THE INFLUENCE OF INDUSTRIAL ARTS EXPERIENCE ON

THE VOCATIONAL KNOWLEDGE OF STUDENTS IN THE

AREA-VOCATIONAL SCHOOLS IN OKLAHOMA

By

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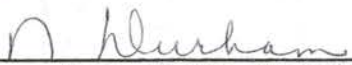
AREA-VOCATIONAL SCHOOLS IN OKLAHOMA

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

PURPOSE AND DESIGN OF THE STUDY

Introduction to the Problem

In the past, educators have differed in their opinions of the purposes of industrial arts education at the secondary level. Some believe that it is a means of exploring various phases of industry to help students decide what kind of high school education, post high school education, or work they may wish to pursue. Some educators profess that industrial arts can be general education, occupational orientation, or prevocational education. Industrial arts as prevocational education is the major topic for discussion and the focal point for this statistical study. The review of the literature contains information from research studies either confirming or rejecting the prevocational effectiveness of industrial arts education.

Lowell A. Burkett, an official of the American Vocational Association in 1965, expressed the association's views on the purposes of industrial arts education in relation to vocational education.[1] He stated that the closest relationship between industrial arts and vocational education is its capacity to help students make a vocational choice. He encouraged all students to take a course in industrial arts

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[1]Kenneth Dawson and Lowell Burkett, "A Conversation on Industrial Arts and Vocational Education," NEA Journal (November, 1965), pp. 25-28.

prior to making a decision concerning which trade and industrial course

they were going to take. In fact, when the article just mentioned was

written, Illinois, the state concerned in the discussion, insisted that

industrial arts programs should support the trade and industrial educa-

tion programs.

Steeb, consultant for Industrial Arts, Florida State Department of

Education made the following statements concerning how occupational

education is related to industrial arts:

1. Industrial arts and vocational-occupation education
   are related and offered courses whose sequences are
   characterized by continuity, branching and, at times,
   parallel programs.

2. Industrial arts and occupational courses must be
   organized on the basic, unique and identified program
   objectives of each.

3. Industrial arts courses should not assume the aspect of
   occupational training. Occupational courses should not
   assume the broad general objectives of industrial arts.

4. Occupational education below grade ten should be limited
   to pupils with special academic and economic handicaps
   identified with the potential dropout.[2]

As a result of the lack of a definite direction, many teachers of

industrial arts may have difficulty in deciding whether or not they

should orient their teaching efforts toward prevocational goals. They

may ask:

Can I teach some important concepts through my subject that
will make a substantial contribution to the future occupa-
tional preparation or adjustment of my students, yet let me
continue to teach my brand of industrial arts?[3]

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[2]Ralph Steeb, "To Define A Position," Journal of Industrial Arts
Education (November-December, 1968), p. 11.

[3]Howard F. Nelson, "Which Way Industrial Arts in the 70's?"
School Shop (December, 1970), pp. 35-36.

The question could be answered by countering with several questions.

Should a teacher advocate that industrial arts continue to be only

general education when nine-tenths of the students in industrial arts

will enter the world of work or a vocational-technical program after

leaving the industrial arts class?[4] Should a teacher continue to orient

the industrial arts program toward something other than prevocational

training if he knew that 87 percent of all jobs in the nation do not

require college degrees and that vocational-technical training given in

secondary or post-secondary schools can help qualify graduating students

for such jobs?[5]

Nelson, Professor of Vocational-Technical Education, University of

Minnesota, said:

> If you believe that a sizable segment of your students will
> go on to post-secondary vocational and technical institutes,
> then you must relate your instruction to the content of
> institute courses so that one course will flow directly into
> the next; when you do, you negotiate advanced standing for
> them at the next school. This is one of the most important
> contributions which you can make to the futures of the grad-
> uates from your school. . . And for this graduating group,
> I don't believe you dare disclaim responsibility for pro-
> viding some form of occupational education or prevocational
> instruction.[6]

Other authors in the field of industrial arts education imply that

industrial arts should claim responsibility for prevocational instruc-

tion. William T. Kelley is of the opinion that an efficient and

effective vocational education program that meets the needs of youth is

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[4]Ibid., p. 36.

[5]Ibid.

[6]Ibid.

difficult to build without an effective industrial arts program.[7]

Similarly, Larson, Professor of Vocational Education, Colorado State

University, is of the opinion that if vocational education is to meet

its goals it must be supported by more effective industrial arts pro-

grams.[8] Pautler asks what could be a better foundation for vocational

education other than an industrial arts program that has a study of

industry and the materials, tools, and processes associated with it.[9]

Kabakjian, Executive Secretary of the American Industrial Arts

Association, maintains that industrial arts can help alleviate the

problems of manpower shortage.[10] He said that industrial arts is to

prepare people for life and the world of work. It also provides real-

istic experiences with tools, materials, processes, and concepts of

industry that contribute to the acquisition of knowledge, mental skills,

manipulative skills and attitudes. He also recommends increasing the

number of contact hours spent in industrial arts oriented activities to

broaden the learners' educational experiences and to better prepare them

to make vocational choices.

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[7]William T. Kelley, "The Relationship Between Industrial Arts and
Trade and Industrial Education at the Secondary Level," Where The Action
Is, Washington, D.C.: American Industrial Arts Association (1969),
pp. 197-198.

[8]Milton E. Larson, "Supportive Role of Industrial Arts in the
Total Program of Occupational Education," Where The Action Is,
Washington, D.C.: American Industrial Arts Association (1969), p. 199.

[9]Albert J. Pautler, "Conceptual Framework for Industrial Arts and
Vocational Education," Industrial Arts and Vocational Education
(November, 1967), pp. 70, 72-73.

[10]Edward Kabakjian, "A Role to Play in Manpower Development,"
Journal of Industrial Arts Education (March, 1970), pp. 36-39.

There are instances where educators advocate the correlation of trade and industrial education courses with industrial arts. An example of correlation of this nature is provided by R. J. Williams, Director of Vocational and Industrial Education, Warren, Ohio.[11] Two industrial arts courses are required for all seventh and eighth grade boys. During the ninth grade, each student studies three subjects for a period of twelve weeks per subject. In the tenth grade the students may enroll in the prevocational program where they rotate through all of the shops in the school. All of these courses are taught by the vocational instructor. Prior to enrolling in the trade and industrial education program the student must have had a satisfactory rating in the courses preparing him for the vocational area selected.

Billings, State Coordinator of Vocational-Technical-Industrial Education in New York, supports Williams by claiming "It has been found the most effective programs of vocational and practical arts instruction are based on a good correlation between the two curriculums."[12]

There are educators who, while not verbally discounting the pre-vocational value of industrial arts education, maintain that industrial arts has more important educational functions. A study by Backus found that the objective of obtaining shop skills and knowledges was less favored by school superintendents than by industrial arts teachers and

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[11]R. J. Williams, "T & I Correlated With Industrial Arts," American Vocational Journal (September, 1968), pp. 37-40.

[12]Don Billings, "Don't Confuse Them; Correlate Them; Practical Arts and Vocational Education," American Vocational Journal (September, 1968), pp. 26-28.

coordinators.[13] As the size of the school district increased, superin-

tendents became less favorable toward the previously stated objective.

Pratzner supports the beliefs of the superintendents in Backus' study,

by advocating that shop skills and knowledges should be a function of

the high school and post high school vocational-technical programs.[14]

Similarly, Mason found that senior high school principals and counselors

perceived industrial arts as a part of general education and not voca-

tional in purpose.[15] Super[16] and DiPaul[17] share similar convictions

relative to the purpose of industrial arts in the secondary curriculum.

Super maintains that ninth grade students are in an exploratory stage

rather than a decision making stage relative to vocational pursuits.

He pursues this point by advocating a school curriculum which facil-

itates exploration and does not pursue occupational preparation in any

form. DiPaul advocates industrial arts as a means of student self dis-

covery or identification of vocational potential; not to develop

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[13]Kelly D. Backus, "A Study of Perceived Objectives of Industrial
Arts Among Superintendents, Industrial Arts Coordinators and Industrial
Arts Teachers of Six Public School Districts of Texas" (unpub. Ed. D.
dissertation, Colorado State College, 1968).

[14]Frank C. Pratzner, "Chaining the Goals of Industrial Arts to an
Occupational Development Curriculum," Journal of Industrial Arts
Teacher Education, VI (Winter, 1969), pp. 31-40.

[15]William H. Mason, "Attitudes of Indiana High School Principals
and Counselors Toward Industrial Arts" (unpub. Ed. D. dissertation,
University of Missouri, 1970).

[16]D. E. Super, "The Critical Ninth Grade: Vocational Choice or
Vocational Exploration," Personnel and Guidance Journal, XXXIX
(September, 1960-May, 1961), pp. 106-109.

[17]H. B. DiPaul, "What's Wrong With Industrial Arts Education?"
Pennsylvania School Journal, CXIX (November, 1970), pp. 146-147.

vocational skills. Both, in summary, are saying that the centarl objective of industrial arts education should be vocational guidance rather than vocational preparation.

Seckendorf,[18] Swanson, Wright, and Halfin[19] support the thesis that industrial arts should be a study of American industry, making a student aware of changing technology and how this influences the ways that people earn their livings. Also, students should be taught, through industrial arts courses, the role of technology in facilitating the production of goods and services. Seckendorf further defines his position by saying:

> If industrial arts is to be a curriculum area without entanglements with other subject areas, particularly the vocational-industrial-technical area, the present organizational pattern firmly footed in materials, must be replaced.[20]

Statement of the Problem

No conclusive evidence has been established by research that industrial arts experiences are or are not a contributing factor to future achievement in secondary vocational subjects. Various studies have attempted to ascertain the influence of varying levels of secondary industrial arts experience on academic success in post high school trade

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[18]R. S. Seckendorf, "Where Should We Be Going in Industrial Arts?" National Association of Secondary School Principals Bulletin (November, 1969), pp. 98-107.

[19]Robert Swanson, T. S. Wright, and Harold Halfin, "Occupational Education: A Means of Focusing Industrial Arts," Theory Into Practice, IX, No. 5 (December, 1970), pp. 290-299.

[20]Seckendorf.

and technical schools. Other studies have looked at the relationship between secondary industrial arts education and academic success in general education, industrial arts teacher education, engineering, and engineering drawing and technical drawing. Studies have also been done to see if high school industrial arts courses influenced information achievement in other secondary industrial arts courses. The subjects in the studies were either in college or had been out of school for various periods of time and then entered some form of post high school education. This study is designed to study the influence of industrial arts experience on the vocational knowledge of students in area vocational schools without a time lapse between the industrial arts education and attempted vocational education.

Since the beginning of area vocational schools in Oklahoma, a uniformly accepted role of secondary industrial arts relative to vocational subjects offered in the area vocational schools has not been defined. Assuming that the primary role of industrial arts is general education and a secondary role is a prevocational education function, it should be known whether or not secondary industrial arts, as it exists in Oklahoma, is effective as a prevocational experience. If industrial arts is effective as prevocational experience, which factors associated with it appear to contribute to its prevocational effectiveness, and how can these factors be emphasized to further enhance the prevocational effectiveness? If it is ineffective as prevocational experience, perhaps industrial arts educators should abandon prevocational experience as a role of industrial arts or attempt to assimilate curriculum material that will provide effective prevocational experiences concurrent with fulfilling its general education objective.

Purpose of the Study

The primary purpose of this study was to ascertain the influence of various types and numbers of semesters of secondary industrial arts experience on the vocational knowledge of entering juniors and continuing enrolled in automechanics, carpentry, and machine shop in fourteen area vocational schools that were operational in Oklahoma as of May 1971.

The second purpose of the study was to:

1. Examine and describe the linear relationships between group mean scores on the trade proficiency test and the number of semesters of industrial arts.

2. Examine and describe the linear relationships between industrial arts grade point average and the number of semesters of industrial arts.

3. Ascertain the degree of correlation between industrial arts grade point averages and scores on the trade proficiency test.

An additional purpose of this study was to compare group mean scores on the trade proficiency test of juniors and seniors with various numbers of semesters and types of industrial arts to reveal the difference, if any, between the vocational knowledge of juniors and seniors as indicated by group mean scores on the trade proficiency test.

The major questions this study attempted to answer were:

1. Did increasing semesters of related industrial arts experience increase significantly a difference between the vocational knowledge of entering juniors or continuing seniors in the area vocational schools? If so,

what amount of related industrial arts experience con-
tributed most significantly to that difference?

2. Did an accumulation of unrelated industrial arts experi-
ence contribute significantly to a difference between the
vocational knowledge of entering juniors or continuing
seniors in the area vocational schools? If so, what
amount of unrelated industrial arts experience contributed
most significantly to that difference.

3. Did an accumulation of related plus unrelated industrial
arts experience contribute significantly to a difference
between the vocational knowledge of entering juniors or
continuing seniors in the area vocational schools? If so,
what amount of related plus unrelated industrial arts
experience contributed most significantly to that difference?

4. Did the assumed advantage of previous industrial arts
experience diminish after the first year of vocational
education?

5. Did groups with higher mean industrial arts grade point
averages score higher or lower on the trade proficiency
test?

6. Did mean industrial arts grade point average for the groups
become higher or lower as the amount of industrial arts
increased?

7. What was the correlation between scores on the trade pro-
ficiency test and industrial arts grade point averages?

Statement of Hypotheses

The general research hypothesis of the investigation is that
related industrial arts experience, an accumulation of unrelated indus-
trial arts experience, or an accumulation of related plus unrelated
industrial arts experience will contribute significantly to a difference
between the vocational knowledge of entering juniors and continuing
seniors in the area vocational schools. Factors contributing to the
significant influence of previous industrial arts experience will be
more semesters of industrial arts and higher grade point averages in the
previous industrial arts courses.

Hypotheses Relative to Automechanics Juniors

The following null hypotheses were used to statistically test the
significance of influence that related, unrelated, and related plus
unrelated industrial arts experiences make toward the difference in
vocational knowledge of entering automechanics juniors.

There will be no significant difference between the vocational
knowledge of entering automechanics juniors with no industrial arts and
entering automechanics juniors with:

HO_1: related industrial arts.

HO_2: unrelated industrial arts.

HO_3: related plus unrelated industrial arts.

The following null hypotheses were used to test for linear rela-
tionships between group mean scores on the trade proficiency test and
number of semesters of each type of industrial arts.

There will be no positive linear relationship between the group
mean scores on the trade proficiency test and number of semesters of

industrial arts of entering automechanics juniors with:

HO$_4$: related industrial arts.

HO$_5$: unrelated industrial arts.

HO$_6$: related plus unrelated industrial arts.

There will be no positive linear relationship between the industrial arts grade point averages and number of semesters of industrial arts of entering automechanics juniors with:

HO$_7$: related industrial arts.

HO$_8$: unrelated industrial arts.

HO$_9$: related plus unrelated industrial arts.

The following null hypotheses were used to test for significant positive correlations between scores on the trade proficiency test and industrial arts grade point averages.

There will be no significant positive correlation between the scores on the trade proficiency test and industrial arts grade point averages within each group of entering automechanics juniors with:

HO$_{10}$: related industrial arts.

HO$_{11}$: unrelated industrial arts.

HO$_{12}$: related plus unrelated industrial arts.

Hypotheses Relative to Automechanics Seniors

The following null hypotheses were used to statistically test for the significance of influence that related, unrelated, and related plus unrelated industrial arts experiences make toward the difference in vocational knowledge of continuing automechanics seniors.

There will be no significant difference between the vocational knowledge of continuing automechanics seniors with no industrial arts

and continuing automechanics seniors with:

HO$_{13}$:   related industrial arts.

HO$_{14}$:   unrelated industrial arts.

HO$_{15}$:   related plus unrelated industrial arts.

The following null hypotheses were used to test for linear relationships between the group mean scores on the trade proficiency test and number of semesters of each type of industrial arts.

There will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of industrial arts of continuing automechanics seniors with:

HO$_{16}$:   related industrial arts.

HO$_{17}$:   unrelated industrial arts.

HO$_{18}$:   related plus unrelated industrial arts.

There will be no positive linear relationships between the industrial arts grade point averages and number of semesters of industrial arts of continuing automechanics seniors with:

HO$_{19}$:   related industrial arts.

HO$_{20}$:   unrelated industrial arts.

HO$_{21}$:   related plus unrelated industrial arts.

The following null hypotheses were used to test for significant positive correlations between scores on the trade proficiency test and industrial arts grade point averages.

There will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing automechanics seniors with:

HO$_{22}$:   related industrial arts.

HO_{23}: unrelated industrial arts.

HO_{24}: related plus unrelated industrial arts.

Hypotheses Relative to Carpentry Juniors

The following null hypotheses were used to statistically test the significance of influence that related, unrelated, and related plus unrelated industrial arts experiences make toward the difference in vocational knowledge of entering carpentry juniors.

There will be no significant difference between the vocational knowledge of entering carpentry juniors with no industrial arts and entering carpentry juniors with:

HO_{25}: related industrial arts.

HO_{26}: unrelated industrial arts.

HO_{27}: related plus unrelated industrial arts.

The following null hypotheses were used to test for linear relationships between group mean scores on the trade proficiency test and number of semesters of each type of industrial arts.

There will be no positive linear relationship between the group mean scores on the trade proficiency test and number of semesters of industrial arts of entering carpentry juniors with:

HO_{28}: related industrial arts.

HO_{29}: unrelated industrial arts.

HO_{30}: related plus unrelated industrial arts.

There will be no positive linear relationship between the industrial arts grade point averages and number of semesters of industrial arts of entering carpentry juniors with:

HO_{31}: related industrial arts.

HO_{32}: unrelated industrial arts.

HO_{33}: related plus unrelated industrial arts.

The following null hypotheses were used to test for significant positive correlations between scores on the trade proficiency test and industrial arts grade point averages.

There will be no significant positive correlation between the scores on the trade proficiency test and industrial arts grade point averages within each group of entering carpentry juniors with:

HO_{34}: related industrial arts.

HO_{35}: unrelated industrial arts.

HO_{36}: related plus unrelated industrial arts.

Hypotheses Relative to Carpentry Seniors

The following null hypotheses were used to statistically test the significance of influence that related, unrelated, and related plus unrelated industrial arts experiences make toward the difference in vocational knowledge of continuing carpentry seniors.

There will be no significant difference between the vocational knowledge of continuing carpentry seniors with no industrial arts and continuing seniors with:

HO_{37}: related industrial arts.

HO_{38}: unrelated industrial arts.

HO_{39}: related plus unrelated industrial arts.

The following null hypotheses were used to test for linear relationships between group mean scores on the trade proficiency test and number of semesters of each type of industrial arts.

There will be no positive linear relationships between the group

mean scores on the trade proficiency test and number of semesters of

industrial arts of continuing carpentry seniors with:

HO_{40}: related industrial arts.

HO_{41}: unrelated industrial arts.

HO_{42}: related plus unrelated industrial arts.

There will be no positive linear relationships between the indus-

trial arts grade point averages and number of semesters of industrial

arts of continuing carpentry seniors with:

HO_{43}: related industrial arts.

HO_{44}: unrelated industrial arts.

HO_{45}: related plus unrelated industrial arts.

The following null hypotheses were used to test for significant

positive correlations between scores on the trade proficiency test and

industrial arts grade point averages.

There will be no significant positive correlation between the

scores on the trade proficiency test and industrial arts grade point

averages within each group of continuing carpentry seniors with:

HO_{46}: related industrial arts.

HO_{47}: unrelated industrial arts.

HO_{48}: related plus unrelated industrial arts.

Hypotheses Relative to Machine Shop Juniors

The following null hypotheses were used to statistically test the

significance of influence that related, unrelated, and related plus

unrelated industrial arts experiences make toward the difference in

vocational knowledge of entering machine shop juniors.

There will be no significant difference between the vocational

knowledge of entering machine shop juniors with no industrial arts and

entering machine shop juniors with:

HO_{49}: related industrial arts.

HO_{50}: unrelated industrial arts.

HO_{51}: related plus unrelated industrial arts.

The following null hypotheses were used to test for linear rela-

tionships between group mean scores on the trade proficiency test and

number of semesters of each type of industrial arts.

There will be no positive linear relationships between the group

mean scores on the trade proficiency test and number of semesters of

industrial arts of entering machine shop juniors with:

HO_{52}: related industrial arts.

HO_{53}: unrelated industrial arts.

HO_{54}: related plus unrelated industrial arts.

There will be no positive linear relationships between the indus-

trial arts grade point averages and number of semesters of industrial

arts of entering machine shop juniors with:

HO_{55}: related industrial arts.

HO_{56}: unrelated industrial arts.

HO_{57}: related plus unrelated industrial arts.

The following null hypotheses were used to test for significant

positive correlations between scores on the trade proficiency test and

industrial arts grade point averages.

There will be no significant positive correlation between the

scores on the trade proficiency test and industrial arts grade point

averages within each group of entering machine shop juniors with:

HO_{58}: related industrial arts.

HO_{59}: unrelated industrial arts.

HO_{60}: related plus unrelated industrial arts.

Hypotheses Relative to Machine Shop Seniors

The following null hypotheses were used to statistically test the significance of influence that related, unrelated, and related plus unrelated industrial arts experiences make toward the difference in vocational knowledge of continuing machine shop seniors.

There will be no significant difference between the vocational knowledge of continuing machine shop seniors with no industrial arts and continuing machine shop seniors with:

HO_{61}: related industrial arts.

HO_{62}: unrelated industrial arts.

HO_{63}: related plus unrelated industrial arts.

The following null hypotheses were used to test for linear relationships between group mean scores on the trade proficiency test and number of semesters of each type of industrial arts.

There will be no positive linear relationships between the group mean scores on the trade proficiency test and number of semesters of industrial arts of continuing machine shop seniors with:

HO_{64}: related industrial arts.

HO_{65}: unrelated industrial arts.

HO_{66}: related plus unrelated industrial arts.

There will be no positive linear relationships between the industrial arts grade point averages and number of semesters of industrial arts of continuing machine shop seniors with:

HO_{67}:   related industrial arts.

HO_{68}:   unrelated industrial arts.

HO_{69}:   related plus unrelated industrial arts.

The following null hypotheses were used to test for significant

positive correlations between scores on the trade proficiency test and

industrial arts grade point averages.

There will be no significant positive correlation between the

scores on the trade proficiency test and industrial arts grade point

averages within each group of continuing machine shop seniors with:

HO_{70}:   related industrial arts.

HO_{71}:   unrelated industrial arts.

HO_{72}:   related plus unrelated industrial arts.

<div align="center">Definition of Terms</div>

Industrial arts education is a program of courses designed to

provide exploratory experiences, general education, and in some in-

stances prevocational experience to secondary students.

Vocational knowledge is defined as a student's knowledge of a

particular vocational subject as indicated by a score on the following

trade proficiency examinations as developed by the New York State

Education Department: (1) Trade Proficiency Examination, Automech-

anics, Written - Form C; (2) Trade Proficiency Examination, Carpentry,

Written - Form C; and (3) Trade Proficiency Examination, Machine Shop,

Written - Form C.

Semester is a term used to define an eighteen week course. During

the semester, the classes in a particular subject meet five days per

week for one hour per day.

Area vocational school is a vocational school established in a specified geographic district for the purpose of providing vocational education for those students of participating comprehensive high schools within that district.

Participating school is a school that has students attending the area-vocational school in its district.

Adults are those students enrolled in a vocational course with the high school students but not attending a secondary school.

Prevocational defines those industrial arts courses purposely correlated with a vocational course to develop a degree of competency in the student prior to entry into the vocational course.

Related industrial arts is defined as those courses which have the same subject matter as the vocational subject that a student is enrolled in but the content is at a lower level of difficulty. These are courses which could be considered as prerequisites to the vocational courses.

Unrelated industrial arts is defined as those courses which have content that is completely different than the vocational subject the student is enrolled in at the area vocational school.

Entering juniors designates those students enrolling in a vocational subject in the area-vocational-technical schools for the first time.

Continuing seniors designates those students in the same subject matter and same area vocational-technical school they were in as juniors.

Category refers to a grouping of students under the headings of related, unrelated, or related plus unrelated industrial arts.

Group refers to those students who have had 0, 1-2, 3-4, or 5-6 semesters of industrial arts in one of the categories.

Group mean scores refers to the average score obtained by a group of students on the trade proficiency examination in automechanics, carpentry, or machine shop.

Industrial arts grade point average refers to the average grades a group of students obtained in related, unrelated, or related plus unrelated high school industrial arts courses.

Automechanics I refers to a course in vocational automechanics designed for high school juniors.

Automechanics II refers to a course in vocational automechanics designed for high school seniors who have had Automechanics I.

Carpentry I refers to a course in vocational carpentry designed for high school juniors.

Carpentry II refers to a course in vocational carpentry designed for high school seniors who have had Carpentry I.

Machine Shop I refers to a course in vocational machine shop designed for high school juniors.

Machine Shop II refers to a course in vocational machine shop designed for high school seniors who have had Machine Shop I.

Positive linear relationship refers to a condition where increases on one variable are associated with increases on another variable.

Negative linear relationship refers to a condition where increases on one variable are associated with decreases on another variable.

Nonmonotonic relationship refers to a condition where increases on one variable are associated with both increases and decreases on the other variable.

Scope of the Study

This study includes entering juniors and continuing seniors who came from participating high schools with no dropout time elapsing between the tenth and eleventh grades. This study does not include students with previous and/or concurrent occupational experience in their chosen subject matter in the area vocational school. Adults were excluded from the study. The preceding precautions were taken in an effort to help purify the sample.

Limitations

The following are limitations that may have confounded the results of the study.

1. Students knew they were in an experimental situation, which may have influenced, either positively or negatively, the results of the study.

2. There may have been a time interval between the industrial arts experience and administering the trade proficiency test to the entering junior. This time interval may have contributed to a loss of information and, consequently, a lower score on the test, therefore, causing a decrease in the significance of the contribution of previous industrial arts experience.

3. The degree of similarity between subject matter in the industrial arts courses and vocational subjects may have varied, possibly causing one course in industrial arts to contribute more or less significantly to vocational knowledge than the same course in another school.

4. The amount actually learned by students in high school industrial arts courses may have varied between students and between schools regardless of similarities in industrial arts grade point average.

5. Motivation, aspiration, and level of individual maturation may have influenced what the student had learned in high school industrial arts courses.

6. Motivation, aspiration, and level of maturation may have also influenced what the continuing senior had learned since he enrolled as a beginning junior.

7. All the industrial arts courses that students have had may not have been indicated on the Student Information Sheet due to nonavailability of student records.

8. Students could not be randomly selected or assigned to groups based on previous industrial arts experience. This was predetermined by the students' educational history.

Assumptions

The preceding limitations and lack of means to control them necessitated the following assumptions. It was assumed that:

1. The effects of student knowledge of the experimental situation were randomly distributed throughout the sample.

2. The effects of a time interval between industrial arts experience and administering the trade proficiency test were randomly distributed throughout the sample.

3. The effects of the differences between subject matter
   in the industrial arts courses and vocational subjects
   were randomly distributed throughout the sample.

