

ILLEGIBLE DOCUMENT

**THE FOLLOWING
DOCUMENT(S) IS OF
POOR LEGIBILITY IN
THE ORIGINAL**

**THIS IS THE BEST
COPY AVAILABLE**

THE ACADEMIC PREPARATION OF JUNIOR HIGH SCHOOL
SCIENCE TEACHERS IN KANSAS FOR THE YEAR 1971-1972

by

613-8302

JOHN BASYE YOST

B. S., Kansas State University, 1971

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

Approved by:


Major Professor

**THIS BOOK
CONTAINS
NUMEROUS PAGES
WITH THE ORIGINAL
PRINTING BEING
SKEWED
DIFFERENTLY FROM
THE TOP OF THE
PAGE TO THE
BOTTOM.**

**THIS IS AS RECEIVED
FROM THE
CUSTOMER.**

LD
2668
J4
1973
468
c.2
Document

TABLE OF CONTENTS

	Page
LIST OF TABLES	iii
LIST OF FIGURES	iv
ACKNOWLEDGEMENTS	v
Chapter	
1. INTRODUCTIONS	1
PURPOSE	1
STATEMENT OF PROBLEM	2
DEFINITION OF TERMS	2
SAMPLE	3
ASSUMPTIONS OF THIS STUDY	5
HYPOTHESES	6
2. REVIEW OF THE LITERATURE	8
3. METHODS AND PROCEDURES.	13
DESCRIPTION OF SAMPLE	13
DATA COLLECTION	17
DATA ANALYSIS	17
4. RESULTS	21
5. CONCLUSIONS	33
REFERENCES CITED	37
APPENDIX	39

LIST OF TABLES

Table	Page
1. Number of Districts, Number of Seventh, Eighth, and Ninth Grade Students, Percent of Total Number of Seventh, Eighth, and Ninth Grade Students, and Number of Students per District for Each of the School Organizations in Kansas	14
2. Number of Science Teachers, Number of Junior High Schools, Number of Teachers per Building, and Mean Number of Students per Building	15
3. Number and Percent of Unqualified Teachers for Each Size Group and Total	21
4. Means, Standard Deviations, and F-ratios for Biology, Geology, Physics, Chemistry, General Science, and Total Science Semester Hours of Credit by Size Groupings	24
5. Means, Standard Deviations, and T-statistic for Biology and Physical Science Hours by Size Groups and Total	26
6. Numbers and Percents of Teachers in the Four Groups Divided According to the Level and What the Teachers Taught	27
7. Number of Non-Science Subjects Taught by Junior High School Science Teachers by Size Groups and Total	29
8. Means and Standard Deviations of Group A, B, C, and D for Biology, Geology, Physics, Chemistry, General Science, and Total Science Credit Hours, and F-ratios for Comparisons of the Means	31
9. Means and Standard Deviations of the Years of Experience of the Teachers by Size Groups	32

LIST OF FIGURES

Figure	Page
1. Map of Kansas Showing Distribution of Junior High Schools in Unified School Districts Reporting an Organization of 6-3-3.	16

ACKNOWLEDGEMENTS

I would like to thank Dr. Robert James, major professor, for guidance and assistance in preparation of this thesis. I would like to thank Dr. Howard Kittleson for advice on statistics and data analysis. Thanks is also expressed to the Kansas State Department of Education for making their files and facilities available.

Chapter 1

INTRODUCTION

The separately organized junior high school has been an integral part of the education system of Kansas for the last twenty years. The junior high school teacher is an essential ingredient of the education process at the junior high school level, and the junior high school teacher must have considerable understanding of the junior high school aged youth for effective education of the junior high school student. Conant (1960:13) states the junior high school teacher needs a considerable amount of knowledge in at least one subject area like senior high school teachers and an understanding of children like the elementary school teachers. So the education of the junior high school teachers is very important. The teacher's preparation must include courses in understanding the junior high school aged youth and courses in the subject area the teacher plans to teach.

Very little research has been done on the preparation of the junior high school science teacher. Bruce (1969:421) states that there is a lot of talk about the preparation of the junior high school science teacher but there are very few studies on the subject. Because of this lack of research, a number of unsubstantiated assumptions are used when the preparation of the junior high school science teacher is talked about. A definite need exists to determine the validity of these unsubstantiated assumptions about the junior high school science teachers' science preparation.

