1 1/2 x 3 10. 1 2/3 x 1 1/2 11. 2 1/2 x 1 1/4 12. 1/2 x 3 1/4 x 4

DIVIDE THE FOLLOWING FRACTIONS:

1. 18/25 ÷ 3 2. 12/9 ÷ 4 3. 7/8 ÷ 5 4. 3/4 ÷ 7

5. 9/16 ÷ 3/8 6. 3/4 ÷ 7 7. 9/16 ÷ 3/8 8. 11/12 ÷ 5/7

9. 7 ÷ 1/2 10. 4 1/2 ÷ 1/4 11. 3 3/4 ÷ 1/5 12. 8 ÷ 2/3

ADD THE FOLLOWING FRACTIONS

1. 1/2 + 3/4	2. 1/3 + 1/2	3. 2/3 + 3/4	4. 1/5 + 3/10
5. 2/3 + 5/8	6. 5/6 + 3/4	7. 7/8 + 7/16	8. 5/16 + 5/32
9. 3/4 + 7/8	10. 3/32 + 15/16	11. 15/16 + 31/32	

SUBTRACT THE FOLLOWING FRACTIONS

1. 9/16 − 5/16	2. 7/8 − 3/8	3. 3/4 − 1/2	4. 29/32 − 5/8
5. 1/2 − 1/3	6. 4/5 − 3/4	7. 7/8 − 5/16	8. 13/15 − 9/20
9. 14/15 − 7/12	10. 5/12 − 5/18	11. 7/8 − 3/10	12. 1/12 − 1/144