4. The effects of differences between what students have
   actually learned in various industrial arts courses were
   randomly distributed throughout the sample.

5. The effects of motivation, aspiration, and level of
   individual maturation were randomly distributed throughout
   the sample.

It was also assumed that the subjects in the sample may have
varied due to geographic location. It is felt that all geographic loca-
tions within the state were adequately represented by the sample, and a
further assumption was made that influence due to geographic location
was randomly distributed (Appendix A).

CHAPTER II

REVIEW OF THE LITERATURE

During the past fifteen to twenty years, many studies have been
undertaken to ascertain the contribution of a particular subject to
success in another subject either related or non-related. In this
review of the literature, major emphasis will be given to studying the
contribution of industrial arts education in the secondary schools to
success in similar subject matter, particularly to vocational education
in area schools. Several studies are also included that are attempts to
ascertain the influence of secondary industrial arts education on
achievement in general education, consumer, and occupational knowledge.

Studies are categorized under the following three general headings
and defined as:

1. Non-significant contribution - those studies indicating
   that secondary industrial arts education does not contribute
   to success in other related or non-related subject matter
   areas.

2. Significant contribution - those studies indicating that
   secondary industrial arts education does contribute to
   success in other related or non-related subject matter
   areas.

3. Limited significant contribution - those studies indicating
   that secondary industrial arts education influences success

in some specific way but no in another. For example,

high school mechanical drawing may influence a student's

drafting technique in advanced courses, but not his

ability to visualize hidden lines or cutting plane lines.

Non-Significant Contribution

Perhaps the most extensive study to ascertain the influence of

industrial arts education on achievement in related fields was conducted

under the direction of Jerome Moss at the University of Minnesota in

1966.[1]

The primary purpose of Moss' study was to ascertain the influence

of industrial arts experiences on achievement in post-high school trade

and technical education. Automechanics, carpentry, drafting, and elec-

tricity were the areas in which achievement was evaluated. During the

process of the study, the influence of the following four factors on

achievement was studied:

1. Amount of Industrial arts taken.

2. Grades earned in these courses.

3. Content of industrial arts courses in relation to the
    post-high school curriculum in which the student enrolled.

4. The primary purpose for which the industrial arts courses
    were offered.[2]

The questions for which answers were sought that are most relevant

to the author's study were:

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[1] Jerome Moss, Jr., *The Influence of Industrial Arts Experience on
Grades Earned in Post-High School Trade and Technical Curriculums*,
Minneapolis, Minnesota, Research Coordinating Unit in Occupational
Education, Cooperative Research Project No. 2050 (1966).

[2] Ibid., p. 1.

1. Are there differences in post-high school scholastic achievement of students attributable to the effect of three patterns of senior high school course work containing (a) no industrial arts, (b) one to five semesters of industrial arts, (c) six or more semesters of industrial arts?

2. Are there differences in the post-high school scholastic achievement of students attributable to the (a) direct or (b) indirect relationship between the content of senior high school industrial arts courses taken and the content of the post-high school trade and technical curriculums in which they were enrolled as compared with students who did not take any industrial arts?[3]

The mean of all grades earned by the student during enrollment in post-high school trade or technical curriculum was used as the basis for academic achievement.

The results of the study pertinent to the first question confirmed the fact that:

1. Varying amounts of previous industrial arts experience made no difference in the achievement of students enrolled in the secondary trade and technical curriculum.

2. As the amount of previous industrial arts experience increased, the achievement of the student in the post-high school trade and technical curriculum decreased.

3. It appeared that the courses taken in the physical sciences had as much prevocational value as the courses taken in industrial arts.

The results of the study pertinent to the second question supported the fact that directly related, indirectly related, or no industrial arts experience made no difference in the achievement of trade and technical students. But it should be pointed out that students with

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[3]Ibid., p. 23.

increased experience in industrial arts were characterized by a decrease
in score on the intelligence, verbal aptitude, numerical aptitude, and
form perception portions of the General Aptitude Test Battery. This
could have been a factor in the reduced degree of success of students
with increased experience in industrial arts as compared with those
students who had physical science backgrounds and higher scores on
similar portions of the General Aptitude Test Battery.

Referring to item number three above, it should be pointed out that
those students who were more successful, had more physical science back-
ground, scored higher on the intelligence, verbal aptitude, numerical
aptitude, and form perception portions of the test than students with
previous industrial arts experience.

Although the foregoing conclusions were quite damaging to the
theory of industrial arts education having prevocational effectiveness,
the results were not entirely negative. Further examination of the data
indicated that students with high achievement in industrial arts per-
formed better in the trade and technical schools than students with low
achievement in industrial arts. However, Moss still maintained that
industrial arts has ". . . no special prevocational value for its
students."[4]

As has been previously stated, Moss' study involved students in
post-high school trade and technical courses. The author of this study
is concerned about the influence of industrial arts on the vocational
knowledge of students who have not yet graduated from high school.
Also, Moss studied the influence on achievement of industrial arts

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[4]Ibid., p. 24.

directly or indirectly related to a vocational subject. In addition to the categories used by Moss, this author is concerned about the influence of an accumulation of industrial arts that is related and unrelated to a subject a student is pursuing in the area vocational school.

A study by Lunneborg and Lunneborg of the predictors of success in community college vocational courses supported the results of Moss' study.[5] It was found that the best predictors of success in the vocational courses were grade point averages in academic subjects such as English, mathematics, natural science, social studies, and the student's electives.

Griffin's study supported Moss' study by finding that graduates who had taken more units in high school industrial arts had lower levels of achievement in industrial arts professional and technical courses than those students who had fewer units in high school industrial arts. For example, the technical and professional grade point average of industrial arts teacher education graduates with 3.1 to 5.0 units of high school industrial arts was lower than the grade point average of those graduates with 0-3 units of high school industrial arts.[6]

The validity of the instrument used for grouping of students in this study is questionable. The students in this study were grouped on the basis of raw scores on the Ohio State Psychological Examination. According to Hoyt, this test is for differentiation in the upper

[5]C. E. Lunneborg and D. W. Lunneborg, "Predicting Success in Community College Vocational Courses," Journal of Counseling Psychology, XVI (July, 1969), pp. 353-357.

[6]James F. Griffin, "Relationship of Selected High School Courses Completed to Achievement in Industrial Arts Teacher Education" (unpub. Ed. D. dissertation, University of Missouri, 1970).

one-half of the general high school population from which most college freshmen are drawn.[7] There is no evidence indicating that the population in this study met the previously mentioned criteria. Those teacher education graduates with more high school industrial arts had a lower grade point average than those teacher education graduates with fewer units of high school industrial arts. This phenomenon is similar to Moss' findings that increasing industrial arts experience was accompanied by a decrease in various learning characteristics, therefore, the reader may deduce that the population may not have been from the upper one-half of the graduating class and the instrument may not have been appropriate for the population he was sampling.

Although Griffin's study was similar to the one proposed by this author, it involved post high school students in college level courses. Also, his study did not specify as to whether the high school industrial arts was related directly or indirectly to the technical and professional college level industrial arts courses. The students in the study were grouped in only two ways relative to the amount of previous industrial arts experience. It was considered desirable by the author of this study to:

1. Categorize students according to the relationship of their industrial arts experience to their chosen vocational subject.

2. Group students under 0, 1-2, 3-4, and 5-6 semesters of industrial arts.

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[7]Cyril J. Hoyt, "The Fifth Mental Measurements Yearbook," Oscar Krisen Buros, ed. (Highland Park, New Jersey, 1959), p. 360.

A study similar to Griffin's was performed by Harlan to compare the academic success or ability of graduates from high school academic, vocational, and technical courses in the industrial arts division of the New York State College for Teachers at Buffalo.[8] The order of success of the three groups based on academic achievement was: first, the technical group; second, academic group; and third, the vocational group. Pertinent to these results were the facts that vocational students had five to seven more units in shop courses than the other groups. Also, the technical group, which was the most successful, had more units in mathematics, science, and mechanical drawing. In addition, the correlation between units earned in social studies, mechanical drawing, or shop courses and college graduation was negative.

Boone conducted a study to ascertain if there was a significant relationship between the number and kinds of courses taken in high school and achievement by engineering students.[9] The high school courses used in the study were industrial arts, foreign languages, mathematics, science, and social science. The only course that correlated significantly with the achievement of engineering students was foreign language. The other subjects, including industrial arts, were not statistically significant in their relationship with achievement of engineering students.

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[8] Owen Harlan, "Comparison of Scholastic Records of Students From Academic Vocational and Technical High Schools in the Industrial Arts Division of a Teachers College" (unpub. Ed. D. dissertation, University of Missouri, 1953).

[9] James L. Boone, Jr., "The Relationship Between Selected High School Subjects and Achievement by Engineering Students" (unpub. Ed. D. dissertation, Texas A & M University, 1966).

Hawlk compared the achievement of industrial arts objectives by industrial arts and cooperative education students in public schools of Ohio, Michigan, and Pennsylvania.[10] It was found that cooperative work experience students achieved higher on six of the nine objectives than did industrial arts students. It is important to note that three of the six objectives were orderly performance, shop skills, and knowledge. Industrial arts students achieved at a higher level in regard to the objectives of appreciation, use, drawing, and design.

A study that further supported the findings of Moss and others was conducted by Barrow.[11] A secondary purpose of the study was to ascertain the influence of prior industrial arts experience in transportation, automechanics, and power mechanics on achievement in the first year of a vocational automechanics course. The findings indicated that there was no difference in the achievement between students who had or had not completed prior industrial arts courses in transportation, power mechanics, or automechanics.

Barrow did not group the students relative to the amount of industrial arts. The author of this study is interested in analyzing data for increased or decreased scores on a test relative to increased semesters of industrial arts.

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[10]Robert H. Hawlk, "A Comparative Study of Estimated Achievement by Industrial Arts Students and Students of Cooperative Experience Selected from the Public Secondary Schools of Pennsylvania, Ohio and Michigan" (unpub. Ed. D. dissertation, Pennsylvania State University, 1960).

[11]Richard Wesley Barrow, "A Comparison of the Achievement of Vocational Automechanics Students in First Year Day Trade With Students in First Year Industrial Cooperative Training" (unpub. Ed. D. dissertation, Texas A & M University, 1969).

Significant Contribution

Many studies in education either have or have not supported a par-
ticular hypothesis. Such is the case with the present review of the
literature. There are studies that have supported the prevocational
effectiveness or information achievement function of secondary indus-
trial arts education. All the studies in this section are not directly
related to achievement in vocational education but range from informa-
tional achievement to achievement in consumer knowledge.

March produced a study that gave support to the theory that indus-
trial arts experience in the secondary schools contributes to informa-
tional and problem solving achievement.[12]

It was found that students in the ninth grade industrial arts
courses had better informational achievement if they had prior indus-
trial arts experience in the seventh and/or eighth grade. A level of
significance was not indicated in the study. The subject areas checked
for informational achievement were mechanical drawing, electricity,
metalwork, and woodwork.

March's study did not have separate tests for each subject matter
area. Therefore, the industrial arts background could not be clearly
declared related or unrelated to the subject of the test. The author of
this research desires to study the influence of industrial arts on a
vocational subject to which it is related or unrelated.

Anderson, as a result of a study concerning whether or not boys
receive occupational knowledge from industrial arts experience, found

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[12]Bryce D. March, "Assessment of Informational Achievement in
Industrial Arts" (unpub. Ph.D. dissertation, Southern Illinois
University, 1961).

that:

1. Students with graphic arts experience possessed more occupational knowledge of graphic arts industries than other students.

2. Students who had more than two semesters of graphic arts experience possessed more occupational knowledge of graphic arts than students who had one or two semesters.

3. Students with metals experience possessed more occupational knowledge of the metals industries than others.

4. Students with more than two semesters of metals experience possessed more occupational knowledge of metal industries than students who had one or two semesters.[13]

The criterion for the degree of occupational knowledge gained was a score on occupational information tests in metals and graphic arts. Assuming that occupational information test scores and grade point averages are related, findings two and four above contradict Moss' findings that increased industrial arts experience is accompanied by a decrease in grade point average.

While reviewing this study, the following questions arose concerning the population used:

1. Did the investigator attempt to exclude those subjects that may have been currently employed in similar part time occupations?

2. Did the investigator attempt to exclude those subjects that may have had previous occupational experience in metalwork and graphic arts?

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[13]Robert Granville Anderson, "The Contribution of Industrial Arts Experience to Occupational Knowledge" (unpub. Ed. D. dissertation, Colorado State College, 1961).

3. Why did the investigator not attempt to equalize the
subjects on some intellectual variable that could con-
tribute to higher scores on the examinations?

Also the .84 reliability coefficient of the test is questionable.
The test-retest method was used to ascertain the reliability coeffi-
cient. The weakness of this method is that shorter periods of time
between the two administrations of the test generally create a carry
over effect resulting in higher reliability scores. Therefore, depend-
ing on the time lapse between tests, the reliability could be higher or
lower. Perhaps the split halves method could have been used or the
test could have been given to a group of students who were not involved
in the study. This would have prevented the carry over or learning
effect.

Further analysis indicated that students with industrial arts
experience in metalwork and graphic arts had obtained more knowledge
about the area of graphic arts than those students who had only graphic
arts experience. The same type of group (students with both metals and
graphic arts experience) had obtained more occupational knowledge in
the area of metals than students who had only metals experience. This
phenomenon placed more emphasis on the need to ascertain the influence
on the vocational knowledge of an accumulation of industrial arts
related and unrelated to a chosen vocational subject.

Anderson concluded that a relationship existed between a student's
knowledge of the two occupational areas and the number of semesters of
metals and graphic arts experiences.

He recommended that all boys take a minimum of one semester in
each of the two areas because the data indicated that the greatest
increase in occupational knowledge occurred in the first semester.

Torres sought to ascertain the relationship that existed between
first and third semester achievement of junior college industrial arts
students and certain intellectual variables.[14]

The selected variables included scores on standardized tests and
junior college grade point averages. The findings indicated a signifi-
cant relationship between first and third semester grade point averages
in the industrial arts, the general, and the total program and junior
college grade point average. Two studies were done that were unrelated
to the contribution of secondary industrial arts education to vocational
education. Krubeck attempted to ascertain the relationship of certain
high school courses, including industrial arts, to achievement in the
College of Engineering and how much the grades in each of the subjects
contributed to achievement.[15] He found that the correlation between
grades earned in each of the high school courses and achievement was
large enough to be significant. Also it was found that grades earned
in the four high school subjects accounted for approximately 16 percent
of the grade point average of the engineering students. Grades earned
in high school industrial arts accounted for 2.48 percent of the 16
percent.

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[14]Leonard Torres, "A Study of the Relationship Between Selected
Variables and the Achievement of Industrial Arts Students at Long Beach
State College. Research Study No. 1" (unpub. Ed. D. dissertation,
Colorado State College, 1963).

[15]Floyd Earl Krubeck, "Relation of Units Taken and Marks Earned in
High School Subjects to Achievement in the Engineering College" (unpub.
Ed. D. dissertation, University of Missouri, 1954).

Jacobsen studied the influence of industrial arts woodworking on consumer knowledge.[16] He found that students with experience in woodworking possessed significantly greater consumer knowledge of materials and products made from wood than students without woodworking experience. The ability to purchase wisely and use wood and related materials properly accounted for their significant knowledge.

<div align="center">Limited Significant Contribution</div>

The following studies are included in the review of literature to point out that studies have been conducted indicating that secondary industrial arts experience was beneficial to achievement in one fashion, but not in another.

Horine's study was an example of limited influence as defined earlier. He attempted to relate high school drafting experience to five factors that influenced achievement in college engineering drawing.[17] The five factors were:

1. Drafting skill development.

2. Informational achievement.

3. Visualizing ability.

4. Attitude toward college engineering drawing.

5. Final grades.

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[16]James Huffman Jacobsen, "A Study of the Contribution of Industrial Arts Instruction to Consumer Knowledge" (unpub. Ed. D. dissertation, Colorado State College, 1964).

[17]John William Horine, "Relation of Experience in High School Drafting to Achievement in Engineering Drawing at the College Level" (unpub. Ed. D. dissertation, University of Missouri, 1961).

The subjects were divided into three groups on the basis of how much previous experience they had in high school drafting. The data were analyzed to find:

1. If there was any significant difference in the groups with regard to each of the four factors mentioned previously.

2. If increasing the amount of high school drafting experience increases the student's achievement in engineering drawing.

The findings indicated:

1. Significantly higher skill grades were earned by those students who had one or two semesters of high school drafting than students without such experience.

2. High school drafting experience beyond the two semesters resulted in still higher achievement in engineering drawing.

3. Increasing the amount of high school drafting experience significantly increased the student's visualization scores.

4. The final grades of all students in the study with one, two, or more semesters of high school drafting were higher in engineering drawing than those students with no such experience.

The conclusion was that the student was likely to be more skillful in engineering drawing if he had high school drafting experience. Another finding of the study that indicated a limitation of the contribution of high school drafting to achievement in engineering drawing

was that previous high school drafting experience did not contribute to subsequent informational achievement.

This study was included because the method of grouping students was similar to that which will be employed in this author's study and also because Horine attempted to ascertain if varying levels of high school industrial arts experience were correlated positively with a varying student achievement in engineering drawing.

In reference to the increasing amount of industrial arts contributing to the increased achievement, Spencer found that to enable students to make significantly greater gains in understanding industry, they must take five or more semesters of industrial arts.[18]

Ryan conducted a similar study and found no correlation between performance in college technical drawing and the amount of high school mechanical drawing.[19] However, the results indicated that high school mechanical drawing in combination with advanced mathematics did slightly influence higher achievement in technical drawing.

A non-degree research project by Hatley, utilizing a survey of the opinions of the heads of 38 drafting departments concerning the contribution of high school drafting to college drafting, lists these results:

1. Nine of the teachers said that student's performance with one or zero semesters of high school drafting was about equal.

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[18]Albert Glenn Spencer, "Contribution of Industrial Arts to the Understanding of Industry Possessed by Secondary School Students" (unpub. Ed. D. dissertation, University of Columbia, 1969).

[19]Robert Dale Ryan, "A Study of Performance in First Year Technical Drawing at St. Cloud State College as Related to Certain High School Courses and ACT Scores" (unpub. Ed. D. dissertation, Colorado State College, 1964).

2. Nineteen department heads indicated that students with
   high school drafting did about 5 percent better than
   those students without high school drafting.

3. Twenty-eight rated as 5 percent better those students
   with two full years of high school drafting.

4. Less difference was observed between the achievement of
   second semester college drafting students.

5. Courses that had the most influence on achievement in
   college drafting were geometry, machine drafting,
   general drafting and descriptive geometry.

6. High school drafting contributed more to effective tech-
   niques than acquiring information.[20]

Two studies related to the achievement of students in industrial

arts teacher education and general education were made by Reams[21] and

Massey.[22] Reams found no relationship between amount or quality of

industrial arts experience and scholastic success in college. However,

he did find that industrial arts students had grade point ratios in the

upper one-half of their class if they were in an area of vocational

preparation. Massey found that, compared on ability level indicated by

the SCAT Test, industrial arts students were significantly below the

non-industrial arts student. In other words, industrial arts according

to Massey's study, made no significant contribution to the goals of

[20] Jimmy Hatley, "A Survey of College Drafting Department Chairmen
to Compare the Performance of College Students With High School Drafting
Experience and Students With No Drafting Experience," Industrial Arts
and Vocational Education (February, 1967), pp. 41-42.

[21] Jake W. Reams, "The Relationship of Selected Factors to the
Scholarship of Industrial Arts Teacher Education Students at Ball State
Teachers College" (unpub. Ed. D. dissertation, Indiana University,
1963).

[22] Hal Massey, "A Research Instrument for Measuring the Unique
Contributions of Industrial Arts to the Goals of General Education"
(unpub. Ed. D. dissertation, University of Maryland, 1965).

general education. However, at the fourth, fifth, eighth, and ninth

deciles of the SCAT, students with previous industrial arts scored

significantly higher than the non-industrial arts student.

Kjos compared the occupational experience and success of day trade

and general high school graduates.[23] The general high school graduates

had taken at least two years of industrial arts electives. He found

that:

1. Day-trade graduates were only slightly more successful
   than general high school graduates.

2. General high school graduates had a tendency to be
   employed in technical and managerial jobs.

3. A high percentage of general high school graduates
   indicated that general shop training was of no value
   to them.

<div align="center">Summary</div>

In summarizing the review of literature, it appears that most of

the studies are contradictory on several points. The non-influential

studies tend to support the hypothesis that students with prior experi-

ence in industrial arts do not achieve as well in other educational

endeavors as do the students with less industrial arts but more academic

courses. Also, as the amount of industrial arts units completed in-

creases, the achievement in vocational subjects decreases.

The influential studies support the hypothesis that previous

industrial arts experience contributes to informational achievement in

the area specifically studied and, in some instances, facilitates

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[23]Oscar Edwin Kjos, "Occupational Experience and Success of Day-
Trade Versus General High School Graduates" (unpub. Ed. D. dissertation,
University of Missouri, 1954).

additional knowledge achievement in occupational areas not studied.
Also, previous industrial arts experience contributed to achievement in
engineering, consumer knowledge, and the junior college total program.

Studies indicating limited influence occur in the literature.
Pertinent studies done in drafting indicated that high school drafting
contributed to drafting technique but not to informational achievement
or the ability to visualize certain views of an object. In one instance,
high school mechanical drawing supplemented by advanced mathematics con-
tributed to achievement in technical drawing. Also, it was found in a
study that although industrial arts experience did contribute to
achievement, it took a substantial number of units in industrial arts to
foster the increased achievement.

Although many variables in the studies reviewed were similar to
the variables the author intends to use, they were either not used on
the type of population with which this study is concerned or they were
not used in the same combination with which the author is concerned.
Some studies utilized various amounts of industrial arts but the amounts
were not divided into 0, 1-2, 3-4, and 5-6 semesters. Related and un-
related industrial arts categories were used but not as they related to
automechanics, carpentry, and machine shop in the area vocational
schools. When different amounts and types of industrial arts were used
in combination it was not in a study concerning students in an area
vocational school. Also, the previously mentioned variables were not
used in a study that involved both juniors and seniors.

All of the foregoing controversial points in the review of the
literature and the lack of studies combining the variables as desired,
led the author to the present study.

CHAPTER III

METHODOLOGY

Procedure of Investigation

Sources of Data

This study involved those junior and senior students in fourteen area vocational schools who were enrolled in Automechanics I and II, Carpentry I and II, and Machine Shop I and II. The students were also concurrently enrolled in a secondary school within the district which the area vocational school served.

Selection of the area vocational schools used in this study was based on the criteria of:

1. Offering two years of automechanics, carpentry, or machine shop.

2. Having been in operation long enough to have seniors enrolled in the three subjects mentioned above, who also had the junior year of their chosen vocational subject in the same area vocational school.

3. Being located in a district where the participating schools offered industrial arts courses that could possibly have contributed to the vocational knowledge of students enrolled in the area vocational schools in the subjects of automechanics, carpentry, or machine shop.

The initial step in the data collection was to ascertain the vocational knowledge of the students utilized in the study. For this purpose the following multiple choice trade proficiency examinations were used:

1. Trade Proficiency Examination, Automechanics, Written - Form C.

2. Trade Proficiency Examination, Carpentry, Written - Form C.

3. Trade Proficiency Examination, Machine Shop, Written - Form C.

The tests were obtained from the Vocational-Technical Department, State University College, Oswego, New York. The trade proficiency tests were designed for evaluating the competency of potential trade and industrial education teachers. During the test construction content validity was improved by a group of experts in each occupation. The scope of each examination was examined by the group to ascertain which areas were over emphasized or not represented. Items were added and deleted on these basis. Questions were removed to eliminate items that reflected knowledge obtained in teaching rather than knowledge gained through experience. A comparison of responses of academic students with high verbal ability and vocational students with low verbal ability indicated that relevant occupational training and not just verbal skill was being measured by the examination.

The process of designing the tests also involved steps to establish as much reliability as possible. Test items were submitted by trade and industrial education teachers to a group of specialists in each occupation. Tests were constructed from the pool of questions submitted. Standard procedures for administering and scoring the test were

established. The tests were scored and an item analysis performed on the questions. Poor questions were eliminated and new items drawn from the test item pool. This process was repeated several times during a period of approximately two years.

Although the tests were designed for evaluating the competency of potential trade and industrial education teachers they were administered to vocational high school seniors in New York and the reliability coefficients calculated. The reliability coefficient of each test in the following subjects was: automechanics, .903; carpentry, .78; and machine shop, .821.[1]

The junior and senior students in automechanics, carpentry, and machine shop utilized in this study took the same trade proficiency test. The reliabilities of tests given to students in the present study were calculated by using a formula developed by Kuder-Richardson. The formula utilized the mean, standard deviation, and number of items on the test. The following reliability coefficients were obtained: automechanics, .62; carpentry, .51; machine shop, .41. Also, as part of the test administration, the students provided information about themselves which included:

1. Class (sophomore, junior, senior or adult).

2. Previous occupational experience related to the subject they were enrolled in at the area vocational school other than experience obtained in a public education system.

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[1]Lewis A. Koenigsberg and Robert R. Reilly, "An Investigation of the Reliability and Validity of Selected Occupational Competency Examinations and Their Use in Evaluating Prospective Trade and Industrial Teachers Final Report," Albany, New York: New York State Education Department, Bureau of Occupational Education Research (June, 1968).

3. Participating school.

Information in Item 1 above was used to group students under the heading of junior or senior as was necessary for the statistical analysis used in this study. Also, these data were used as a basis for eliminating students who were not juniors or seniors. The scores on the trade proficiency test of those students who indicated they were sophomores or adult students were not used in the statistical analysis of the data.

Information in Item 2 was used to eliminate from the study those students who had occupational experience related to their chosen vocational subject other than experience gained in an educational system that may have influenced the score they made on the trade proficiency tests.

Information in Item 3 enabled the researcher to send the names of students to the participating school that maintained that particular student's records.

Arrangements for administering the tests were accomplished through a telephone conversation with the director or superintendent of the area vocational school. The telephone conversation was preceded by a letter from the state coordinator of Area Vocational-Technical Schools (see Appendix B). The purpose of the letter was to explain the purpose and possible benefits of the study. The letter also solicited the cooperation of area vocational school administrators.

The next step in data collection was to obtain information from participating high schools concerning each student's background in industrial arts subjects. The Student Information Sheet was used for this purpose (Appendix C). Properly filled out, the following

information concerning a student's background in industrial arts could be ascertained:

1. Number of semesters of industrial arts courses taken that were related to the chosen subject in the area vocational school.

2. Number of semesters of industrial arts courses taken that were unrelated to the chosen subject in the area vocational school.

3. Number of semesters of related plus unrelated industrial arts a student had accumulated prior to enrolling in a subject at the area vocational school.

4. Grades earned in related, unrelated, and related plus unrelated industrial arts courses.

The grades were used to calculate each student's grade point average in the related, the unrelated, and the related plus the unrelated industrial arts courses.

The Student Information Sheets were sent to the appropriate high schools with the students' names entered in the proper column. Enclosed with the Student Information Sheet was a letter from the State Supervisor of Industrial Arts Education asking for the cooperation of high school principals in having the Student Information Sheets completed and returned (Appendix D). Also enclosed were instructions for completing the Student Information Sheets (Appendix E), and a return envelope. After three weeks, follow-up letters with a duplicate of the initial contents were mailed (Appendix F). A total of one hundred seventy-eight high schools were mailed Student Information Sheets. Eighty-six percent or one hundred fifty-one of the schools returned the completed forms.

The scores on the trade proficiency tests of students for which data were not returned were not used in the statistical analysis performed on the test scores.

To facilitate indicating the percentage of students for which data were returned by the participating high schools on the Student Information Sheets, Table I and an explanation are provided. The data returned from participating schools and scores on the trade proficiency tests concerning some students were not used in this study because the data pertained to students who were sophomores, adult students, or had previous or concurrent occupational experience related to the vocational subject in which they were enrolled at the area vocational school.

TABLE I

PERCENTAGE OF STUDENT DATA RETURNED

	Automechanics Students	Carpentry Students	Machine Shop Students
Total Tested	523	213	322
Total Nonusable	96	33	52
Total Usable Tested	467	180	270
Total Usable Returned	372	154	234
Percent Usable Returned	79.0	85.5	87.0

An explanation of entries in Table I reveals that a total of 523 automechanics students were tested. Ninety-six of the 523 students tested were declared nonusable and excluded from the study due to reasons stated in the previous paragraph. Therefore, the data indicated on the Student Information Sheets were to be collected from the participating schools for 467 automechanics students. The names of the 467 automechanics students were sent to the appropriate participating high schools on the Student Information Sheets. Data for 372 of the 467 automechanics students were returned.

The explanation in the previous paragraph is applicable to carpentry and machine shop students. Two hundred thirteen carpentry students were tested. Thirty-three were declared nonusable because of variables previously outlined that may have influenced their vocational knowledge of the subject on which they were tested. Consequently, data indicated on the Student Information Sheets were to be collected from the participating schools for 180 carpentry students. The names of the 180 carpentry students were sent to the appropriate particpating high schools on the Student Information Sheets. Data for 154 of the 180 carpentry students were returned.

Three hundred twenty-two machine shop students took the machine shop trade proficiency examination. Fifty-two were declared nonusable because of the variables perviously outlined that may have influenced their vocational knowledge of the subject on which they were tested. Therefore, data on the Student Information Sheets were to be collected from the participating high schools for 270 machine shop students. The names of 270 machine shop students were sent to the appropriate

participating high schools on the Student Information Sheets. Data for 234 of the 270 machine shop students were returned.

The last entry in each of the columns in Table I indicates the percentage of students in each subject matter area for which data were returned. Data for 79 percent of the automechanic students declared usable were returned. Data for 85.5 percent of carpentry students declared usable were returned. Data for 87 percent of the machine shop students declared usable were returned. Overall, 83.3 percent of data requested from participating high schools were returned. The trade proficiency test scores of students for which data were not returned from the participating high schools were not included in the statistical analysis of test scores.

The data collected from the participating high schools and scores on the trade proficiency examinations were placed on Fortran Coding Forms. The student's home school, area vocational school, subject enrolled in at the area vocational school, and class (junior or senior) were given code numbers and placed in columns on the Fortran Coding Forms. Each student's grade point average in the related, the unrelated, and the related plus unrelated industrial arts courses was calculated and placed in columns also. The Fortran Coding Forms were given to a key punch operator and the data were transferred to IBM cards for use in the computer.

Methodology

The purpose of the statistical analysis used in this study was to ascertain if the scores on the trade proficiency tests differed

significantly due to students having various amounts and types of
industrial arts experiences.

To perform the statistical analysis the students' scores on the
trade proficiency examination were categorized and grouped as shown in
Table II. Three variables were used to categorize students:

1. Class (junior or senior).

2. Subject of trade proficiency examination (automechanics,
   carpentry, or machine shop).

3. Related, unrelated, or related plus unrelated industrial
   arts.

Four variables were used to group the students within the categories:

1. No industrial arts.

2. 1-2 semesters of industrial arts.

3. 3-4 semesters of industrial arts.

4. 5-6 semesters of industrial arts.

The students' scores on the trade proficiency examination were
placed in one of the groups within one of the categories based on the
amount of previous industrial arts experience accrued. Therefore, for
example, the statistical analysis would indicate if a significant
difference existed between the test scores of:

1. Automechanic juniors with 0, 1-2, 3-4, or 5-6 semesters
   of related industrial arts.

2. Automechanic juniors with 0, 1-2, 3-4, or 5-6 semesters
   of unrelated industrial arts.

3. Automechanic juniors with 0, 1-2, 3-4, or 5-6 semesters
   of related plus unrelated industrial arts.

This example applies to students categorized as:

1. Automechanic seniors with various amounts of related industrial arts.

2. Automechanic seniors with various amounts of unrelated industrial arts.

3. Automechanic seniors with various amounts of related plus unrelated industrial arts.

4. Carpentry juniors with various amounts of related industrial arts.

5. Carpentry juniors with various amounts of unrelated industrial arts.

6. Carpentry juniors with various amounts of related plus unrelated industrial arts.

7. Carpentry seniors with various amounts of related industrial arts.

8. Carpentry seniors with various amounts of unrelated industrial arts.

9. Carpentry seniors with various amounts of related plus unrelated industrial arts.

10. Machine shop juniors with various amounts of related industrial arts.

11. Machine shop juniors with various amounts of unrelated industrial arts.

12. Machine shop juniors with various amounts of related plus unrelated industrial arts.

13. Machine shop seniors with various amounts of related industrial arts.

14. Machine shop seniors with various amounts of unrelated industrial arts.

15. Machine shop seniors with various amounts of related plus unrelated industrial arts.

Random assignment of students to the various categories and groups based on amount and type of industrial arts was not possible because the group within which a student would be was predetermined by the industrial arts background of the student.

TABLE II

SAMPLE GROUPING OF STUDENT TEST SCORES

Junior Automechanics Students				
Number of Semesters of Related Industrial Arts				
0	1-2		3-4	5-6
x	x	test	x	x
x	x	scores	x	x
Number of Semesters of Unrelated Industrial Arts				
0	1-2		3-4	5-6
x	x	test	x	x
x	x	scores	x	x
Number of Semesters of Related Plus Unrelated Industrial Arts				
0	1-2		3-4	5-6
x	x	test	x	x
x	x	scores	x	x

A homogeneity of variance check was performed on the trade pro-
ficiency test scores after they were grouped as previously described.
Levene's technique was used because it is applicable to unequal group
sizes. In this study there were groups of unequal size. A significance
level of .05 was interpreted as representing a significant lack of
homogeneity between groups.

Following the homogeneity of variance check, the analysis of vari-
ance was used to test for significant differences between students
grouped as previously described. Data were analyzed for significant
differences only between groups within a single category. A signifi-
cance level of .05 was interpreted as representing significant differ-
ences between groups due to various amounts and types of previous
industrial arts. Initially, an analysis of covariance was proposed
using the G (Intelligence) Score of the General Aptitude Test Battery
as a covariable. This approach was abandoned due to a shortage of G
Scores and a low correlation between trade proficiency test scores and
G Scores that were available.

As a result of the computer programming procedure used, the group
mean scores on the trade proficiency test and the grade point averages
in industrial arts courses were available. These data plus the number
of semesters of industrial arts were used as a basis for analyzing linear
relationships between group mean scores on the trade proficiency test
and the number of semesters of industrial arts, between industrial arts
grade point average and number of semesters of industrial arts. A
Pearson product moment correlation coefficient was calculated between

scores on the trade proficiency test and industrial arts grade point averages within each group.

These data and relationships were used to construct the graphs in Chapter III.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

Introduction

The primary objective of this research was to group automechanics,
carpentry, and machine shop students according to class (junior or
senior) and the number of semesters and type of industrial arts experi-
ence accrued and to compare the differences between groups on the
knowledge of a vocational subject.

To investigate the diversity among these groups, eighteen null
hypotheses were tested by the analysis of variance and an .05 level of
significance was the criterion used as a basis for accepting or reject-
ing the null hypotheses. Each subject matter area has a table which
includes the results of the analysis of variance performed on data for
the groups of students categorized under related, unrelated, or related
plus unrelated industrial arts.

Bar graphs are used to illustrate the relationships between des-
criptive statistics such as group mean scores on the trade proficiency
test and number of semesters of industrial arts and between the number
of semesters of industrial arts and grade point averages in those
courses. The correlation between the scores on the trade proficiency
test and industrial arts grade point averages within each group is also
included on the graphs. Some graphs do not have bars representing the
mean scores on the trade proficiency test and grade point average in

industrial arts courses for some groups. This is because there were no students tested with that type and number of semesters of industrial arts or data for students with such experience were not returned from the participating high school that maintained the student's records. The figures are preceded by a discussion of the relationships within that figure.

Findings and Disposition of Hypotheses

Diversity Among Junior Automechanics Students

Hypotheses 1 through 3 state there will be no significant differences between the vocational knowledge of entering automechanics juniors with no industrial arts and entering automechanics juniors with different numbers of semesters of related, unrelated, or related plus unrelated industrial arts. Table III presents the findings of the tests for differences among groups on these variables. There were no significant differences between groups concerning vocational knowledge relative to previous types or number of semesters of industrial arts experience. All null hypotheses applicable to the groups were accepted.

Figure 1 presents the linear relationships between group mean scores on the trade proficiency test and number of semesters of industrial arts and the linear relationships between industrial arts grade point averages and number of semesters of industrial arts for automechanics juniors with related, unrelated, and related plus unrelated industrial arts. The correlation between the scores on the trade proficiency test and industrial arts grade point averages is also indicated for each group. Figure 2 presents the comparisons between group mean scores for automechanics juniors.
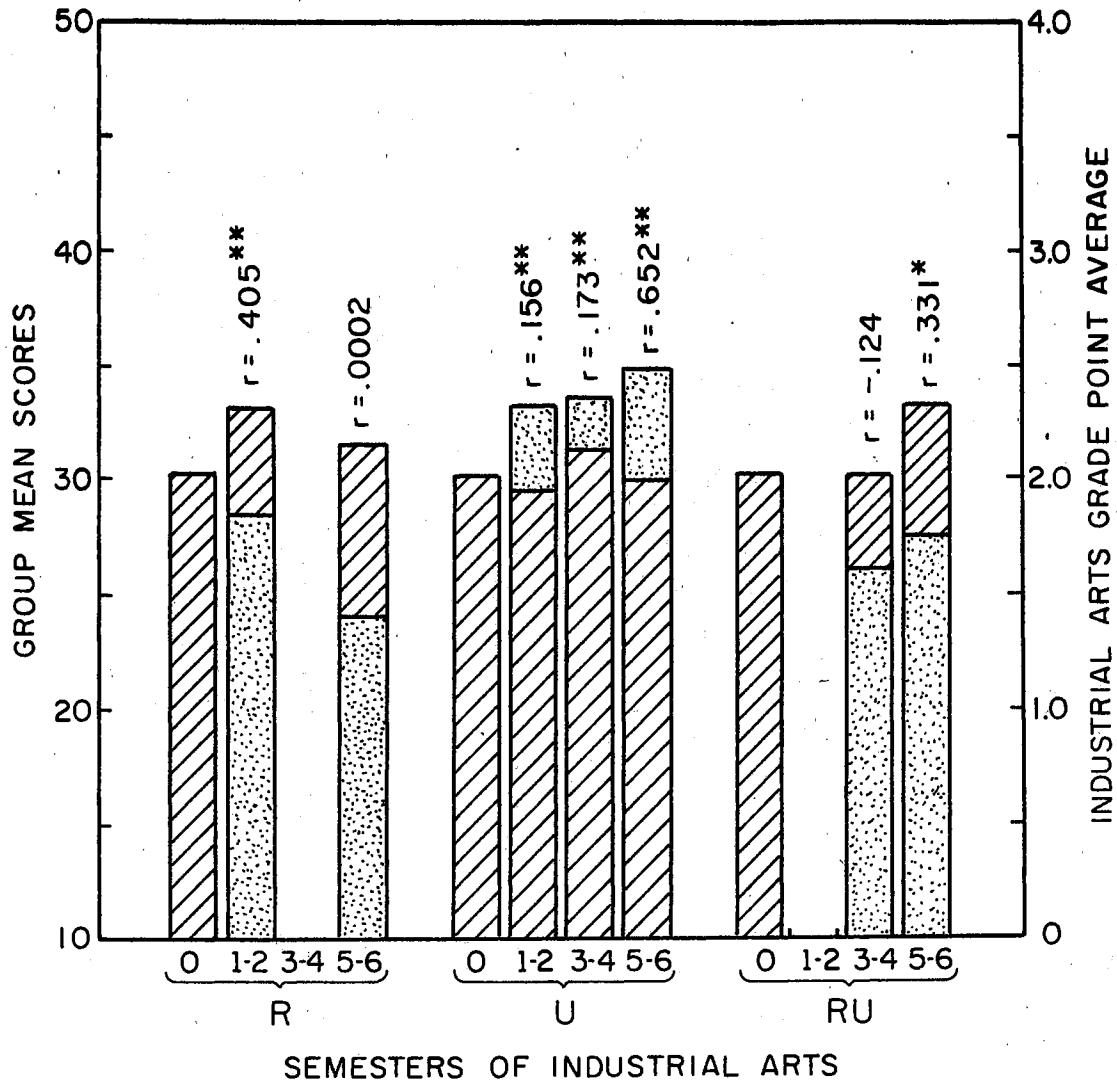
Figure 1. Relationships Between Descriptive Statistics for
           Automechanics Juniors With Related (R),
           Unrelated (U), or Related Plus Unrelated (RU)
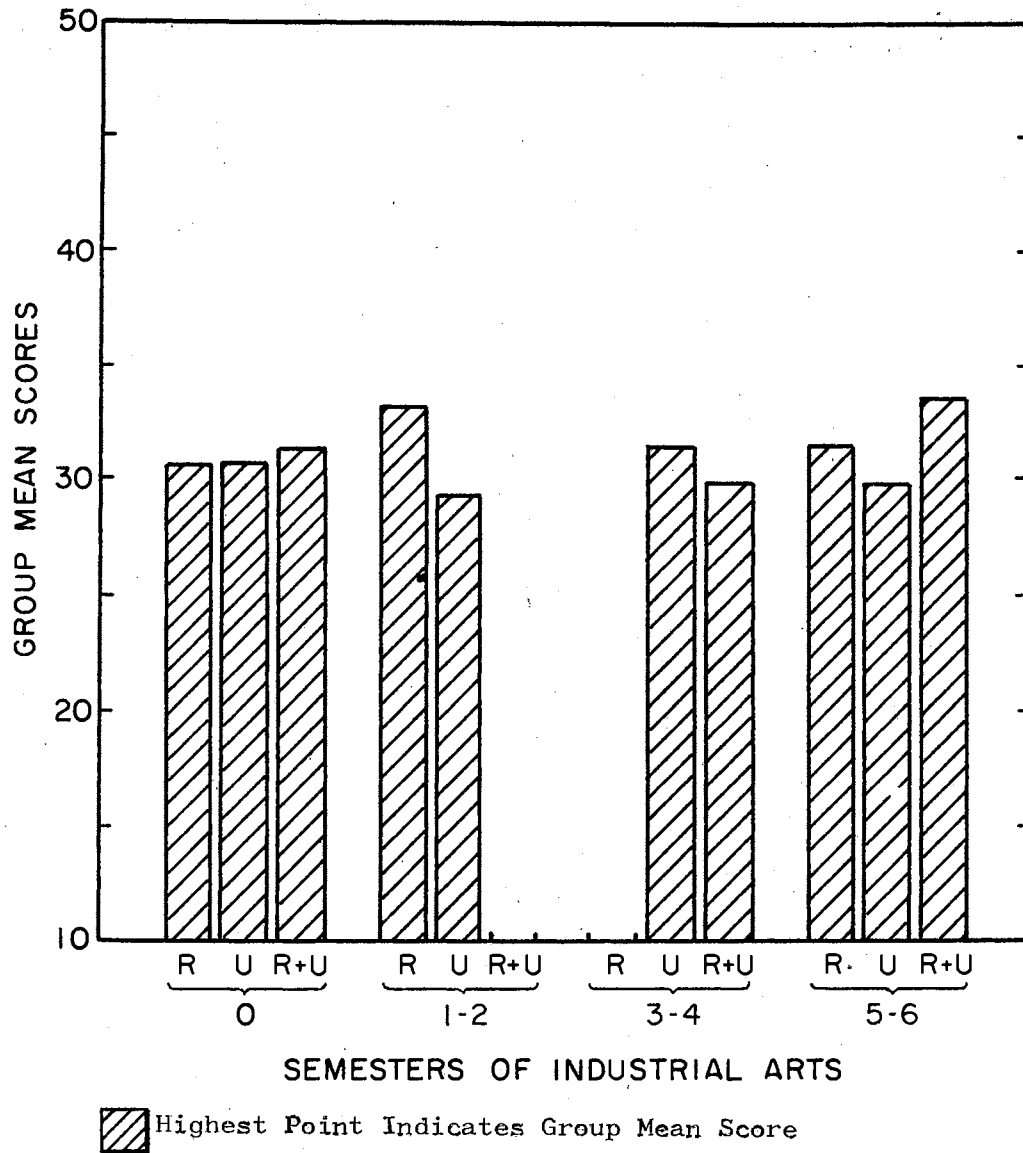   Industrial Arts

Figure 2. Comparison of Group Mean Scores for Automechanics
Juniors With Related (R), Unrelated (U), or
Related Plus Unrelated (RU) Industrial Arts

TABLE III

ANALYSIS OF VARIANCE ON TRADE PROFICIENCY TEST SCORES OF
VOCATIONAL AUTOMECHANICS JUNIORS WITH RELATED,
UNRELATED, OR RELATED PLUS UNRELATED
INDUSTRIAL ARTS EXPERIENCE

Variable and Source of Variance	Sum of Squares	df	Mean Squares	F-Ratio
Related Industrial Arts				
Between Groups	136.80	2	68.40	1.3716
Within Groups	11919.80	239	49.87	
Unrelated Industrial Arts				
Between Groups	154.64	3	51.54	1.03
Within Groups	11952.61	239	50.01	
Related Plus Unrelated Industrial Arts				
Between Groups	79.01	2	39.50	0.78
Within Groups	12028.01	240	50.11	

*Significant at the .05 level.

**Groups were heterogeneous at the .05 level of significance.

Related Industrial Arts Category. Data for the group with 3-4

semesters of related industrial arts were not available because of

reasons previously stated.

Hypothesis 4 states there will be no positive linear relationship

between the group mean scores on the trade proficiency test and number

of semesters of related industrial arts of entering automechanics

juniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables concerned. An increase in the number of semesters of industrial arts was associated with both higher and lower group mean scores. The group with 1-2 semesters of industrial arts scored higher on the trade proficiency test than the group with no industrial arts. The group with 5-6 semesters of industrial arts scored only slightly higher on the trade proficiency test than the group with no industrial arts.

Hypothesis 7 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related industrial arts of entering automechanics juniors. The null hypothesis was accepted.

A negative linear relationship existed between the variables concerned. However, there were only two groups within this category with an industrial arts grade point average which automatically produced a linear relationship. The group with 5-6 semesters of industrial arts related to automechanics had a lower grade point average in those courses than the group with 1-2 semesters of industrial arts.

Hypothesis 10 states there will be no significant positive correlation between the scores on the trade proficiency test and industrial arts grade point averages within each group of entering automechanics juniors with related industrial arts. The null hypothesis was accepted for the group with 5-6 semesters of industrial arts and rejected for the group with 1-2 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned of students with 1-2 semesters of industrial arts related to automechanics. This group also had the highest mean score on the trade proficiency test and the highest mean

industrial arts grade point average within this category. The group
with more semesters of industrial arts had a lower mean grade point
average and a lower group mean score on the trade proficiency test. It
also had a lower correlation between the trade proficiency scores and
industrial arts grade point averages. These data suggested that higher
grade point averages in industrial arts courses may have been more
influential on higher trade proficiency test scores than more semesters
of industrial arts.

Unrelated Industrial Arts Category. Hypothesis 5 states there
will be no positive linear relationship between group mean scores on the
trade proficiency test and number of semesters of unrelated industrial
arts of entering automechanics juniors. The null hypothesis was
accepted.

There was a nonmonotonic relationship between the variables con-
cerned. Higher and lower group mean scores were associated with an
increase in the number of semesters of unrelated industrial arts. The
group with no industrial arts and 3-4 semesters of industrial arts had
the highest group mean scores. The group with 5-6 semesters of indus-
trial arts unrelated to automechanics had a lower group mean score than
the group with no industrial arts. This suggested that more semesters
of industrial arts unrelated to automechanics may have had little effect
on trade proficiency test scores.

Hypothesis 8 states there will be no positive linear relationship
between the industrial arts grade point average and number of semesters
of unrelated industrial arts of entering automechanics juniors. The
null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The industrial arts grade point averages for the groups became slightly higher as the number of semesters of unrelated industrial arts increased. The group with 5-6 semesters had the highest grade point average in the unrelated industrial arts courses.

Hypothesis 11 states there will be no significant positive correlation between the scores on the trade proficiency test and industrial arts grade point averages within each group of entering automechanics juniors with unrelated industrial arts. The null hypothesis for each group within this category was accepted.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for each of the groups within this category. The correlations between the two variables were: .156 for students with 1-2 semesters; .173 for students with 3-4 semesters; and .652 for students with 5-6 semesters. The latter correlation was associated with the highest mean grade point average and one of the lower group mean scores within the category. The group of students with the lowest correlation between the two variables had the lowest group mean score on the trade proficiency test and the lowest mean grade point average in the industrial arts courses.

The data for groups within this category suggested that neither higher industrial arts grade point averages nor more semesters of industrial arts had an effect on the trade proficiency test scores.

Related Plus Unrelated Industrial Arts Category. Data were not available for the group with 1-2 semesters of industrial arts related and unrelated to automechanics due to reasons previously stated.

Hypothesis 6 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and number of semesters of related plus unrelated industrial arts. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The groups with more semesters of related plus unrelated industrial arts had slightly higher group mean scores on the trade proficiency test than groups with fewer semesters of industrial arts. The group with 5-6 semesters of industrial arts related and unrelated to automechanics had the highest group mean score on the trade proficiency test. The group with no semesters of industrial arts scored almost as high as the group with 3-4 semesters.

Hypothesis 9 states there will be no positive linear relationship between the industrial arts grade point averages and number of semesters of related plus unrelated industrial arts of entering automechanics juniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. As the number of semesters of industrial arts increased the grade point averages of the groups became higher. The group with 5-6 semesters of related plus unrelated industrial arts had a higher grade point average in those courses than the group with 3-4 semesters.

Hypothesis 12 states there will be no significant positive correlation between the scores and industrial arts grade point averages within each group of entering automechanics juniors with related plus unrelated industrial arts. The null hypothesis was accepted for the group with 1-2 semesters of industrial arts and rejected for the group with 5-6 semesters of industrial arts.

There was a positive correlation, significant at the .05 level, between the variables concerned for the group with 5-6 semesters of related plus unrelated industrial arts. This group also had the highest mean industrial arts grade point average and the highest mean score on the trade proficiency test. There was a negative correlation between the variables concerned for the group with 3-4 semesters of related plus unrelated industrial arts. This group had the lowest mean industrial arts grade point average and the lowest group mean score on the trade proficiency test within the category. Although a negative correlation existed between the variables concerned for the group with 3-4 semesters, the groups with the higher industrial arts grade point average scored higher on the trade proficiency test. This phenomenon suggested that higher industrial arts grade point averages may have been influential on higher scores on the trade proficiency test.

Comparison of Group Mean Scores for Automechanics Juniors. Figure 2 compares group mean scores for all three categories of automechanics juniors. The two highest group mean scores were obtained by the groups with 1-2 semesters of industrial arts related to automechanics and the group with an accumulation of 5-6 semesters of industrial arts related and unrelated to automechanics. The group mean scores of the remaining groups were nearly the same as the group mean scores of groups with no industrial arts. Some of the groups with industrial arts experience scored lower on the trade proficiency test than groups with no industrial arts experience.

Diversity Among Senior Automechanics Students

Null hypotheses 13 through 15 state there will be no significant differences between the vocational knowledge of continuing automechanics seniors with no industrial arts and continuing automechanics seniors with different numbers of semesters of related, unrelated, or related plus unrelated industrial arts. Table IV presents the findings of the tests for differences among groups on these variables. There were no significant differences concerning vocational knowledge relative to previous types or numbers of semesters of industrial arts for the groups with related or unrelated industrial arts. The null hypotheses applicable to groups within these two categories were accepted.

A significant difference was indicated between the two groups categorized under related plus unrelated industrial arts. There were only two groups because some data were missing for reasons previously explained. The group with 5-6 semesters of industrial arts related and unrelated to automechanics displayed a significantly greater vocational knowledge of automechanics than the group with no industrial arts. However, a homogeneity of variance check on the groups made prior to the analysis of variance was also significant at the .05 level. Therefore, the difference in vocational knowledge could not be positively attributed to the previous industrial arts experience. The null hypotheses applicable to this category were also accepted.

Figure 3 presents the linear relationships between group mean scores on the trade proficiency test and the number of semesters of industrial arts and the linear relationships between industrial arts grade point averages and the number of semesters of industrial arts for automechanics seniors with related, unrelated, and related plus unrelated
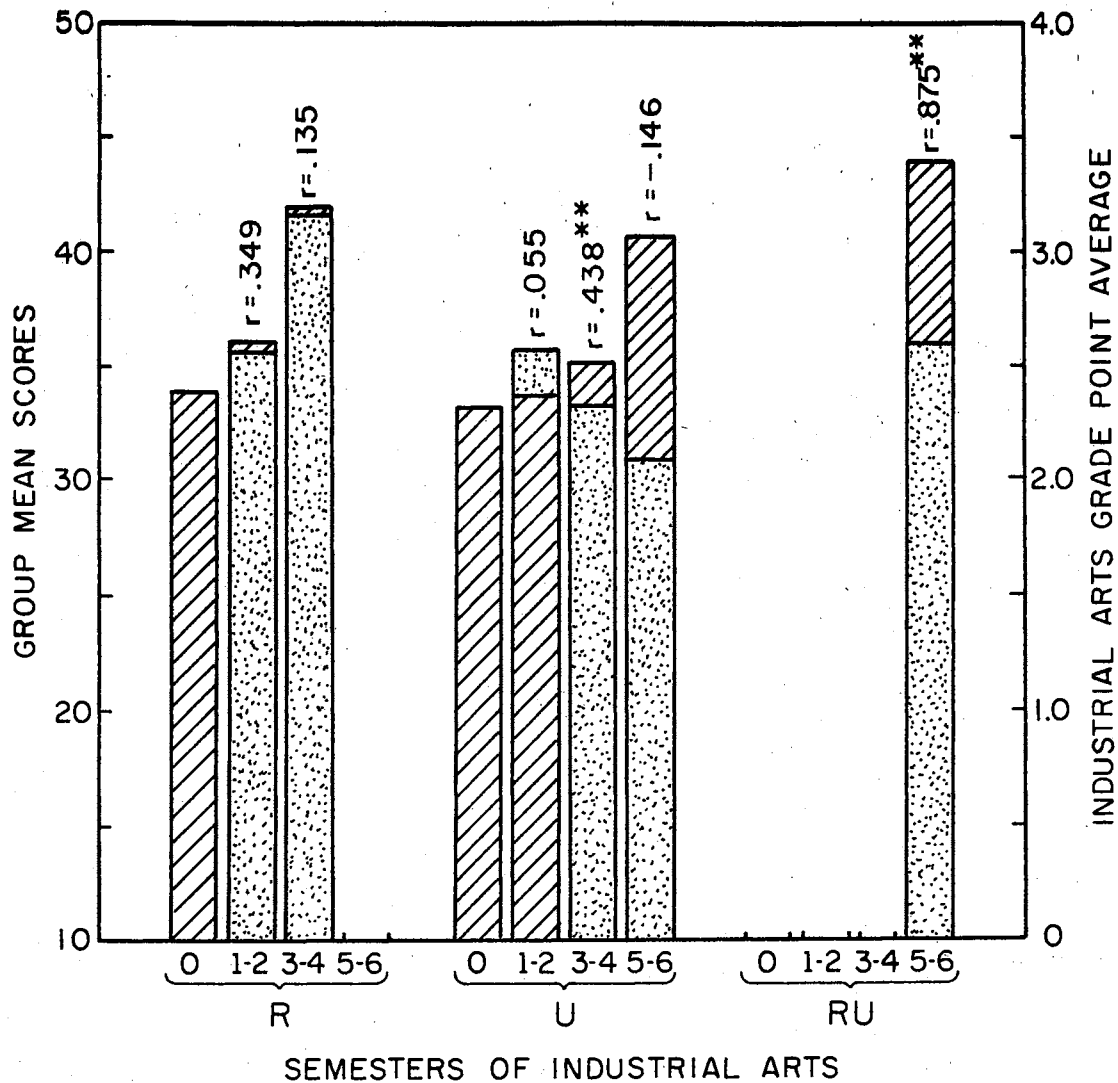
Figure 3. Relationships Between Descriptive Statistics for
Automechanics Seniors With Related (R), Unrelated
(U), or Related Plus Unrelated (RU) Industrial
Arts

industrial arts. The correlation between the scores on the trade pro-
ficiency test and industrial arts grade point averages within each group
is also indicated. Figures 4 through 6 compare juniors and seniors on
the basis of group mean scores and industrial arts grade point averages
by amount and type of industrial arts. Figure 7 compares the group mean
scores for all three categories of automechanics seniors.

TABLE IV

ANALYSIS OF VARIANCE ON TRADE PROFICIENCY TEST SCORES OF
VOCATIONAL AUTOMECHANICS SENIORS WITH RELATED,
UNRELATED, OR RELATED PLUS UNRELATED
INDUSTRIAL ARTS EXPERIENCE

Variable and Source of Variance	Sum of Squares	df	Mean Squares	F-Ratio
Related Industrial Arts				
Between Groups	323.10	2	161.55	2.35
Within Groups	8635.54	126	68.53	
Unrelated Industrial Arts				
Between Groups	268.38	3	89.46	1.28
Within Groups	8690.33	125	69.52	
Related Plus Unrelated Industrial Arts**				
Between Groups	431.76	1	437.76	6.38*
Within Groups	8518.57	126	67.60	

*Significant at the .05 level.

**Groups were heterogeneous at the .05 level of significance.

Figure 4. Comparison of Group Mean Scores and Industrial Arts
Grade Point Averages for Automechanics Juniors (J)
and Seniors (S) With Related Industrial Arts

Figure 5. Comparison of Group Mean Scores and Industrial Arts
          Grade Point Averages for Automechanics Juniors (J)
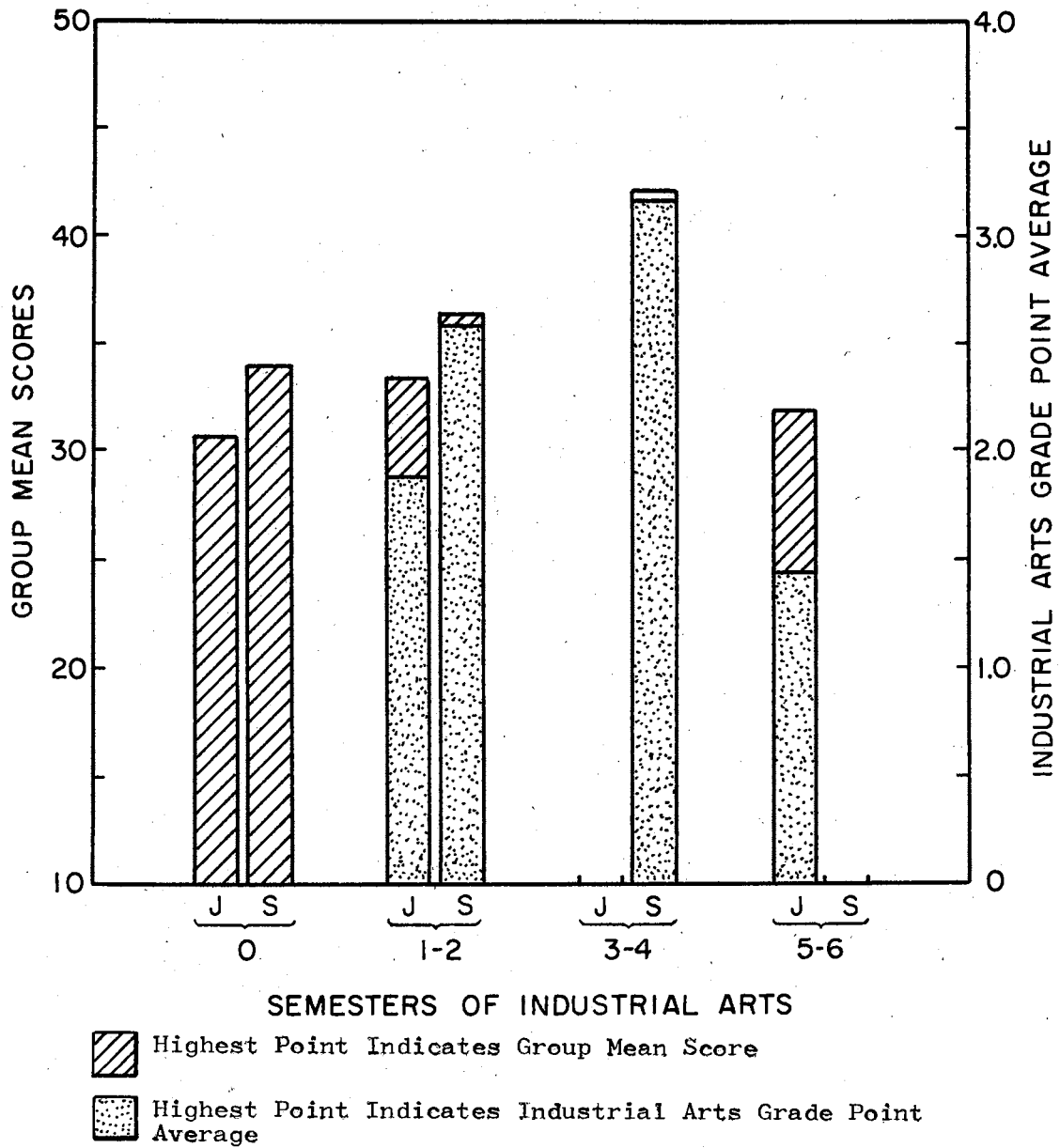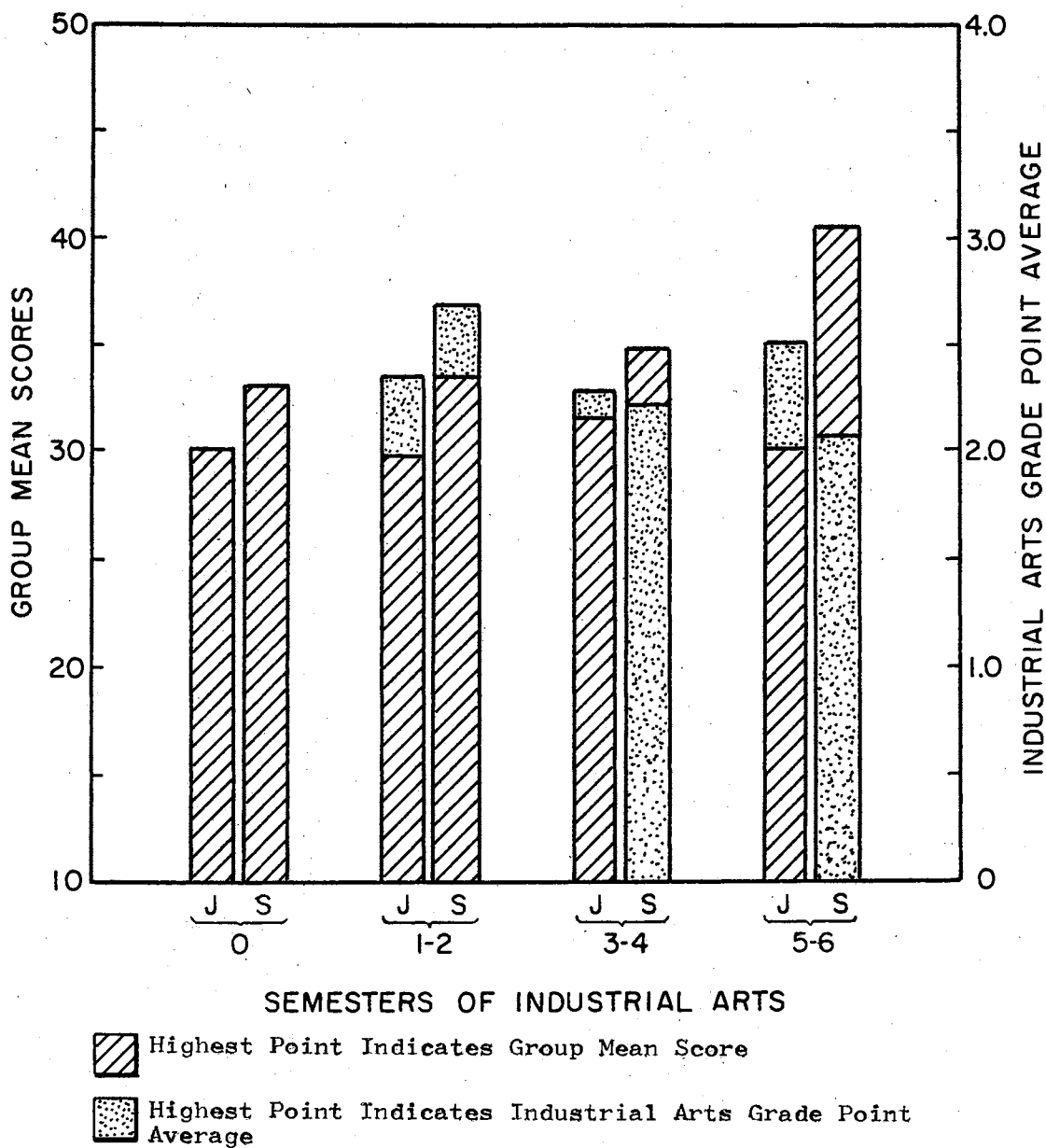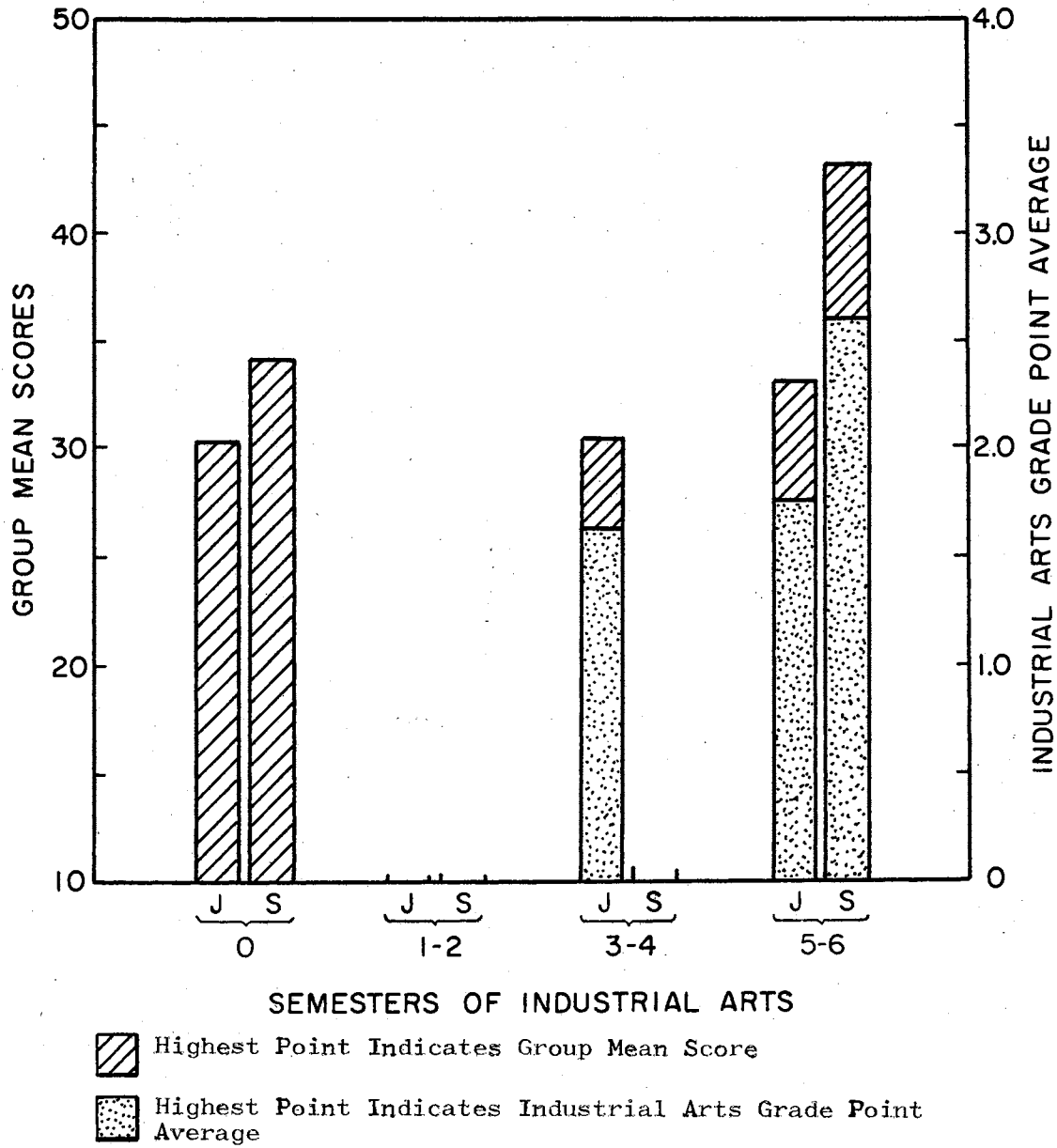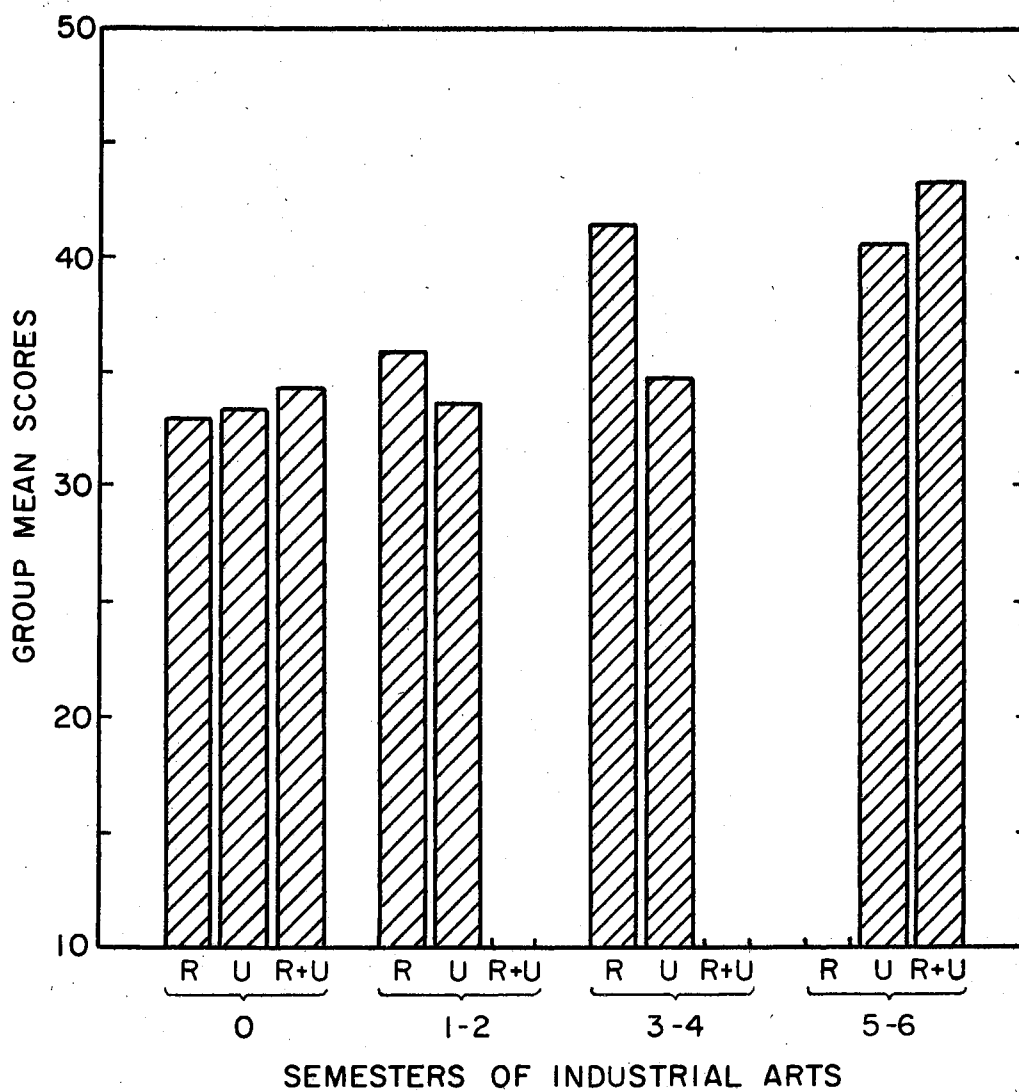   and Seniors (S) With Unrelated Industrial Arts

Figure 6. Comparison of Group Mean Scores and Industrial Arts
Grade Point Averages for Automechanics Juniors (J)
and Seniors (S) With Related Plus Unrelated
Industrial Arts

Figure 7. Comparison of Group Mean Scores for Automechanics Seniors With Related (R), Unrelated (U), and Related Plus Unrelated (RU) Industrial Arts

<u>Related Industrial Arts Category.</u> Data for the group with 5-6 semesters of related industrial arts were not available due to reasons previously explained.

Hypothesis 16 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of related industrial arts for continuing auto-mechanics seniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The available data indicated a tendency for group mean scores on the trade proficiency test to be higher for the groups with more industrial arts related to automechanics. However, the higher group mean scores could not be attributed entirely to more semesters of industrial arts because these two groups have had two semesters of instruction in vocational automechanics.

Hypothesis 19 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related industrial arts of continuing automechanics seniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The groups with more semesters of industrial arts had higher grade point averages in those courses.

Hypothesis 22 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing seniors with related industrial arts. The null hypothesis was accepted for each group within this category for which data were available.

There was no significant positive correlation between the variables concerned for the groups with 1-2 and 3-4 semesters of industrial arts related to automechanics. Although no significant correlation existed between the variables concerned, there was a tendency for the group with the highest industrial arts grade point average to score highest on the trade proficiency test. The group with 3-4 semesters had the highest mean industrial arts grade point average and the highest group mean score on the trade proficiency test.

Unrelated Industrial Arts Category. Hypothesis 17 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of unrelated industrial arts of continuing automechanics seniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The groups with more semesters of industrial arts unrelated to automechanics had a tendency to score higher on the trade proficiency test. It should be pointed out that the groups under discussion consisted of seniors who have had two semesters of instruction in vocational automechanics. The higher group mean scores on the trade proficiency test may have been influenced more by the two semesters of vocational instruction than more semesters of industrial arts unrelated to automechanics.

Hypothesis 20 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of unrelated industrial arts of continuing automechanics seniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. There was a tendency for the groups with more semesters of industrial arts to have lower grade point averages in those courses. The group with 5-6 semesters of industrial arts had the lowest grade point average in those courses.

Hypothesis 23 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing automechanics seniors with unrelated industrial arts. The null hypothesis was accepted for the groups with 1-2 and 5-6 semesters of industrial arts and rejected for the group with 3-4 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 3-4 semesters of industrial arts unrelated to automechanics. There was a negative correlation between the variables concerned for the group with 5-6 semesters of industrial arts. There was also a trend within this category for groups with lower industrial arts grade point averages to score higher on the trade proficiency test. The group with the negative correlation between the variables concerned had the highest group mean score on the trade proficiency test and the lowest industrial arts grade point average.

Related Plus Unrelated Industrial Arts Category. Data for the groups with 3-4 and 5-6 semesters of related plus unrelated industrial arts were not available due to reasons previously stated.

Hypothesis 18 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the

number of semesters of related plus unrelated industrial arts of continuing automechanics seniors.

Sufficient data to adequately examine the relationship between the groups on the stated variables were not available, consequently the null hypothesis could not be accepted or rejected. The group with 5-6 semesters of related plus unrelated industrial arts scored higher on the trade proficiency test than the group with no industrial arts. Again it should be pointed out that the higher group mean score of the group with 5-6 semesters of related plus unrelated industrial arts may have been due to two semesters of vocational instruction in automechanics.

Hypothesis 21 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related plus unrelated industrial arts of continuing automechanics seniors.

Sufficient data were not available for reasons previously stated to adequately examine the relationship between the variables concerned. The null hypothesis could not be accepted or rejected.

Hypothesis 24 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing automechanics seniors with related plus unrelated industrial arts. The null hypothesis was rejected for the group within this category for which data were available.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 5-6 semesters of industrial arts related and unrelated to automechanics. This group had the highest correlation coefficient between the variables concerned

and the highest group mean score among all groups of seniors within the three categories.

Comparison of Juniors and Seniors. A comparison between group mean scores on the trade proficiency test of juniors and seniors, Figures 4 through 6, showed that in most groups the seniors' group mean scores differed very little from the group mean scores of juniors although the seniors had received two semesters of instruction in vocational auto-mechanics and the juniors had not. There was an approximate ten point difference in group mean scores for four groups: seniors with 3-4 semesters of industrial arts related to automechanics and juniors with 5-6 semesters of industrial arts related to automechanics (Figure 4); and juniors and seniors with 5-6 semesters of industrial arts unrelated to automechanics (Figure 5). It is questionable whether, if either, industrial arts or two semesters of vocational automechanics was the contributing factor in the ten point difference.

A comparison of industrial arts grade point averages indicated that in only two instances did the grade point averages of seniors fall below that of juniors. These two groups, seniors with 3-4 and 5-6 semesters of industrial arts unrelated to automechanics, also had generally higher group mean scores on the trade proficiency test (Figure 5). In two instances, industrial arts grade point averages became lower as the amount of industrial arts increased: juniors with 1-2 and 5-6 semesters of industrial arts related to automechanics (Figure 4) and seniors with 3-4 and 5-6 semesters of industrial arts unrelated to automechanics (Figure 5).

<u>Comparison of Group Mean Scores of Automechanics Seniors.</u> All
bars in this graph showed a tendency for a slight increase in group mean
scores on the trade proficiency test as the amount of industrial arts
increased regardless of whether it was related, unrelated, or a combina-
tion of related plus unrelated industrial arts. There was a noticeable
increase in group mean scores on the trade proficiency test between the
groups with 1-2 and 3-4 semesters of industrial arts related to
automechanics.

Diversity Among Junior Carpentry Students

Null hypotheses 25 through 27 state there will be no significant
differences between the vocational knowledge of entering carpentry ju-
niors with no industrial arts and entering carpentry juniors with
different numbers of semesters of related, unrelated, or related plus
unrelated industrial arts. Table V presents the findings of the test
for differences among groups on these variables. There were no signifi-
cant differences concerning vocational knowledge between the groups
categorized under related and related plus unrelated industrial arts
experience. The null hypotheses applicable to these groups were
accepted.

A significant difference was indicated between the groups catego-
rized under unrelated industrial arts. The group with 5-6 semesters of
unrelated industrial arts had a greater mean score on the trade pro-
ficiency test indicating a significantly greater vocational knowledge
than one of the other groups. However, a homogeneity of variance check
made on the groups prior to the analysis of variance was significant at
the .05 level. Therefore, the difference in vocational knowledge could

not be attributed positively to the previous industrial arts experience. The null hypothesis applicable to this category was accepted.

Figure 8 presents the linear relationships between group mean scores on the trade proficiency test and the number of semesters of industrial arts and the linear relationships between the industrial arts grade point averages and the number of semesters of industrial arts for carpentry juniors with related, unrelated, and related plus unrelated industrial arts. The correlation between scores on the trade proficiency test and industrial arts grade point averages within each group is also indicated. Figure 9 compares group mean scores for all three categories of carpentry juniors.

TABLE V

ANALYSIS OF VARIANCE ON TRADE PROFICIENCY TEST SCORES OF VOCATIONAL
CARPENTRY JUNIORS WITH RELATED, UNRELATED, OR RELATED
PLUS UNRELATED INDUSTRIAL ARTS EXPERIENCE

Variable and Source of Variance	Sum of Squares	df	Mean Squares	F-Ratio
Related Industrial Arts				
Between Groups	55.39	3	18.46	0.77
Within Groups	2643.63	111	23.81	
Unrelated Industrial Arts**				
Between Groups	235.66	3	78.55	3.53*
Within Groups	2463.36	111	22.19	
Related Plus Unrelated Industrial Arts				
Between Groups	87.42	2	43.71	1.87
Within Groups	2585.05	111	23.28	

*Significant at the .05 level.
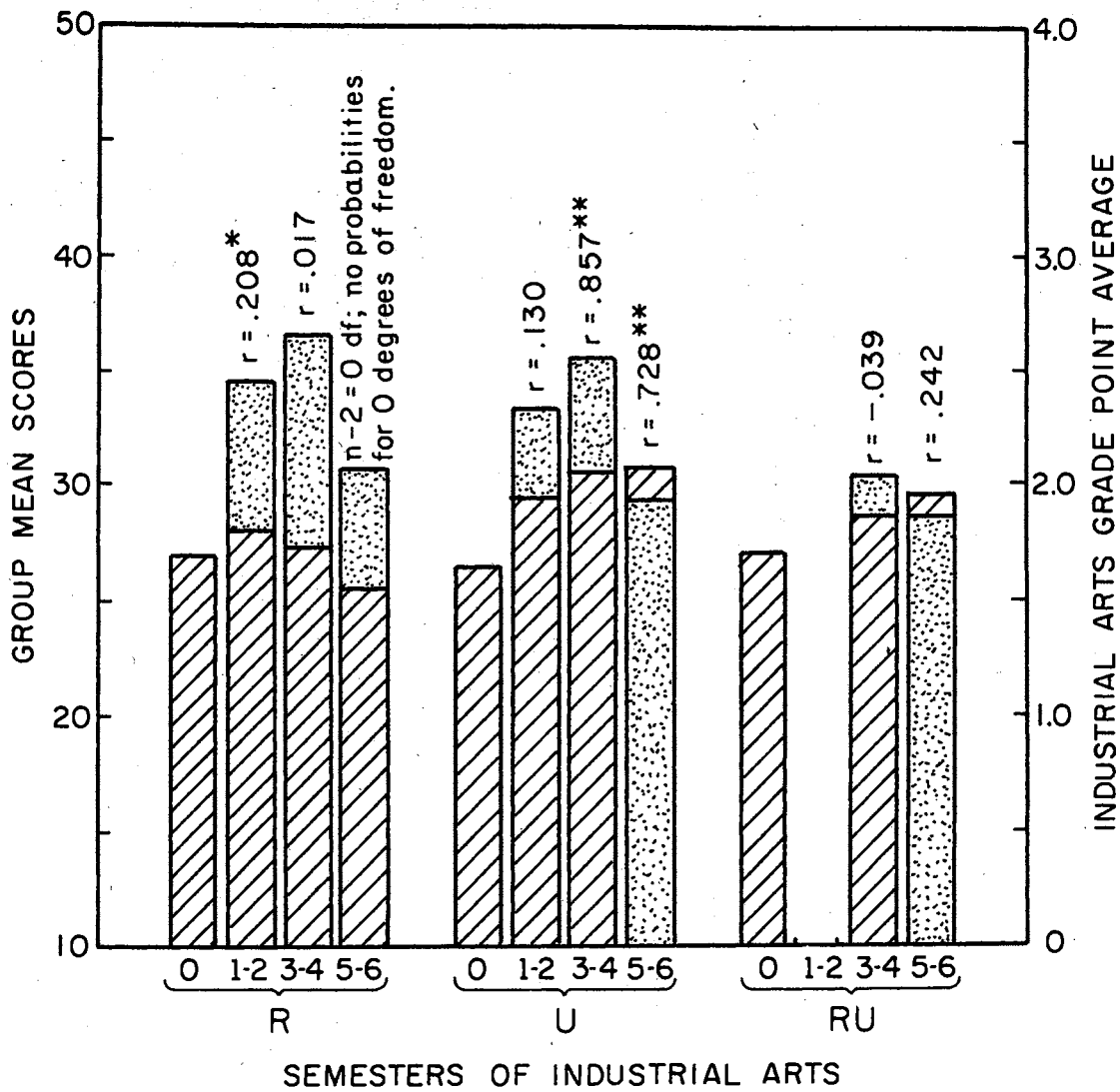
**Groups were heterogeneous at the .05 level of significance.

Figure 8. Relationships Between Descriptive Statistics for Carpentry Juniors With Related (R), Unrelated (U), or Related Plus Unrelated (RU) Industrial Arts

GROUP MEAN SCORES

INDUSTRIAL ARTS GRADE POINT AVERAGE

r = .208* r = .017 n-2 = 0 df; no probabilities for 0 degrees of freedom.

r = .130 r = .857** r = .728**

r = -.039 r = .242

O 1-2 3-4 5-6   O 1-2 3-4 5-6   O 1-2 3-4 5-6
R   U   RU

SEMESTERS OF INDUSTRIAL ARTS

Highest Point Indicates Group Mean Score

Highest Point Indicates Industrial Arts Grade Point Average

r = Correlation Coefficient Between Test Scores and Industrial Arts Grade Point Averages Within Each Group

*Significant at the .05 level
**Significant at less than the .05 level

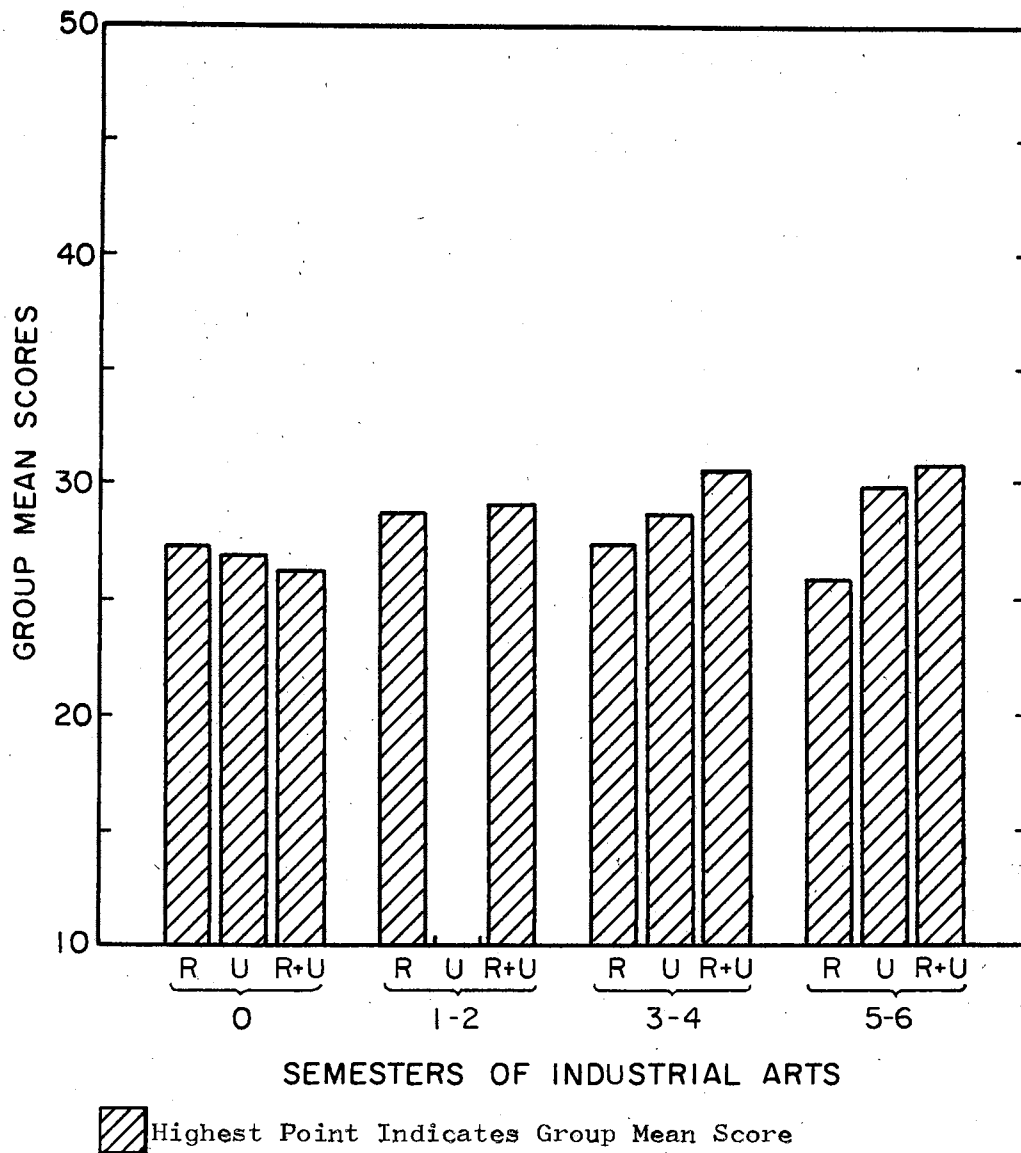Figure 9. Comparison of Group Mean Scores for Carpentry Juniors
With Related (R), Unrelated (U), or Related Plus
Unrelated (RU) Industrial Arts

Related Industrial Arts Category. Hypothesis 28 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of related industrial arts of entering carpentry juniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables concerned. An increase in semesters of industrial arts was associated with both higher and lower group mean scores. The group with 1-2 semesters scored higher on the trade proficiency test than the group with no industrial arts. There was a tendency for the groups with more than 1-2 semesters of industrial arts related to carpentry to score progressively lower on the trade proficiency test.

Hypothesis 31 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related industrial arts of entering carpentry juniors. The null hypothesis was accepted.

A nonmonotonic relationship existed between the variables concerned. An increase in semesters of industrial arts was associated with both higher and lower industrial arts grade point averages. The group with 3-4 semesters of industrial arts related to carpentry had the highest grade point average in those courses. The remaining two groups had lower industrial arts grade point averages.

Hypothesis 34 states there will be no significant positive correlation between the scores on the trade proficiency test and industrial arts grade point averages within each group of entering carpentry juniors with related industrial arts. The null hypothesis was accepted for the groups with 3-4 and 5-6 semesters of industrial arts and rejected for the group with 1-2 semesters of industrial arts.

There was a positive correlation, significant at the .05 level, between the variables concerned for the group with 1-2 semesters of related industrial arts. This group had the highest mean score on the trade proficiency test within this category. The lowest group mean score was obtained by the group with the lowest industrial arts grade point average. The group with the highest industrial arts grade point average had next to the lowest group mean score and the lowest correlation between the variables concerned. Except for the group with 3-4 semesters, there was a tendency for groups with lower industrial arts grade point averages to score lower on the trade proficiency test. The group with 5-6 semesters of related industrial arts included only two students. The formula n-2 yields zero degrees of freedom for which there are no tabled probabilities. The level of significance could not be determined.

Unrelated Industrial Arts Category. Hypothesis 29 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of unrelated industrial arts of entering carpentry juniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The group mean scores became higher as the number of semesters of industrial arts became higher. The group with 5-6 semesters of industrial arts unrelated to carpentry had the highest group mean score in this category.

Hypothesis 32 states there will be no positive linear relationship between the industrial arts grade point averages and the number of

semesters of unrelated industrial arts of entering carpentry juniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables concerned. An increase in the number of semesters of industrial arts was associated with both higher and lower grade point averages in those courses. The group with 3-4 semesters of industrial arts unrelated to carpentry had the highest grade point average in those courses. The group with 5-6 semesters of industrial arts courses unrelated to carpentry had the lowest grade point average in those courses.

Hypothesis 35 states there will be no significant positive correlation between scores on the trade proficiency test and the industrial arts grade point averages within each group of entering carpentry juniors with unrelated industrial arts. The null hypothesis for the group with 1-2 semesters of industrial arts was accepted and rejected for the groups with 3-4 and 5-6 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the groups with 3-4 and 5-6 semesters of industrial arts unrelated to carpentry. The group with 3-4 semesters had the highest correlation between the variables concerned and the highest grade point average. The group with 5-6 semesters had the second highest correlation between the variables concerned and the highest group mean score on the trade proficiency test. It was also characterized by having the lowest industrial arts grade point average.

Related Plus Unrelated Industrial Arts Category. Data for the group with 1-2 semesters of related plus unrelated industrial arts were not available for reasons previously stated.

Hypothesis 30 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of related plus unrelated industrial arts of entering carpentry juniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. The groups with more semesters of industrial arts had a tendency to score progressively higher on the trade proficiency test. The group with 5-6 semesters of related plus unrelated industrial arts had the highest group mean score within this category.

Hypothesis 33 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related plus unrelated industrial arts of entering carpentry juniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. Available data for the groups indicated a decline in industrial arts grade point averages associated with more semesters of industrial arts. The group with 3-4 semesters of related plus unrelated industrial arts had the highest industrial arts grade point average within this category. The group with 5-6 semesters of related plus unrelated industrial arts had the lowest industrial arts grade point averages.

Hypothesis 36 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of entering carpentry juniors with related plus unrelated industrial arts. The null hypothesis was accepted for each of the groups within this category for which data were available.

There was no significant positive correlation between the variables concerned for the groups with 3-4 and 5-6 semesters of industrial arts related and unrelated to carpentry. The group with the highest industrial arts grade point average had the lowest group mean score on the trade proficiency test. Conversely, the group with the lowest industrial arts grade point average had the highest group mean score on the trade proficiency test.

Comparison of Group Mean Scores for Carpentry Juniors. An examination of the bars in Figure 9 revealed that three groups had an accumulation of either 1-2, 3-4, or 5-6 semesters of industrial arts related and unrelated to carpentry. These three groups had a higher group mean score on the trade proficiency test than any other group of carpentry juniors. This suggested that a combination of industrial arts related and unrelated to carpentry may have had more influence on the students' vocational knowledge of carpentry than various amounts of industrial arts related or unrelated to carpentry.

Diversity Among Senior Carpentry Students

Null hypotheses 37 through 39 state there will be no significant difference between the vocational knowledge of continuing carpentry seniors with no industrial arts and continuing carpentry seniors with different numbers of semesters of related, unrelated, or related plus unrelated industrial arts. Table VI presents the findings of the tests for differences among groups on these variables. There were no significant differences concerning vocational knowledge relative to previous types or number of semesters of industrial arts experience. The null hypotheses applicable to these groups were accepted.

TABLE VI

ANALYSIS OF VARIANCE ON TRADE PROFICIENCY TEST SCORES OF
VOCATIONAL CARPENTRY SENIORS WITH RELATED, UNRELATED,
OR RELATED PLUS UNRELATED INDUSTRIAL ARTS
EXPERIENCE

Variable and Source of Variance	Squares	df	Squares	F-Ratio
Related Industrial Arts				
Between Groups	13.85	2	6.92	0.1805
Within Groups	1342.69	35	38.36	
Unrelated Industrial Arts				
Between Groups	5.50	1	5.50	0.14
Within Groups	1393.36	36	38.70	
Related Plus Unrelated Industrial Arts				
Between Groups	13.77	2	6.88	0.17
Within Groups	1395.29	36	38.75	

*Significant at the .05 level.

**Groups were heterogeneous at the .05 level of significance.

Figure 10 presents the linear relationships between group mean
scores on the trade proficiency test and the number of semesters of
industrial arts and the linear relationships between the industrial arts
grade point averages and number of semesters of industrial arts for car-
pentry seniors with related, unrelated, and related plus unrelated
industrial arts. The correlation between the scores on the trade pro-
ficiency test and industrial arts grade point averages within each group
is also indicated. Figures 11 through 13 compare juniors and seniors on
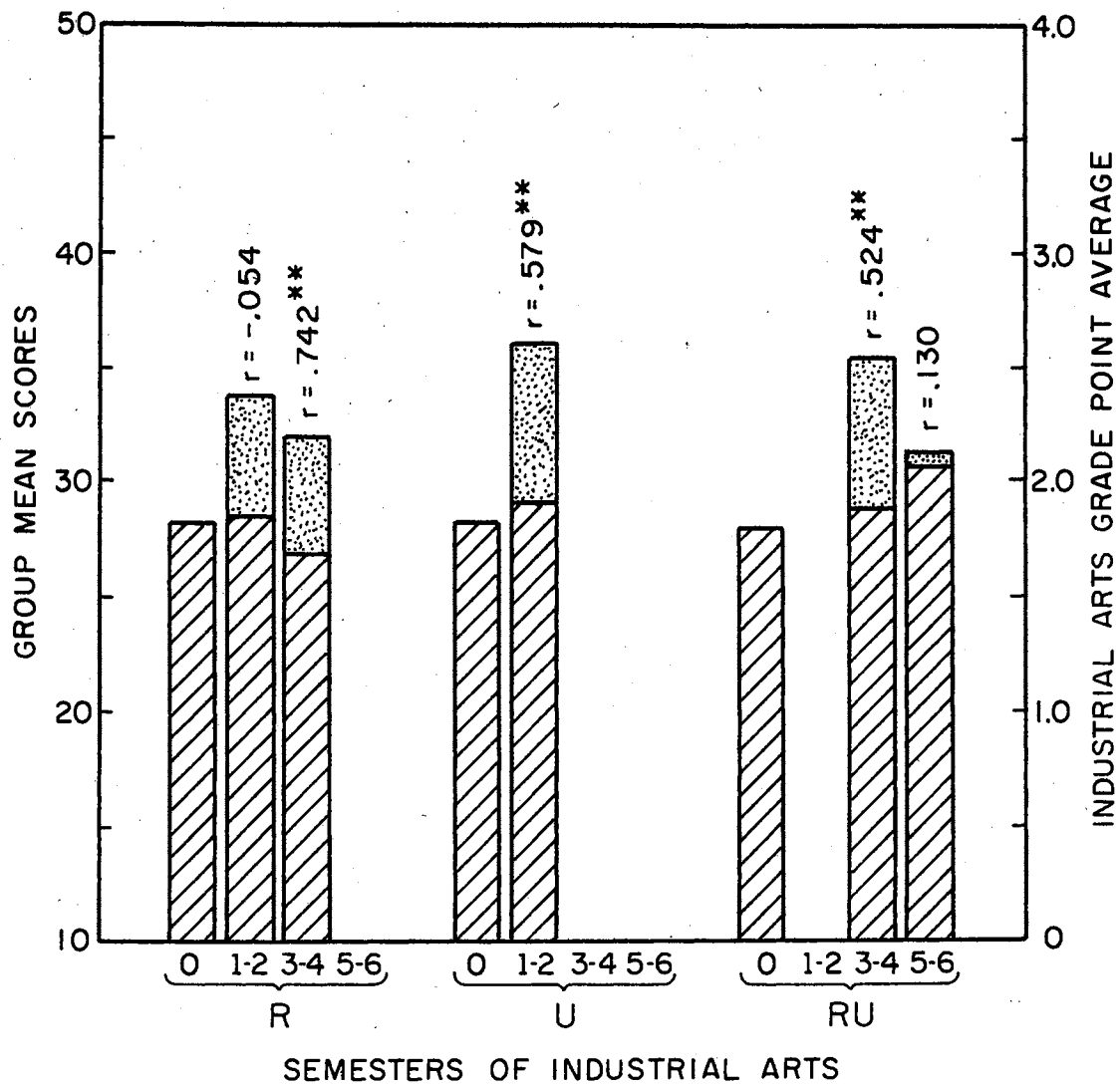
SEMESTERS OF INDUSTRIAL ARTS

Highest Point Indicates Group Mean Score

Highest Point Indicates Industrial Arts Grade Point Average

r = Correlation Coefficient Between Test Scores and Industrial Arts Grade Point Averages Within Each Group

*Significant at the .05 level
**Significant at less than the .05 level

Figure 10. Relationships Between Descriptive Statistics for Carpentry Seniors With Related (R), Unrelated (U), or Related Plus Unrelated (RU) Industrial Arts

Figure 11. Comparison of Group Mean Scores and Industrial Arts
Grade Point Averages for Carpentry Juniors (J)
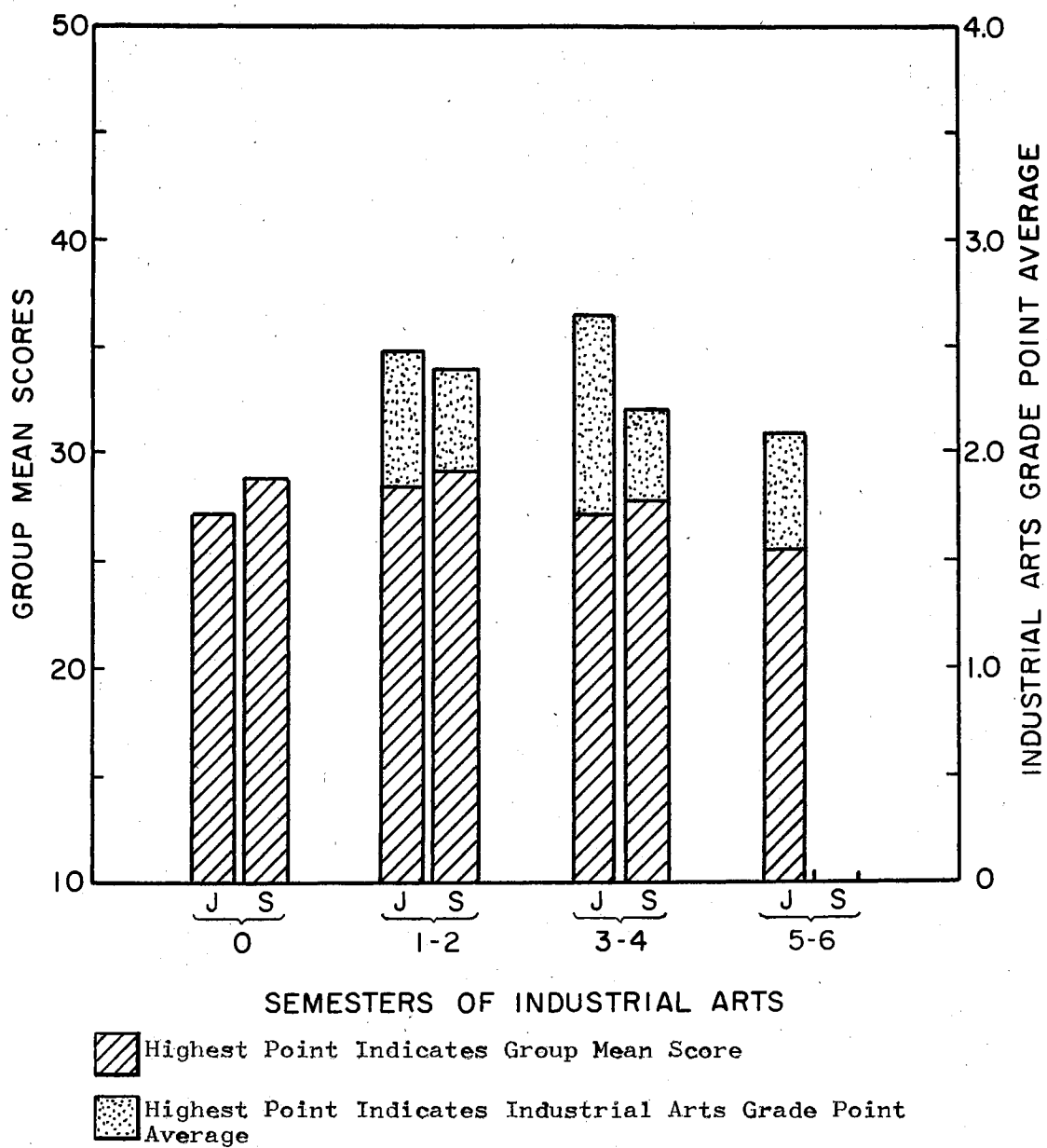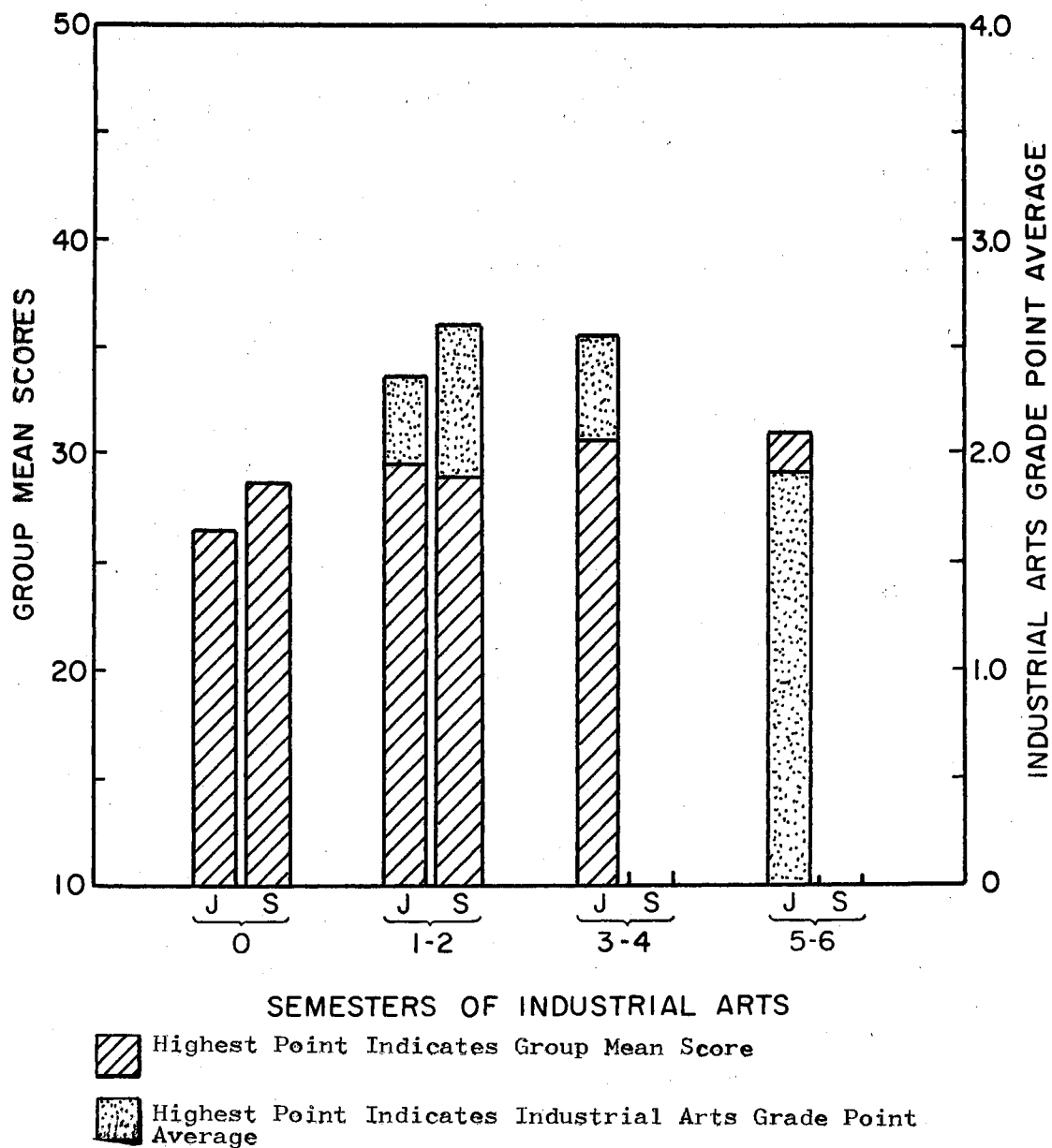and Seniors (S) With Related Industrial Arts

Figure 12.   Comparison of Group Mean Scores and Industrial
Arts Grade Point Averages for Carpentry
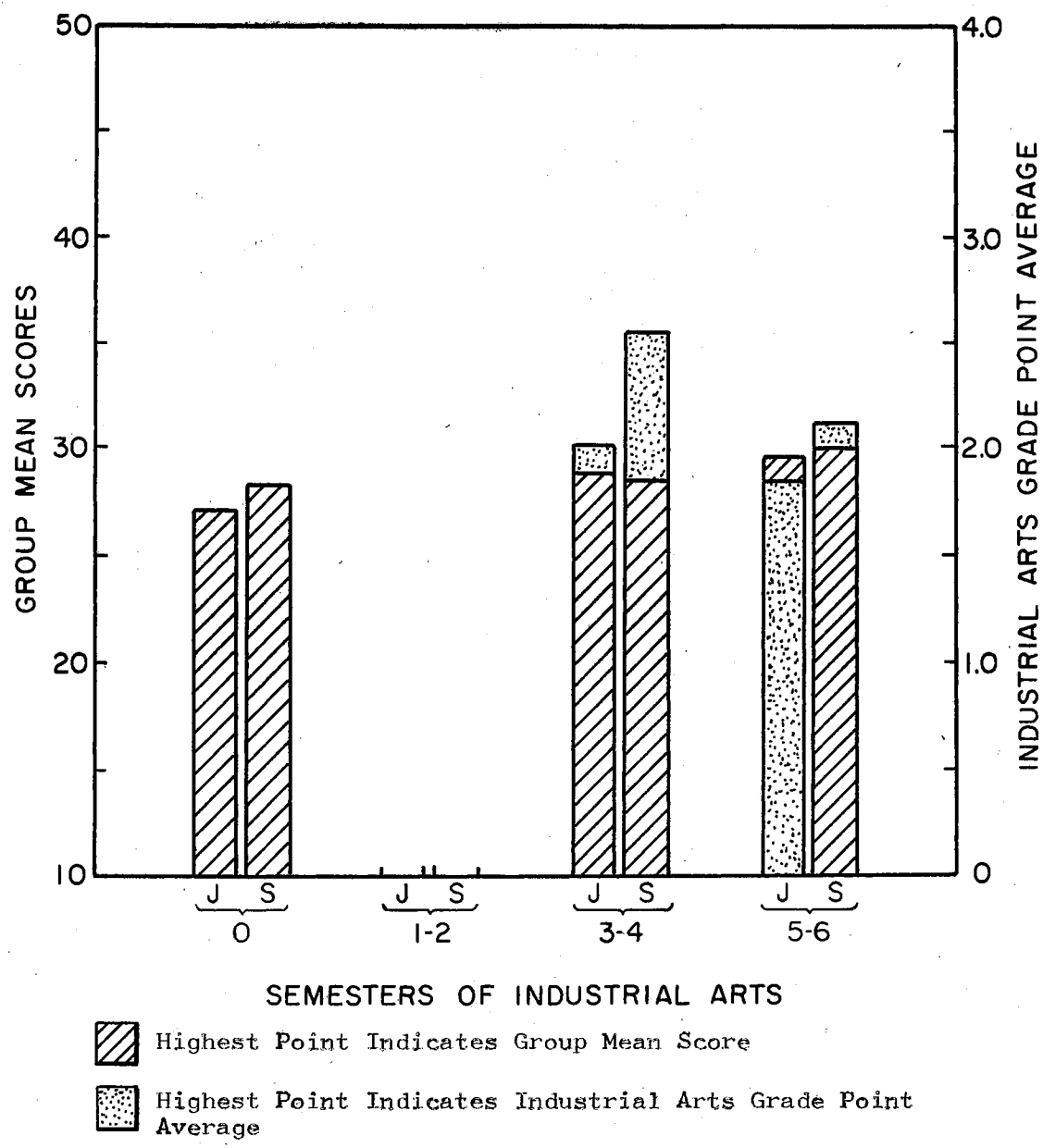Juniors (J) and Seniors (S) With Unrelated
Industrial Arts

Figure 13. Comparison of Group Mean Scores and Industrial
Arts Grade Point Averages for Carpentry
Juniors (J) and Seniors (S) With Related
Plus Unrelated Industrial Arts

the basis of group mean scores and industrial arts grade point averages
by amount and type of industrial arts. Figure 14 compares the group
mean scores for all three categories of carpentry seniors.

Related Industrial Arts Category. Data were not available for the
group with 5-6 semesters of industrial arts related to carpentry for
reasons previously stated.

Hypothesis 40 states there will be no positive linear relationship
between the group mean scores on the trade proficiency test and the
number of semesters of related industrial arts of continuing carpentry
seniors. The null hypothesis was accepted.

The available data revealed a nonmonotonic relationship between
the variables concerned. Data for the groups indicated that an increase
in the number of semesters of industrial arts related to carpentry was
associated with both higher and lower group mean scores on the trade
proficiency test. The group with 1-2 semesters scored highest on the
trade proficiency test. The group with 3-4 semesters scored lower on
the trade proficiency test than the group with no industrial arts.

Hypothesis 43 states there will be no positive linear relationship
between the industrial arts grade point averages and number of semesters
of related industrial arts of continuing carpentry seniors. The null
hypothesis was accepted.

The available data revealed a negative linear relationship between
the variables concerned. A decline in industrial arts grade point
averages was associated with more semesters of industrial arts. The
group with the most industrial arts related to carpentry had the lowest
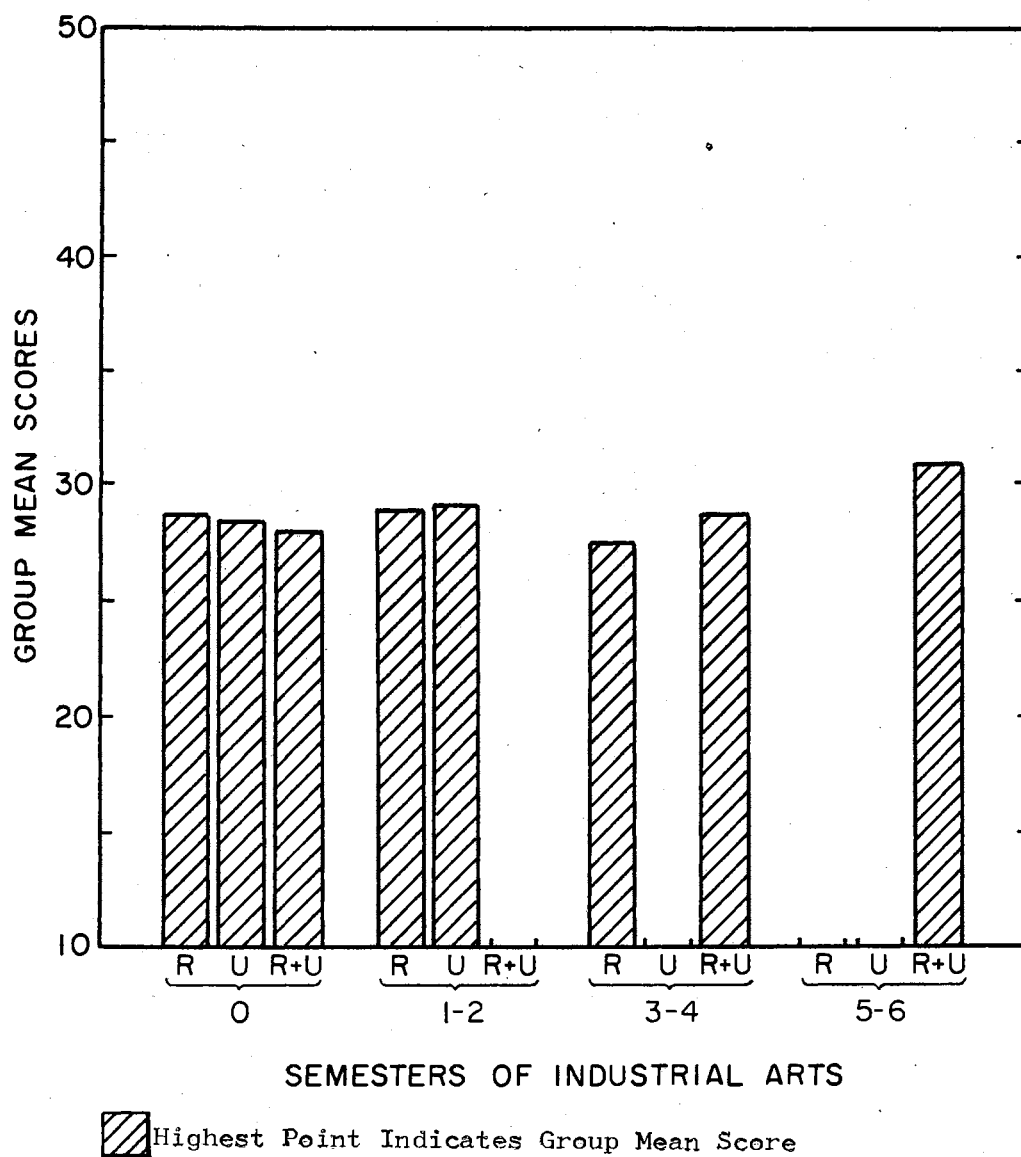grade point average in those courses.

Figure 14. Comparison of Group Mean Scores for Carpentry
Seniors With Related (R), Unrelated (U), or
Related Plus Unrelated (RU) Industrial Arts

Hypothesis 46 states there will be no significant positive corre-
lation between the scores on the trade proficiency test and the indus-
trial arts grade point averages within each group of continuing
carpentry seniors with related industrial arts. The null hypothesis
was accepted for the group with 1-2 semesters of industrial arts and
rejected for the group with 3-4 semesters of industrial arts.

There was a positive correlation, significant at less than the .05
level, between the variables concerned for the group with 3-4 semesters
of industrial arts related to carpentry. The group with 1-2 semesters
of industrial arts had a negative correlation between the variables con-
cerned. There was a tendency for the group with the higher industrial
arts grade point average to score higher on the trade proficiency test.

Unrelated Industrial Arts Category. Data were not available to
form groups with 3-4 and 5-6 semesters of unrelated industrial arts for
reasons previously stated.

Hypothesis 41 states there will be no positive linear relationship
between the group mean scores on the trade proficiency test and the
number of semesters of unrelated industrial arts of continuing carpen-
try seniors. The null hypothesis was rejected.

Although based only on data for two groups, there was a positive
linear relationship between the variables concerned. The group with
1-2 semesters of industrial arts scored slightly higher than the group
with no industrial arts.

Hypothesis 44 states there will be no positive linear relationship
between the industrial arts grade point averages and the number of
semesters of unrelated industrial arts of continuing carpentry seniors.

Enough data were not available upon which to base acceptance or rejection of the null hypothesis.

Hypothesis 47 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing carpentry seniors with unrelated industrial arts. The null hypothesis was rejected for the group within this category for which data were available.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 1-2 semesters of industrial arts unrelated to carpentry.

Related Plus Unrelated Industrial Arts Category. Data for the group with 1-2 semesters of industrial arts related and unrelated to carpentry were not available due to reasons stated previously.

Hypothesis 42 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of related plus unrelated industrial arts of continuing carpentry seniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables concerned. There was a tendency for the group mean scores on the trade proficiency test to become higher as the number of semesters of industrial arts increased. The group with 5-6 semesters of industrial arts related and unrelated to carpentry had the highest group mean score.

Hypothesis 45 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related and unrelated industrial arts of continuing carpentry seniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. There was a tendency for groups with more semesters of industrial arts to have lower grade point averages in those courses. The group with 5-6 semesters of industrial arts related and unrelated to carpentry had the lowest grade point average in those courses.

Hypothesis 48 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing carpentry seniors with related plus unrelated industrial arts. The null hypothesis was accepted for the group with 5-6 semesters of industrial arts and rejected for the group with 3-4 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 3-4 semesters of industrial arts related and unrelated to carpentry. This group had the highest industrial arts grade point average of the two groups but the lowest group mean score on the trade proficiency test. The group with the lowest industrial arts grade point average had the highest group mean score on the trade proficiency test.

Comparison of Juniors and Seniors. A comparison of group mean scores for all groups of juniors and seniors revealed very little difference even though the seniors had received two semesters of instruction in vocational carpentry. The highest group mean scores on the trade proficiency test were obtained by the groups of juniors with 3-4 and 5-6 semesters of industrial arts unrelated to vocational carpentry (Figure 12), and the group of seniors with 5-6 semesters of industrial arts related and unrelated to vocational carpentry (Figure 13). Both of the groups with 5-6 semesters of industrial arts had

relatively low grade point averages in the industrial arts courses taken. In this instance the highest group mean scores were obtained by groups which had relatively low grade point averages in the industrial arts courses that were related or unrelated to carpentry and the maximum semesters of industrial arts.

A comparison of grade point averages for carpentry juniors with industrial arts related and unrelated to carpentry indicated extremely similar tendencies for the grade point average to rise and fall as the amount of industrial arts increased (Figures 11 and 12). In both categories the groups of juniors with 3-4 semesters had a higher industrial arts grade point average than the groups of juniors with 1-2 semesters of industrial arts. As the number of semesters of industrial arts increased beyond 3-4, a tendency existed for the grade point average to be lower. The same phenomenon occurred in groups of juniors and seniors with industrial arts related and unrelated to carpentry (Figure 13).

Comparison of Group Mean Scores for Carpentry Seniors. A comparison of group mean scores for all groups of seniors revealed very little difference relative to types or amounts of previous industrial arts. The group of seniors with 5-6 semesters of industrial arts related and unrelated to carpentry had a slightly higher group mean score than other groups of seniors.

Diversity Among Junior Machine Shop Students

Null hypotheses 49 through 51 state there will be no significant differences between the vocational knowledge of entering machine shop juniors with no industrial arts and entering machine shop juniors with different numbers of semesters of related, unrelated, or related plus

unrelated industrial arts. Table VII presents the findings of the test for differences among groups on the variables. There were no significant differences concerning vocational knowledge relative to previous types or numbers of semesters of industrial arts experience. The null hypotheses applicable to these groups were accepted.

TABLE VII

ANALYSIS OF VARIANCE ON TRADE PROFICIENCY TEST SCORES OF
VOCATIONAL MACHINE SHOP JUNIORS WITH RELATED,
UNRELATED, OR RELATED PLUS UNRELATED
INDUSTRIAL ARTS EXPERIENCE

Variable and Source of Variance	Sum of Squares	df	Mean Squares	F-Ratio
Related Industrial Arts				
Between Groups	22.44	1	22.44	0.62
Within Groups	5604.22	156	35.92	
Unrelated Industrial Arts				
Between Groups	69.82	3	23.27	0.63
Within Groups	5680.10	156	36.41	
Related Plus Unrelated Industrial Arts				
Between Groups	22.45	2	11.22	0.30
Within Groups	5727.18	156	36.71	

*Significant at the .05 level.

**Groups were heterogeneous at the .05 level of significance.

Figure 15 presents the linear relationships between group mean scores on the trade proficiency test and the number of semesters of industrial arts and the linear relationships between industrial arts grade point averages and number of semesters of industrial arts for entering machine shop juniors with related, unrelated, and related plus unrelated industrial arts. The correlation between the scores on the trade proficiency test and industrial arts grade point averages within each group is also indicated. Figure 16 compares the group mean scores for all three categories of machine shop juniors.

Related Industrial Arts Category. Data were not available for the groups with 3-4 and 5-6 semesters of industrial arts related to machine shop for reasons previously stated.

Hypothesis 52 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of related industrial arts of entering machine shop juniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. Data for the groups indicated a decline in group mean scores associated with more semesters of industrial arts. The group with 1-2 semesters of industrial arts related to machine shop had a lower group mean score than the group with no industrial arts.

Hypothesis 55 states there will be no positive linear relationship between the industrial arts grade point averages and the number of semesters of related industrial arts of entering machine shop juniors.

Sufficient data were not available for reasons previously stated to adequately examine the relationship between the variables concerned. The null hypothesis could not be accepted or rejected.
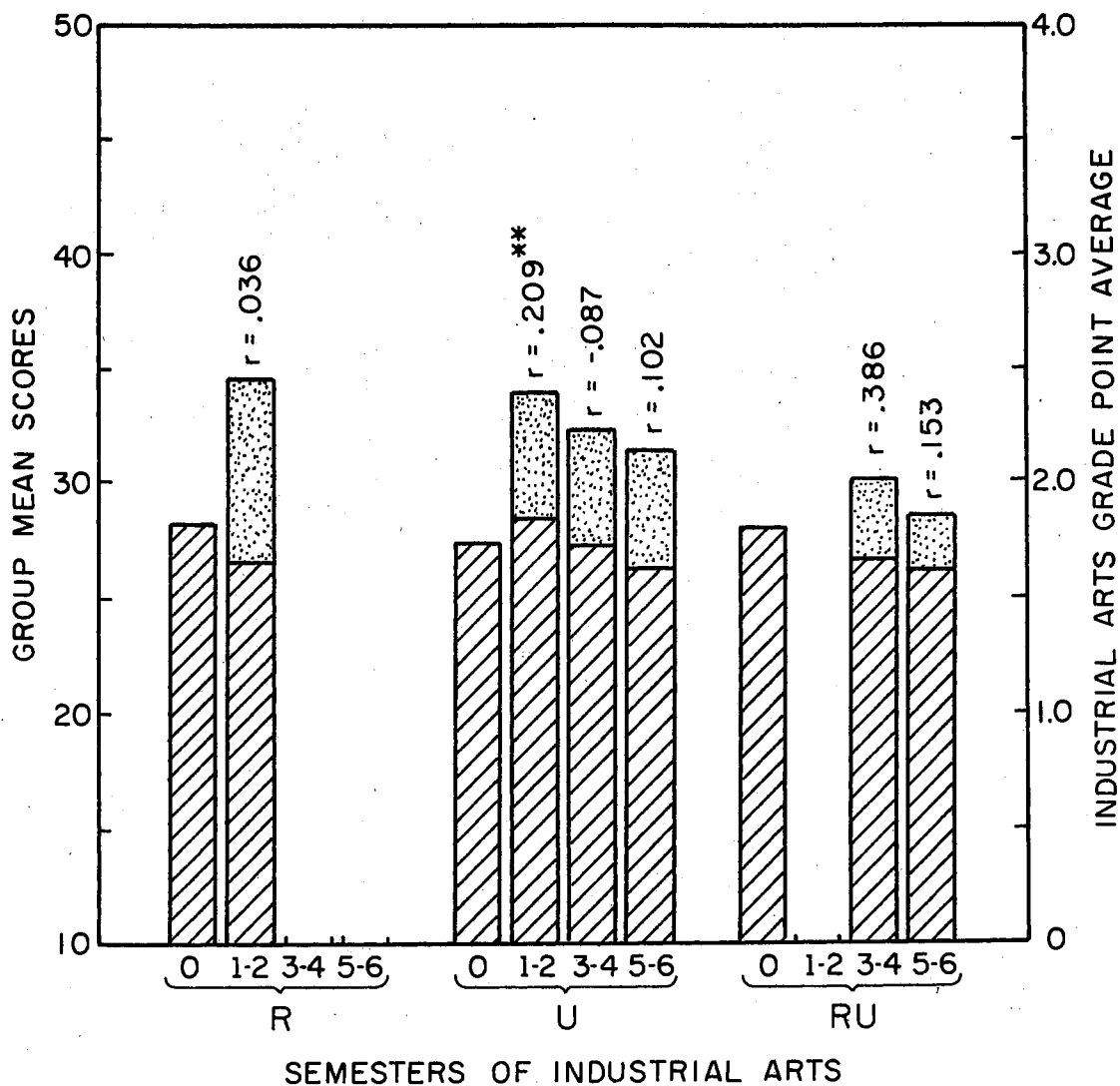
Figure 15. Relationships Between Descriptive Statistics for
Machine Shop Juniors With Related (R), Unrelated
(U), or Related Plus Unrelated (RU) Industrial
Arts
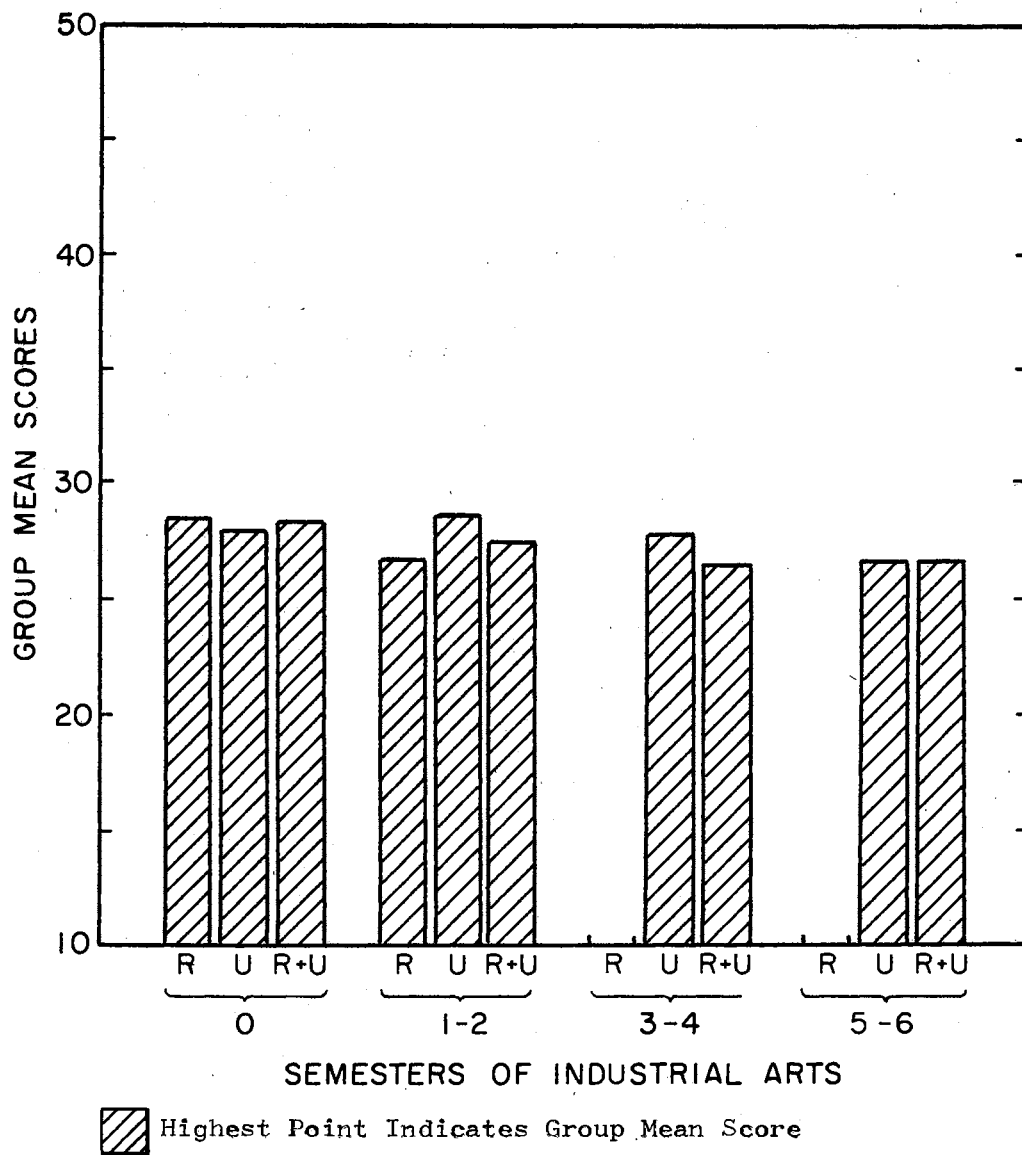
Figure 16. Comparison of Group Mean Scores for Machine
Shop Juniors With Related (R), Unrelated
(U), or Related Plus Unrelated (RU)
Industrial Arts

Hypothesis 58 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of entering machine shop juniors with related industrial arts. The null hypothesis was accepted for the group within this category for which data were available. There was no significant positive correlation between the variables concerned for the group with 1-2 semesters of industrial arts related to machine shop. Although this group had the highest grade point average of all machine shop juniors between the variables concerned, it had one of the lowest group mean scores on the trade proficiency test.

Unrelated Industrial Arts Category. Hypothesis 53 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of unrelated industrial arts of entering machine shop juniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables concerned. An increase in the number of semesters of industrial arts was associated with both higher and lower group mean scores. The group with 1-2 semesters had the highest group mean score on the trade proficiency test. The groups with 3-4 and 5-6 semesters of unrelated industrial arts scored progressively lower on the trade proficiency test. The group with 5-6 semesters of unrelated industrial arts scored lower than the group with no industrial arts.

Hypothesis 56 states there will be no positive linear relationship between the industrial arts grade point averages and the number of

semesters of unrelated industrial arts of entering machine shop juniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. The industrial arts grade point averages of the groups became progressively lower as the number of semesters of unrelated industrial arts became higher. The group with 5-6 semesters of industrial arts unrelated to machine shop had the lowest grade point average in those courses.

Hypothesis 59 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of entering machine shop juniors with unrelated industrial arts. The null hypothesis was accepted for the groups with 3-4 and 5-6 semesters of industrial arts and rejected for the group with 1-2 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 1-2 semesters of industrial arts unrelated to machine shop. This group had the highest group mean score on the trade proficiency test and the highest grade point average in the industrial arts courses. A negative correlation occurred between the variables concerned for the group with 3-4 semesters of industrial arts. The group with 5-6 semesters of industrial arts had the lowest industrial arts grade point average and the lowest group mean score within this category. There was a trend within this category for groups with low industrial arts grade point averages to score low on the trade proficiency test.

Related Plus Unrelated Industrial Arts Category. Data for the group with 1-2 semesters were not available due to reasons previously stated.

Hypothesis 54 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of related plus unrelated industrial arts of entering machine shop juniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. The group mean scores on the trade proficiency test became progressively lower as the number of semesters of related plus unrelated industrial arts became higher. The group with no industrial arts had the highest group mean score. The group with 5-6 semesters of industrial arts scored lower than the group with no industrial arts.

Hypothesis 57 states there will be no positive linear relationship between the industrial arts grade point averages and number of semesters of related plus unrelated industrial arts of entering machine shop juniors. The null hypothesis was accepted.

There was a negative linear relationship between the variables concerned. The groups with more semesters of related plus unrelated industrial arts tended to have lower grade point averages in those courses. The group with 5-6 semesters of related plus unrelated industrial arts had the lowest industrial arts grade point average.

Hypothesis 60 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of entering machine shop juniors with related plus unrelated industrial arts. The null

hypothesis was accepted for each group within this category for which data were available.

There was no significant positive correlation between the variables concerned for the groups with 3-4 and 5-6 semesters of industrial arts related and unrelated to machine shop. The group with 3-4 semesters of industrial arts had the highest industrial arts grade point average and the highest group mean score on the trade proficiency test. The group with 5-6 semesters of industrial arts had the lowest industrial arts grade point average and the lowest group mean score on the trade proficiency test. The data again indicated a tendency for groups with higher grade point averages to score higher on the trade proficiency test.

Comparison of Group Mean Scores for Machine Shop Juniors. The data in this figure revealed that only the group with 1-2 semesters of industrial arts unrelated to machine shop scored higher on the trade proficiency test than juniors with no industrial arts. The remainder of the groups scored lower on the trade proficiency test regardless of the amount or type of industrial arts experience.

Diversity Among Senior Machine Shop Students

Null hypotheses 61 through 63 state there will be no significant differences between the vocational knowledge of continuing machine shop seniors with no industrial arts and continuing machine shop seniors with different numbers of semesters of related, unrelated, or related plus unrelated industrial arts. Table VIII presents the findings of the tests for differences among groups on these variables. There were no significant differences concerning vocational knowledge relative to

previous types or numbers of semesters of industrial arts experience.

The null hypotheses applicable to these groups were accepted.

TABLE VIII

ANALYSIS OF VARIANCE ON TRADE PROFICIENCY TEST SCORES OF
VOCATIONAL MACHINE SHOP SENIORS WITH RELATED,
UNRELATED, OR RELATED PLUS UNRELATED
INDUSTRIAL ARTS EXPERIENCE

Variable and Source of Variance	Sum of Squares	df	Mean Squares	F-Ratio
Related Industrial Arts				
Between Groups	97.37	2	48.68	1.14
Within Groups	2966.59	70	42.37	
Unrelated Industrial Arts				
Between Groups	29.01	3	9.67	0.22
Within Groups	3035.26	70	43.36	
Related Plus Unrelated Industrial Arts				
Between Groups	11.56	1	11.56	0.27
Within Groups	2942.10	71	41.43	

*Significant at the .05 level.

**Groups were heterogeneous at the .05 level of significance.

Figure 17 presents the linear relationships between group mean
scores on the trade proficiency test and number of semesters of indus-
trial arts and the linear relationships between industrial arts grade
point averages and number of semesters of industrial arts for continuing
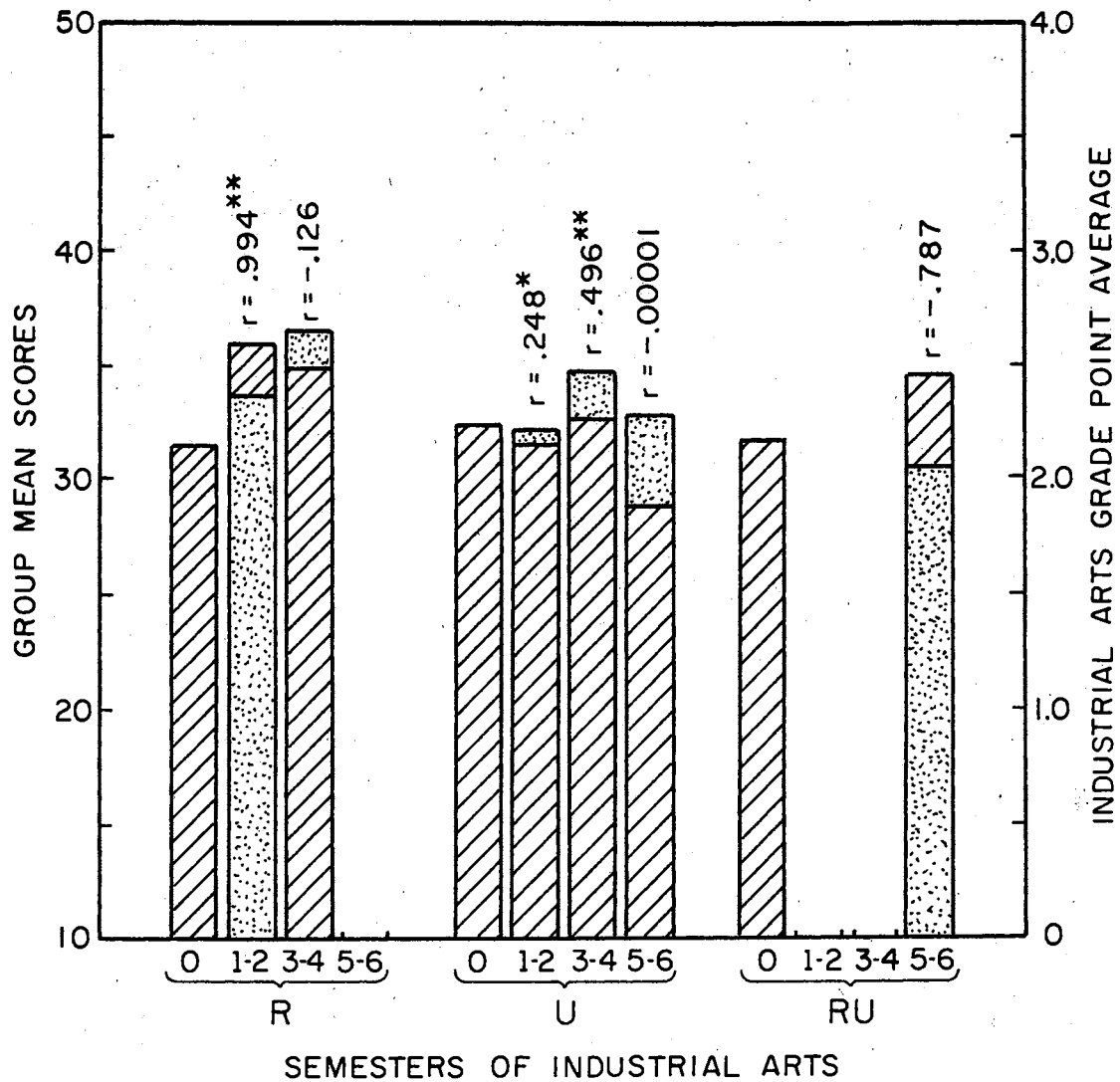
Figure 17. Relationships Between Descriptive Statistics for
Machine Shop Seniors With Related (R),
Unrelated (U), or Related Plus Unrelated (RU)
Industrial Arts

machine shop seniors with related, unrelated, and related plus unre-
lated industrial arts. The correlation between the scores on the trade
proficiency test and the industrial arts grade point averages within
each group is also indicated. Figures 19 through 20 compare juniors and
seniors on the basis of group mean scores and industrial arts grade
point averages by amount and type of industrial arts. Figure 21 com-
pares the group mean scores for all three categories of machine shop
seniors.

Related Industrial Arts Category. Data were not available for the
group with 5-6 semesters of related industrial arts for reasons
previously stated.

Hypothesis 64 states there will be no positive linear relationship
between the group mean scores on the trade proficiency test and number
of semesters of related industrial arts of continuing machine shop
seniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables con-
cerned. An increase in the number of semesters of industrial arts was
associated with both higher and lower group mean scores. The group with
1-2 semesters of related industrial arts scored higher than the group
with no industrial arts. The group with 3-4 semesters scored lower than
the group with 1-2 semesters of industrial arts.

Hypothesis 67 states there will be no positive linear relationship
between the industrial arts grade point averages and the number of
semesters of related industrial arts of continuing machine shop seniors.
The null hypothesis was rejected.

There was a positive linear relationship between the variables
concerned. The trend was for the groups with more semesters of

Figure 18. Comparison of Group Mean Scores and Industrial
Arts Grade Point Averages for Machine Shop
Juniors (J) and Seniors (S) With Related
Industrial Arts
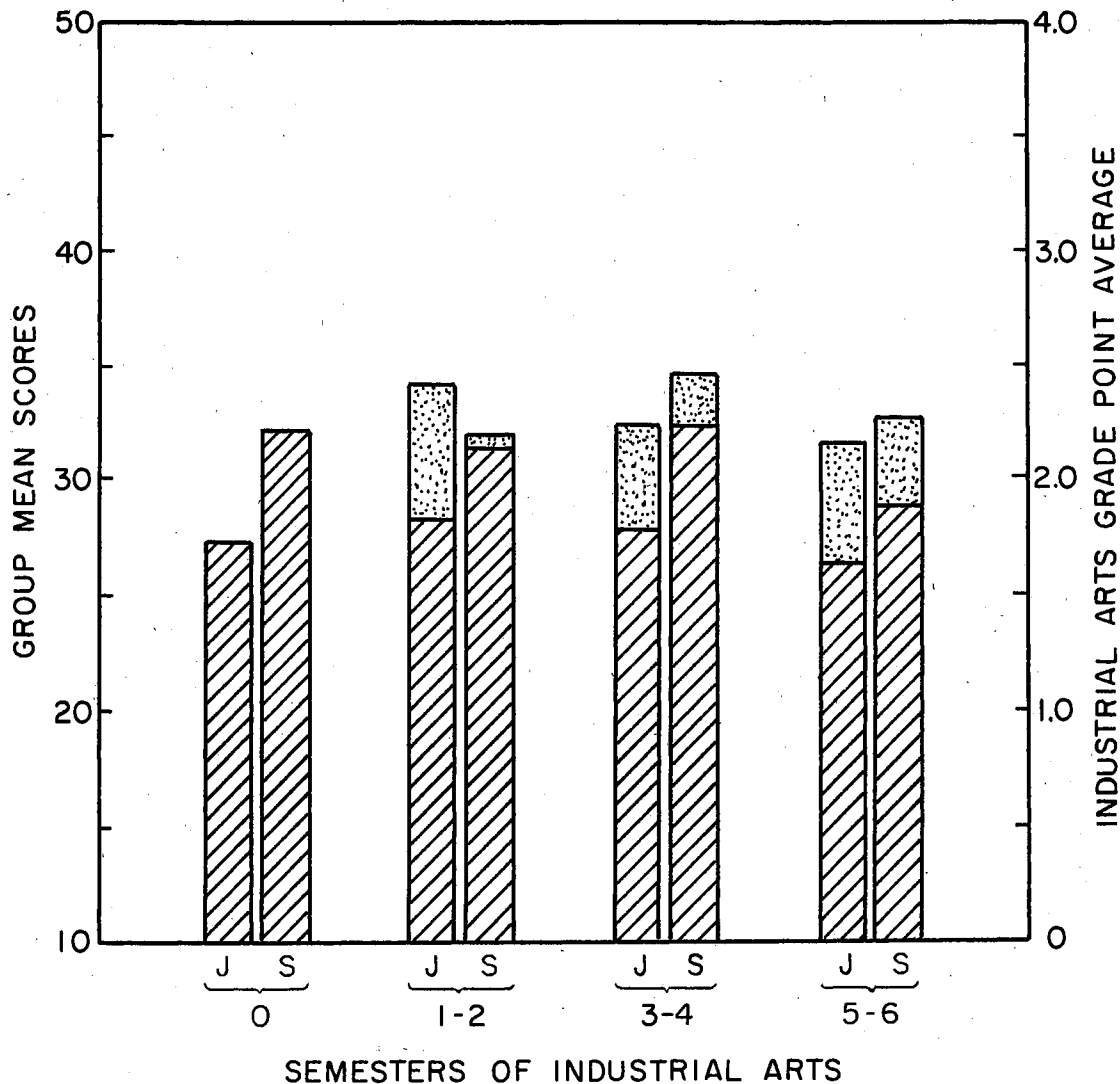
Figure 19. Comparison of Group Mean Scores and Industrial Arts
Grade Point Averages for Machine Shop Juniors (J)
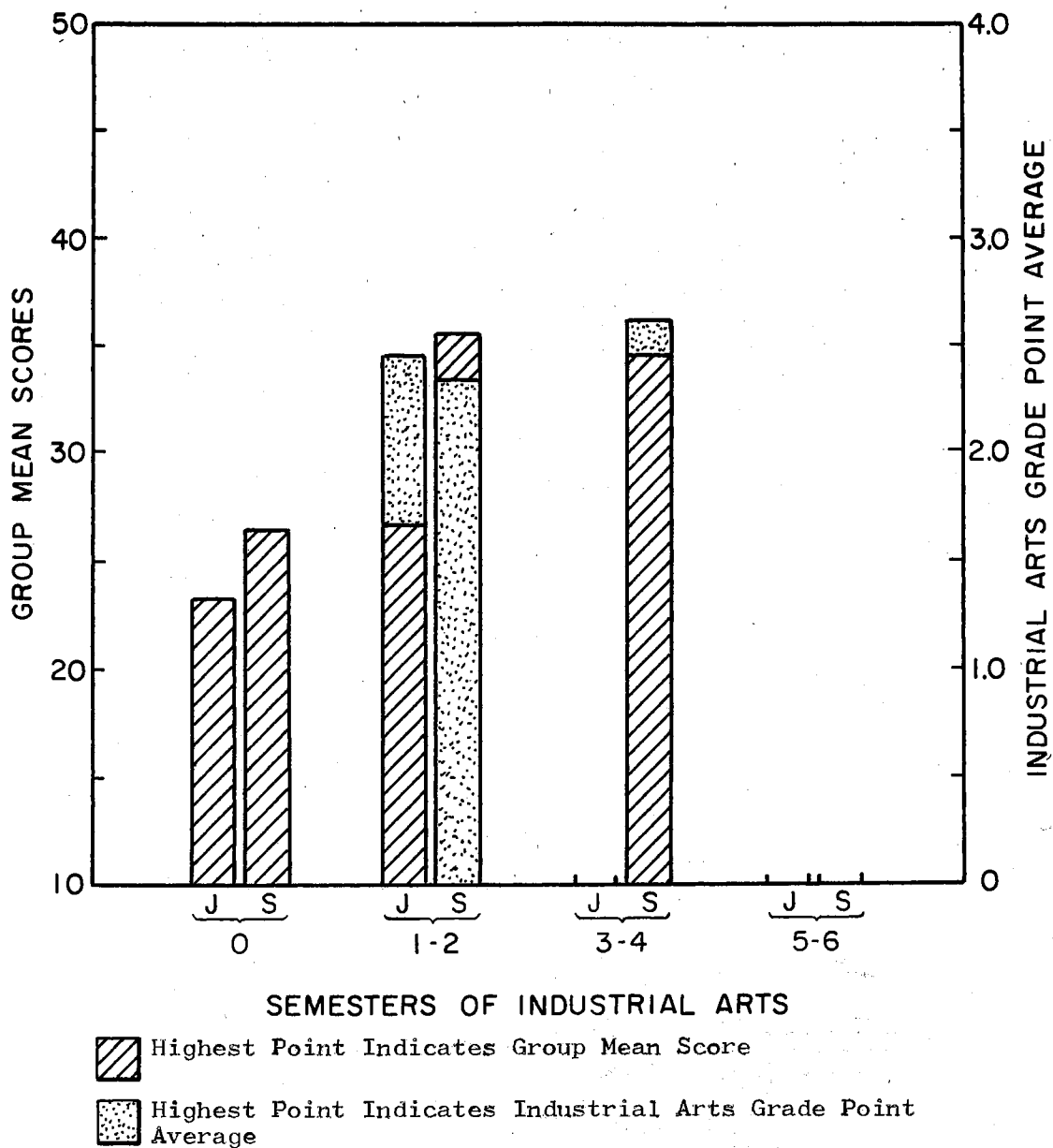and Seniors (S) With Unrelated Industrial Arts
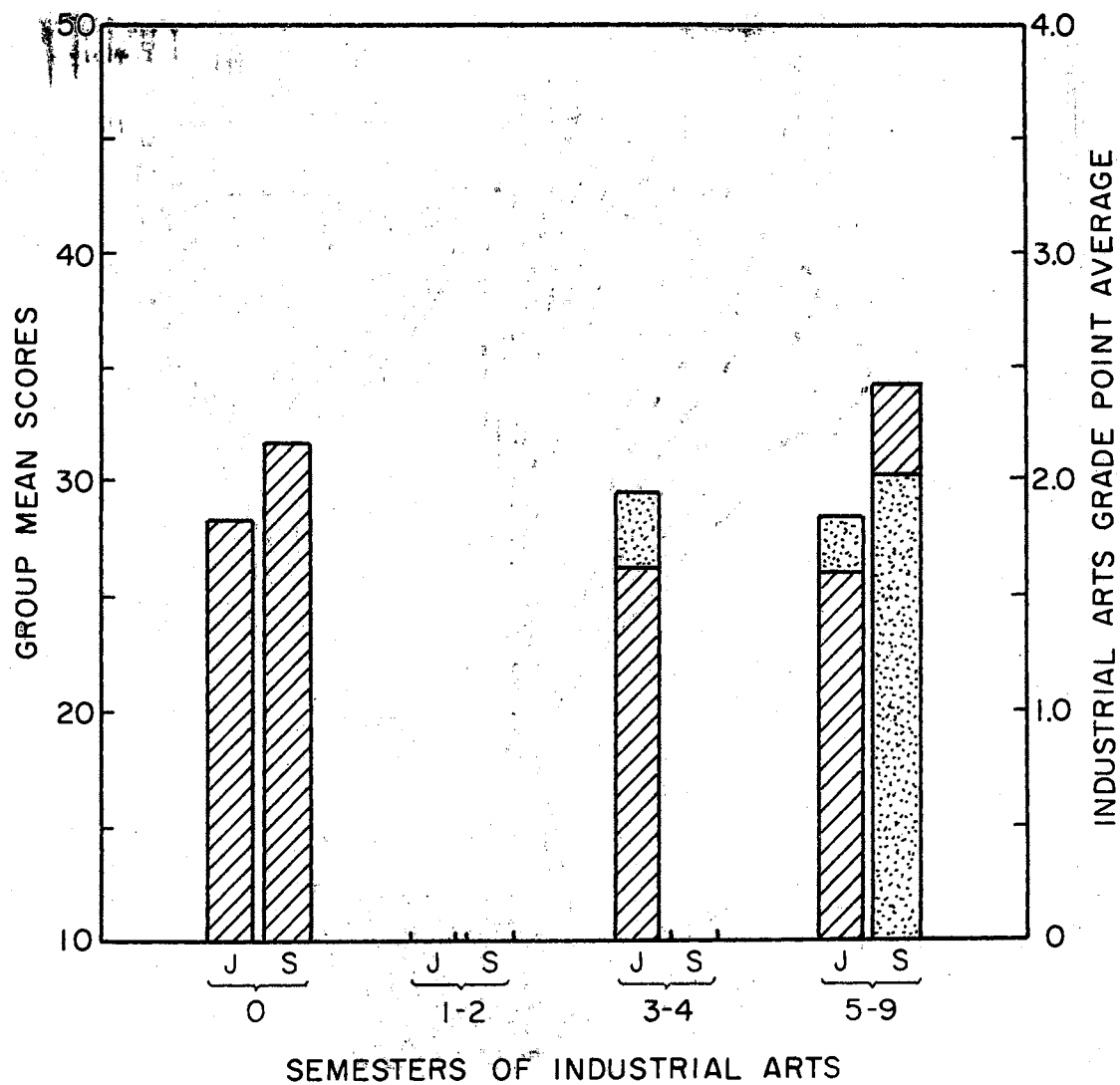
Figure 20. Comparison of Group Mean Scores and Industrial
Arts Grade Point Averages for Machine Shop
Juniors (J) and Seniors (S) With Related
Plus Unrelated Industrial Arts
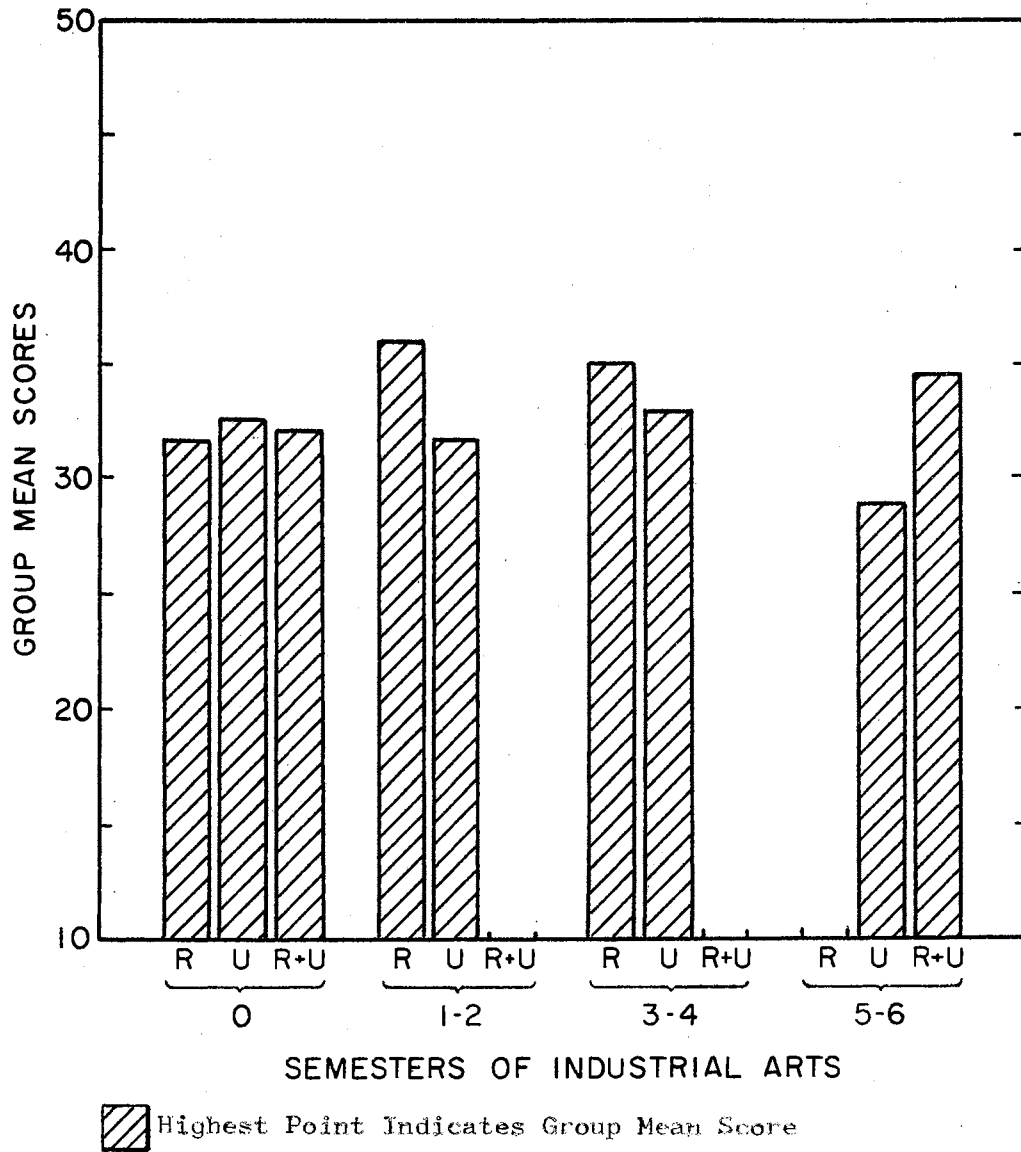
Figure 21. Comparison of Group Mean Scores for Machine
Shop Seniors With Related (R), Unrelated
(U), or Related Plus Unrelated (RU)
Industrial Arts

related industrial arts to have higher grade point averages in those courses.

Hypothesis 70 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing machine shop seniors with related industrial arts. The null hypothesis was accepted for the group with 5-6 semesters of industrial arts and rejected for the group with 3-4 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 1-2 semesters of industrial arts related to machine shop. This group had the highest group mean score on the trade proficiency test but the lowest grade point average in the industrial arts courses. There was a negative correlation between the variables concerned for the group with 3-4 semesters of industrial arts related to machine shop. This group had the highest industrial arts grade point average but the lowest group mean score on the trade proficiency test within this category.

Unrelated Industrial Arts Category. Hypothesis 65 states there will be no positive linear relationship between the group mean scores on the trade proficiency test and the number of semesters of unrelated industrial arts of continuing machine shop seniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables concerned. An increase in the number of semesters of industrial arts was associated with both higher and lower group mean scores on the trade proficiency test. The groups with no industrial arts and 3-4 semesters of unrelated industrial arts had the highest group mean scores. The

groups with 1-2 and 5-6 semesters had the lowest group mean scores. The group with 5-6 semesters of unrelated industrial arts had the lowest group mean score within this category.

Hypothesis 68 states there will be no positive linear relationship between industrial arts grade point averages and the number of semesters of unrelated industrial arts of continuing machine shop seniors. The null hypothesis was accepted.

There was a nonmonotonic relationship between the variables concerned. An increase in the number of semesters of industrial arts was associated with both higher and lower grade point averages in those courses. The group with 3-4 semesters of unrelated industrial arts had a higher grade point average in those courses than the groups with 1-2 and 5-6 semesters of industrial arts. The group with 5-6 semesters had the lowest grade point average.

Hypothesis 41 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing machine shop seniors with unrelated industrial arts. The null hypothesis for the groups with 1-2 and 3-4 semesters was rejected and accepted for the group with 5-6 semesters of industrial arts.

There was a positive correlation, significant at less than the .05 level, between the variables concerned for the group with 1-2 semesters of industrial arts unrelated to machine shop. This group had the lowest industrial arts grade point average and one of the lower group mean scores on the trade proficiency test within the category. The correlation between the variables concerned for the group with 3-4 semesters of industrial arts unrelated to machine shop was significant at less than

the .05 level. Unlike the previous group, this group had the highest
industrial arts grade point average and the highest group mean score on
the trade proficiency test. The group with 5-6 semesters of industrial
arts unrelated to machine shop had one of the lower industrial arts
grade point averages and the lowest group mean score within this cate-
gory. Again, there was a tendency for groups with low industrial arts
grade point averages to score low on the trade proficiency test.

Related Plus Unrelated Industrial Arts Category. Data for the
groups with 3-4 and 5-6 semesters of industrial arts related and unre-
lated to machine shop were not available due to reasons previously
stated.

Hypothesis 66 states there will be no positive linear relationship
between the group mean scores on the trade proficiency test and the
number of semesters of related plus unrelated industrial arts of con-
tinuing machine shop seniors. The null hypothesis was rejected.

There was a positive linear relationship between the variables
concerned of the two groups for which data were available. The group
with 5-6 semesters of related plus unrelated industrial arts scored
higher than the group with no industrial arts. The high group mean
score could not be attributed entirely to more semesters of industrial
arts because this group of machine shop seniors have had two semesters
of vocational instruction in machine shop.

Hypothesis 69 states there will be no positive linear relationship
between the industrial arts grade point averages and the number of
semesters of related plus unrelated industrial arts of continuing
machine shop seniors.

Sufficient data were not available for reasons previously stated to adequately examine the relationship between the variables concerned. The null hypothesis could not be accepted or rejected.

Hypothesis 72 states there will be no significant positive correlation between the scores on the trade proficiency test and the industrial arts grade point averages within each group of continuing machine shop seniors with related plus unrelated industrial arts.

The null hypothesis was accepted for the group within this category for which data were available. There was a high negative correlation between the variables concerned rather than a significant positive correlation.

Comparison of Juniors and Seniors. A comparison of data in Figure 18 indicated that the greatest difference in group mean scores on the trade proficiency test occurred between juniors and seniors with 1-2 semesters of related industrial arts. Otherwise, the group mean scores of seniors differed very little from the mean scores of juniors even though the seniors had received two semesters of instruction in vocational machine shop. Overall, the seniors with 1-2 and 3-4 semesters of industrial arts related to machine shop had the highest group mean score on the trade proficiency test. These two groups also had higher grade point averages in the industrial arts courses than any group of juniors or seniors in machine shop.

A comparison of data in Figure 19 indicated that each group of seniors scored higher on the trade proficiency test than the juniors. Hopefully, this was influenced by the seniors having had two semesters of instruction in vocational machine shop. In all groups except one, a tendency existed for the groups with higher industrial arts grade point

averages to score higher on the trade proficiency test. Seniors with 1-2 semesters of industrial arts unrelated to machine shop had an industrial arts grade point average lower than the other groups of seniors.

Very little data were available for comparison of juniors and seniors in Figure 20 for reasons stated previously. However, it was indicated that mean scores for both groups of seniors for which data were available were higher than the mean score of juniors. Also the juniors with 3-4 and 5-6 semesters of industrial arts related and unrelated to machine shop scored lower on the trade proficiency test than juniors with no industrial arts.

Comparison of Group Mean Scores for Machine Shop Seniors. Figure 21 revealed that the three highest group mean scores for seniors on the trade proficiency test were obtained by the groups with 1-2 and 3-4 semesters of industrial arts related to machine shop and the group with 5-6 semesters of industrial arts related and related to machine shop.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

This study has presented the results and findings of an analysis of
data to ascertain if there were significant differences between the
vocational knowledge of junior and senior vocational students with dif-
ferent types and numbers of semesters of industrial arts experience. It
has been debated whether prevocational education should or should not be
a role of industrial arts education. Research has been conducted to
ascertain whether industrial arts is effective as prevocational experi-
ence. Some research confirms that industrial arts is effective as pre-
vocational experience; some does not. Industrial arts in the secondary
schools is a common source of orientation to industrial occupations
prior to vocational instruction in the area vocational schools. It was
deemed desirable to ascertain the effectiveness of industrial arts in a
prevocational education role on the vocational knowledge of students in
the area vocational schools in Oklahoma.

There were two main steps in the procedure of this study. First, a
test was given to juniors and seniors in automechanics, carpentry, and
machine shop. The tests pertained to the particular subject in which
students were enrolled at the area vocational school. The score on the
test was the dependent variable in the analysis of variance test for
significant differences.

Second, variables such as number of semesters of industrial arts, type of industrial arts and grades in these courses were obtained from the secondary schools. The variables, type and number of semesters of industrial arts were used to place students in the various categories and groups. All three variables were used as a basis to show the relationship between group mean scores, types, and number of semesters of industrial arts and industrial arts grade point averages. Correlation coefficients were calculated between industrial arts grade point averages and trade proficiency test scores within each group of students.

Data of eighteen categories of students with different types and numbers of semesters of industrial arts were analyzed to ascertain the:

1. Relationship between group mean scores on the trade proficiency test and the number of semesters of industrial arts.

2. Relationship between the industrial arts grade point averages and number of semesters of industrial arts.

3. Correlation between scores on the trade proficiency test and industrial arts grade point averages within each of the groups of each category.

Findings

The analysis of variance indicated no significant differences between the mean scores on the trade proficiency test of groups with different types and numbers of semesters of industrial arts.

A synthesis of the relationships between group mean scores on the trade proficiency test and the number of semesters of industrial arts indicated that of the eighteen categories:

1. Eight had a positive linear relationship between the variables concerned. The groups within these categories with more semesters of industrial arts had a tendency to score higher on the trade proficiency test.

2. Seven had a nonmontonic relationship between the variables concerned. Both higher and lower group mean scores were associated with more semesters of industrial arts.

3. Two had a negative linear relationship between the variables concerned. The groups within these categories with more semesters of industrial arts had a tendency to score lower on the trade proficiency test.

4. Sufficient data were not available for one category to establish a relationship between the variables concerned.

A synthesis of the relationships between industrial arts grade point averages and the number of semesters of industrial arts indicated that of the eighteen categories:

1. Three had a positive linear relationship between the variables concerned. The groups within these categories with more semesters of industrial arts had a tendency to have higher industrial arts grade point averages.

2. Seven had a negative linear relationship between the variables concerned. The groups within these categories with more semesters of industrial arts had a low industrial arts grade point average.

3. Three had a nonmonotonic relationship between the variables concerned. Both higher and lower industrial arts

grade point averages were associated with more semesters

of industrial arts.

4. Sufficient data were not available for five categories

to establish a relationship between the variables

concerned.

A synthesis of correlation coefficients between trade proficiency

test scores and industrial arts grade point averages within thirty-

seven individual groups revealed that:

1. Seventeen correlation coefficients were positive at or

less than the .05 level of significance.

2. Twelve correlation coefficients were positive but not

significantly.

3. Eight correlation coefficients were negative.

A comparison of group mean scores of juniors and seniors on the

trade proficienty test revealed that group mean scores of seniors

differed very little from the group mean scores of juniors, even though

the seniors had received two semesters of instruction in their chosen

vocational subject.

The findings of this study support the findings of Moss'[1]

each of the following points:

1. Various numbers of semesters of industrial arts did not

significantly influence the vocational knowledge of

students in the area vocational schools.

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[1]Jerome Moss, Jr., The Influence of Industrial Arts Experience on
Grades Earned in Post-High School Trade and Technical Curriculums,
Minneapolis, Minnesota, Research Coordinating Unit in Occupational
Education, Cooperative Research Project No. 2050, 1966.

2. Various types of industrial arts did not significantly

   influence the vocational knowledge of students in the

   area vocational schools.

3. Some students with increased semesters of industrial

   arts displayed, according to group mean scores, less

   knowledge of the vocational subjects used in this study.

4. Some students with high grade point averages in indus-

   trial arts performed better in vocational education

   subjects than students with low industrial arts grade

   point averages.

The results of this study also support the conclusions reached by

Griffin[2] and Barrow[3]. Griffin found that students with more high

school industrial arts had lower levels of achievement in industrial

arts professional and technical courses than those students who had

fewer units in high school industrial arts. Barrow found that industrial

arts experience in automechanics or power mechanics had no significant

effect on achievement in vocational automechanics.

Conclusions

Therefore, based on the findings of the analysis of the data and a

comparison of these findings with findings of similar studies, the

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[2]James F. Griffin, "Relationship of Selected High School Courses Completed to Achievement in Industrial Arts Teacher Education," (unpublished Ed. D. dissertation, University of Missouri, 1970).

[3]Richard Wesley Barrow, "A Comparison of the Achievement of Vocational Automechanics Students in First Year Day Trade With Students in First Year Industrial Cooperative Training," (unpublished Ed. D. dissertation, Texas A & M University, 1969).

following conclusions were reached as answers to the questions this study attempted to answer.

The null hypotheses relative to significant differences between mean scores of groups with different types and numbers of semesters of industrial arts were confirmed by the conclusions that:

1. More semesters of related industrial arts did not contribute significantly to a difference between the vocational knowledge of entering juniors or continuing seniors in the field of automechanics, carpentry, or machine shop.

2. An accumulation of unrelated industrial arts did not contribute significantly to a difference between the vocational knowledge of entering juniors or continuing seniors in the field of automechanics, carpentry, or machine shop.

3. An accumulation of related plus unrelated industrial arts did not contribute significantly to a difference between the vocational knowledge of entering juniors or seniors in the field of automechanics, carpentry, or machine shop.

Since students with different types and numbers of semesters of industrial arts did not score significantly higher on the trade proficiency test than students without such experience, there appeared to be no advantage to having previous industrial arts experience as far as being effective as prevocational experience is concerned.

The null hypotheses stating there would not be a positive linear relationship between group mean scores and numbers of semesters of

industrial arts were confirmed in a majority of the categories. There

was not a sufficient majority of positive linear relationships upon

which to base any generalizations to the population used in this study.

The null hypotheses stating there would not be a positive linear

relationship between industrial arts grade point averages and numbers of

semesters of industrial arts were confirmed in a majority of the cate-

gories. There was not a sufficient majority of positive linear rela-

tionships upon which to base any generalizations to the population used

in this study.

The null hypotheses stating there would not be a significantly

positive carrelation between scores on the trade proficiency test and

industrial arts grade point averages within each group were disconfirmed

in a majority of the groups. It was concluded that industrial arts

grade point average was the variable most closely related to scores on

the trade proficiency tests.

Overall, it was concluded that industrial arts, as it exists in

Oklahoma, was ineffective as far as contributing significantly to a

student's knowledge of a vocational subject.

Recommendations

Based on the findings and conclusions, the following recommenda-

tions were made:

1. If a secondary role of industrial arts is to serve

    effectively as prevocational education, the industrial

    arts curriculum should consist of courses directly

    related to the vocational subjects offered in the area

    vocational school within a particular district.

2. The content of the courses directly related to the
    vocational subjects should include lectures and activi-
    ties that will contribute to career orientation and
    exploration objectives of industrial arts as it con-
    tributes to the prevocational effectiveness of indus-
    trial arts.

3. If the personnel concerned do not wish to implement
    these recommendations or similar recommendations that
    will achieve the same objectives, the secondary role
    of industrial arts as prevocational education should
    be abandoned.

Recommendations for Further Study

The preceding findings and conclusions elicited several questions
which may be a basis for further study. First, why were there negative
linear relationships between industrial arts grade point averages and
numbers of semesters of industrial arts? Perhaps it was because stu-
dents with higher learning ability found no challenge or became dis-
interested and chose not to enroll in more industrial arts courses.
This phenomenon could have left groups of industrial arts students with
lower learning ability and, consequently, lower grade point averages and
lower scores on the trade proficiency test. Lower grade point averages
could also have been the result of increasing difficulty in the course
work or lack of motivation due to repetitive and uninteresting activi-
ties. Was the association between lower grade point averages and more
semesters of industrial arts a by-product of channeling the so-called
low achievers into the industrial arts program who supposedly could not

have coped with the college preparatory type subjects?

Second, why were mean scores of some groups with fewer semesters of industrial arts higher than mean scores of groups with more industrial arts? Was it because their background in certain academic courses was more of an influence on vocational knowledge than previous industrial arts experience? The results of Moss' study confirmed the previous statement.[4] Perhaps research could be conducted to ascertain the academic background of those students who had higher group mean scores on the trade proficiency test. Also, a study could be conducted to ascertain the trend in the students' attitudes towards the industrial arts curriculum. Do attitudes toward the industrial arts curriculum tend to become negative as they pursue more semesters of industrial arts? If attitudes become progressively negative, is it due to curriculum, course activities, methods of instruction, inadequate or outdated facilities, social pressure, the teacher or a combination of the preceding factors.

Third, why did groups with more semesters of industrial arts not score significantly higher on the trade proficiency test than groups with fewer semesters of industrial arts? A possible explanation is that groups with more semesters of industrial arts consisted of low achievers as suggested by the negative linear relationships between numbers of semesters of industrial arts and industrial arts grade point averages. Also, groups with fewer semesters of industrial arts had higher learning ability as suggested by higher industrial arts grade point averages,

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[4]Moss.

which may have enabled them to score as well on the trade proficiency

test without as much previous industrial arts experience.

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APPENDIX A

GEOGRAPHIC LOCATION OF AREA VOCATIONAL

SCHOOLS CHOSEN FOR THE STUDY
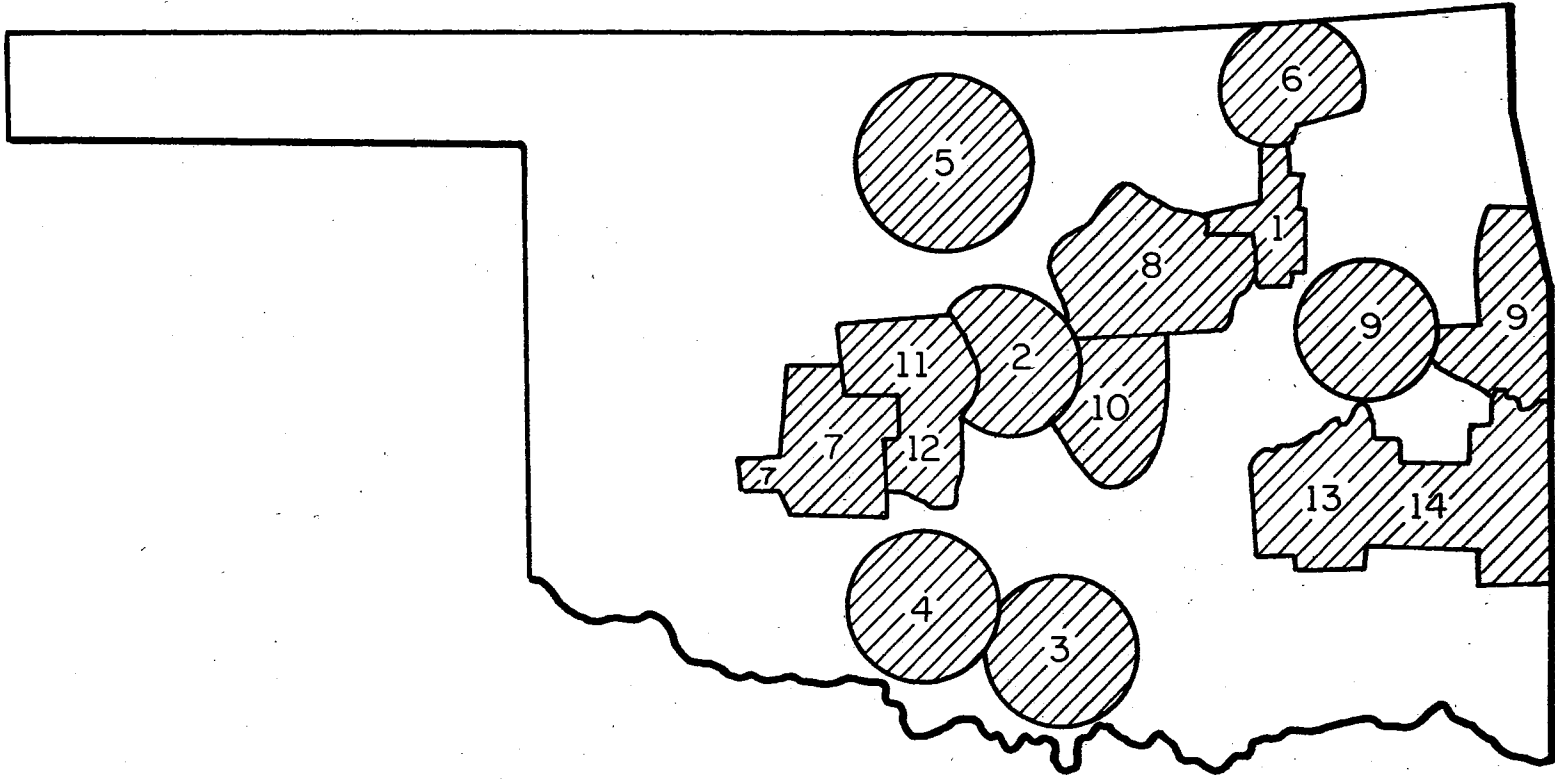
APPENDIX B

LETTER TO AREA VOCATIONAL-TECHNICAL

SCHOOL ADMINISTRATORS

OKLAHOMA STATE DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION

FRANCIS TUTTLE, DIRECTOR ● 1515 WEST SIXTH AVE., ● STILLWATER, OKLAHOMA 74074 ● A.C. (405) 377-2000

August 23, 1971

TO: Area Vocational-Technical School Administrators
FROM: Dale A. Hughey, State Coordinator, Area Vocational-
          Technical Education
SUBJECT: A study which can be beneficial to Area School Administrators

This is a request asking your assistance in a study being conducted
at Oklahoma State University in the Industrial Education Department.

The study concerns the influence of secondary industrial arts
experiences on the vocational knowledge of students in the area
vocational schools. The results of the study should be beneficial
to teachers, administrators, and students for planning and guidance.

Initially, the assistance necessary concerns administering a multiple
choice item test to juniors and seniors in auto mechanics, carpentry
and machine shop.

Secondly, the assistance necessary involves allowing the researcher,
Glen Rehorn, access to student records to enable him to compile
data, concerning the students, necessary for the study.

Third, it concerns the utilization of a regular class period to
administer the test in the latter part of August and possibly
early September. No extra time will be required to administer the
test. Testing time should not exceed normal class hours, depending
on the speed of the slowest students. All test materials will be
furnished by the researcher.

A telephone call will be made by the researcher to your school to
coordinate an appropriate time for administering the tests. Your
cooperation regarding this matter will be appreciated.

DH/sj

PREPARE FOR THE GOOD LIFE

APPENDIX C

SAMPLE STUDENT INFORMATION SHEET

A	STUDENT'S NAME Last, First MI Automechanics Carpentry Machine Shop
B	Student Number
C	Junior Senior
D	Power Mechanics Grades
E	Carpentry Grades
F	Woodworking and/or Building Trades Grades
G	Electronics Grades
H	Drafting and/or Mechanical Drawing Grades
I	Automechanics Grades
J	Machine Shop Grades
K	General Metals Grades
L	Welding Grades
M	Printing Grades
N	Related Unrelated Related & Unrelated
O	

136

APPENDIX D

LETTER TO PARTICIPATING SCHOOL

ADMINISTRATORS

VOTECH OKLAHOMA STATE DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION

FRANCIS TUTTLE, DIRECTOR • 1515 WEST SIXTH AVE., • STILLWATER, OKLAHOMA 74074 • A.C. (405) 377-2000

Dear

This is a request for your assistance in a study being conducted at Oklahoma State University in the Industrial Education Department. The study concerns the influence of secondary industrial arts experience on a student's knowledge of selected vocational-technical subjects offered in the area vocational-technical schools.

It is believed that the results of the study should be of assistance to teachers, administrators, and counselors in the high schools and area vocational-technical schools relative to career planning for future students. Hopefully, the maximum benefit will be experienced by future students.

To conduct the study the researcher needs the information concerning students indicated on the enclosed Student Information Sheet. It is understood that this places an additional burden upon clerical personnel during the initial stages of a school year. Your contribution to the completion of this study would be appreciated.

A self-addressed, stamped envelope is enclosed for convenience of returning the Student Information Sheets.

A copy of the study will be made available upon request. Thank you in advance for your cooperation.

Sincerely,

Harold J. Winburn

Harold J. Winburn
State Supervisor
Industrial Arts

Enclosures

HJW/XCP-01/8

APPENDIX E

INSTRUCTIONS FOR RECORDING DATA

Instructions for Recording Data

These forms contain the names of juniors and seniors in your high
school who are also enrolled in one of the following subjects in an area
vocational school: Automechanics, Carpentry, or Machine Shop. Please
complete the forms according to the following instructions:

(1) It is not necessary to type. Legibile lead pencil is
satisfactory.

(2) Columns A, B, and C: No action required.

(3) Columns D through M: Indicate in the upper left triangle of
the left portion of these columns, the
number of semesters the student has had
in any of the subjects listed. In the
right portion of the column, in the four
squares, indicate the letter grades the
student has earned in each of the
courses. Include industrial arts for
grades 8 thru 10 if available.

Do not be concerned about matching
grades with individual semesters. It is
not necessary for the purposes of this
study. However, it is important that
grades are in the proper subject column.

(4) Columns N and O: No action required.

If the student has had more than four semesters of a particular
subject, please indicate student's name, additional numbers of semesters
of industrial arts, which subject the extra semesters were in and grades
earned on the reverse side of the form.

A partially filled out sample form is included to help illustrate
the preceding directions.

APPENDIX F

FOLLOW-UP LETTER TO PARTICIPATING

SCHOOL ADMINISTRATORS

During the early part of October, you were asked to complete a set of
forms requesting certain information concerning students enrolled in
your school and also attending the vocational school in your area.

Since I have not received the completed forms, I thought they may have
been improperly addressed or lost in the mail. Therefore, I am
enclosing a duplicate set of forms hoping you will have them completed
and returned in the enclosed envelope.

Thanking you in advance for your cooperation and contribution.

Sincerely yours,

GLEN E. REHORN

APPENDIX G

DESCRIPTIVE STATISTICS FOR GROUPS OF

STUDENTS WITHIN CATEGORIES

TABLE IX

DESCRIPTIVE STATISTICS FOR AUTOMECHANICS JUNIORS
WITH RELATED, UNRELATED, AND RELATED PLUS
UNRELATED INDUSTRIAL ARTS EXPERIENCE

Type and No. of Semesters of Industrial Arts	Size of n	Group Mean Scores in Percentage	Standard Deviation	Range	Mean GPA in Type of Industrial Arts
Related					
0	225	30.22	6.7	38.14	
1-2	15	33.33	9.3	32.99	1.86
3-4	0	0	0	0	0
5-6	2	31.95	5.8	8.24	1.40
Unrelated					
0	110	30.29	7.36	41.23	
1-2	63	29.70	6.53	26.80	2.33
3-4	52	31.87	6.81	35.05	2.39
5-6	18	30.01	5.48	22.68	2.50
Related Plus Unrelated					
0	230	30.34	6.91	41.23	0
1-2	0	0	0	0	0
3-4	3	30.24	5.67	11.34	1.61
5-6	10	33.19	7.50	26.80	1.76

TABLE X

DESCRIPTIVE STATISTICS FOR AUTOMECHANICS SENIORS
WITH RELATED, UNRELATED, AND RELATED PLUS
UNRELATED INDUSTRIAL ARTS EXPERIENCE

Type and No. of Semesters of Industrial Arts	Size of n	Group Mean Scores in Percentage	Standard Deviation	Range	Mean GPA in Type of Industrial Arts
Related					
0	116	33.94	7.83	42.26	0
1-2	8	35.95	11.44	36.08	2.56
3-4	5	41.85	9.32	25.77	3.15
5-6	0	0	0	0	0
Unrelated					
0	63	33.33	8.72	45.36	0
1-2	33	33.52	7.34	30.92	2.66
3-4	29	34.80	8.17	32.99	2.32
5-6	4	40.46	5.28	12.37	2.08
Related Plus Unrelated **					
0	123	34.02	8.09	45.36	0
1-2	0	0	0	0	0
3-4	0	0	0	0	0
5-6	5	43.29	7.60	18.55	2.60

**Groups were heterogeneous at the .05 level of significance.

TABLE XI

DESCRIPTIVE STATISTICS FOR CARPENTRY JUNIORS
WITH RELATED, UNRELATED, OR RELATED PLUS
UNRELATED INDUSTRIAL ARTS EXPERIENCE

Type and No. of Semesters of Industrial Arts	Size of n	Group Mean Scores in Percentage	Standard Deviation	Range	Mean GPA in Type of Industrial Arts
Related					
0	54	26.93	4.49	20.26	0
1-2	33	28.28	4.94	24.83	2.47
3-4	26	27.12	5.21	24.18	2.67
5-6	2	25.49	5.22	10.45	2.08
Unrelated **					
0	85	26.49	4.34	26.14	0
1-2	22	29.38	5.84	24.83	2.36
3-4	5	30.58	4.74	11.76	2.56
5-6	3	30.71	1.72	3.26	1.92
Related Plus Unrelated					
0	94	26.90	4.53	26.14	0
1-2	0	0	0	0	0
3-4	13	28.80	6.08	24.83	2.02
5-6	7	29.69	5.22	15.68	1.87

**Groups were heterogeneous at the .05 level of significance.

TABLE XII

DESCRIPTIVE STATISTICS FOR CARPENTRY SENIORS
WITH RELATED, UNRELATED, OR RELATED PLUS
UNRELATED INDUSTRIAL ARTS EXPERIENCE

Type and No. of Semesters of Industrial Arts	Size of n	Group Mean Scores in Percentage	Standard Deviation	Range	Mean GPA in Type of Industrial Arts
Related					
0	20	28.39	6.74	28.10	0
1-2	10	28.49	6.11	22.22	2.40
3-4	8	27.20	4.11	14.37	2.19
5-6	0	0	0	0	0
Unrelated					
0	30	28.08	6.04	30.06	0
1-2	8	29.08	6.67	22.22	2.62
3-4	0	0	0	0	0
5-6	0	0	0	0	0
Related Plus Unrelated					
0	31	28.10	5.94	30.06	0
1-2	0	0	0	0	0
3-4	4	28.75	9.79	22.22	2.54
5-6	4	30.06	2.87	6.53	2.09

TABLE XIII

DESCRIPTIVE STATISTICS FOR MACHINE SHOP JUNIORS
WITH RELATED, UNRELATED, OR RELATED PLUS
UNRELATED INDUSTRIAL ARTS EXPERIENCE

Type and No. of Semesters of Industrial Arts	Size of n	Group Mean Scores in Percentage	Standard Deviation	Range	Mean GPA in Type of Industrial Arts
Related					
0	143	28.05	6.08	34.11	0
1-2	15	26.66	5.12	21.17	2.43
3-4	0	0	0	0	0
5-6	0	0	0	0	0
Unrelated					
0	62	27.85	5.85	30.58	0
1-2	53	28.83	6.21	24.70	2.40
3-4	28	27.68	6.40	30.58	2.24
5-6	17	26.57	5.64	18.82	2.19
Related Plus Unrelated					
0	149	28.11	6.08	34.11	0
1-2	0	0	0	0	0
3-4	4	26.76	3.09	7.05	2.02
5-6	6	26.27	7.12	20.00	1.87

TABLE XIV

DESCRIPTIVE STATISTICS FOR MACHINE SHOP SENIORS
WITH RELATED, UNRELATED, OR RELATED PLUS
UNRELATED INDUSTRIAL ARTS EXPERIENCE

Type and No. of Semesters of Industrial Arts	Size of n	Group Mean Scores in Percentage	Standard Deviation	Range	Mean GPA in Type of Industrial Arts
Related					
0	62	31.49	6.61	35.29	0
1-2	3	35.68	5.80	10.58	2.33
3-4	8	34.70	4.80	12.94	2.62
5-6	0	0	0	0	0
Unrelated					
0	47	32.14	5.82	27.05	0
1-2	16	31.76	7.40	28.23	2.19
3-4	9	32.54	7.15	24.70	2.44
5-6	2	28.82	14.14	20.00	2.24
Related Plus Unrelated					
0	70	31.78	4.43	35.29	0
1-2	0	0	0	0	0
3-4	0	0	0	0	0
5-6	3	34.11	4.07	7.05	2.04

VITA

Glen Ewell Rehorn

Candidate for the Degree of

Doctor of Education

Thesis: THE INFLUENCE OF INDUSTRIAL ARTS EXPERIENCE ON THE VOCATIONAL KNOWLEDGE OF STUDENTS IN THE AREA-VOCATIONAL SCHOOLS IN OKLAHOMA

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Biographical:

Personal Data: Born in Fairfax, Oklahoma, January 14, 1935, the son of Mr. and Mrs. E. W. Rehorn.

Education: Graduated from Fairfax High School, Fairfax, Oklahoma, in May, 1953; attended Oklahoma State University from 1953 to 1955; received a Technician Certificate in Diesel and Stationary Engines in August, 1955; received the Bachelor of Science degree from Oklahoma State University in 1963, with a major in Industrial Arts Education; received the Master of Science degree from Oklahoma State University in 1969, with a major in Industrial Arts Education. Completed requirements for the Doctor of Education degree in July, 1972.

Professional Experience: Four years teaching Industrial Arts Auto-mechanics at Ponca City Senior High School, Ponca City, Oklahoma; one year teaching Industrial Arts at Langston University, Langston, Oklahoma; one semester graduate teaching assistant, Oklahoma State University.

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