PURPOSE

The purpose of this study was to determine the science preparation in biology, geology, physics, chemistry, and general science semester hours of college credit of the junior high school science teachers in the state of Kansas.

STATEMENT OF PROBLEM

This study will concern itself with the following questions: What was the academic preparation in biology, geology, physics, chemistry, general science, and total science semester hours of credit of the junior high school science teachers in the state of Kansas? Does the teachers' academic preparation in biology, geology, physics, chemistry, general science, and total science vary with the number of students in the junior high school in which the teachers taught, with the level at which the teachers taught (junior high school or junior high school and senior high school), and with whether the teachers taught only science or science and courses other than science?

DEFINITION OF TERMS

Biology hours - Semester hours in the biology field which include: anatomy, bacteriology, biological techniques, botany, cell biology, comparative anatomy, developmental biology, ecology, embryology, entomology, environmental biology, evolution, field biology, genetics, heredity, histology, human anatomy, human physiology, institutes in biology, mammalogy, modern developments in biology, natural history, ornithology, parasitology, physiology, plant ecology, research in biology, and wildlife management.

Chemistry hours - Semester hours in the chemistry field which include: general chemistry, qualitative analysis, quantitative analysis, physical chemistry, organic chemistry, biochemistry, research in chemistry, and institutes in chemistry.

General science hours - Semester hours in courses which could not be identified with biology, chemistry, geology, or physics areas.

Geology hours - Semester hours in the geological field which include: earth science, physical chemistry, historical geology, geomorphology, meteorology,

oceanography, astronomy, mineralogy, petrology, research in geology, and institutes in geology.

Junior high school - Separately organized school with grades seven, eight, and nine.

Minimum requirements to teach science in a junior high school in Kansas - Fifteen semester hours of science credit from an accredited college or university plus the required courses needed to teach in any subject field in the junior high school (Certificate Handbook for the State of Kansas).

Physical science hours - The combined hours of geology, physics, and chemistry.

Secondary school - Junior and senior high schools, grades seven, eight, nine, ten, eleven, and twelve.

Senior high school - Schools with grades ten, eleven, and twelve.

School organizations - 6-3-3, 6-2-4, 4-4-4, 5-4-3, 5-3-4, 6-6, 8-4, and K-12. These are determined by the school board in each district. The numbers indicate the grades grouped together.

6-3-3 - School district organization where there are six years in the grade school plus kindergarten, three years in the junior high school (grades seven, eight, and nine), and three years in the senior high school (grades ten, eleven, and twelve).

Total science hours - The combined hours of biology, geology, physics, chemistry, and general science.

Unqualified teachers - Teachers who do not have at least 15 semester hours of science credit, which is the minimum hours of science credit necessary to be certified to teach science in junior high schools in Kansas.

SAMPLE

The semester hours of science credit of all the science teachers in

school districts with 6-3-3 organizations in 1971-1972 school year were examined. There were 123,081 seventh, eighth, and ninth grade students in public schools in Kansas in 1971-1972. Seventy-four thousand five hundred eighty-seven junior high school students or 60% of the total were in school districts with 6-3-3 organizations. Fifty-nine districts had 6-3-3 organizations; and 118 junior high schools were in these 59 districts. Four hundred forty-two junior high school science teachers taught in these 118 junior high schools.

The junior high school science teachers were divided into groups according to (a) the number of junior high school students in the school in which they taught, and (b) whether the teachers taught only science courses or science and non-science courses and whether the teachers taught in a junior high school or a junior high school and a senior high school. The above subdivisions made it possible to test the significance of differences with respect to: (a) the junior high school science teachers' science preparation as to the size of the school in terms of number of students where the teachers taught; (b) what level the teachers taught and whether the teachers taught only science or science and non-science courses.

The junior high school science teachers were divided into five groups according to the number of junior high school students enrolled in the school in which they taught. The five groups were: group I, 1-300 students; group II, 301-600 students; group III, 601-900 students; group IV, 901-1200 students; and group V, 1201 students and larger. (The readers will note that these five groups will be designated by Roman numerals I through V). The junior high school teachers were also divided into four groups according to the level they taught and subjects they taught. These four groups were: group A, teachers who taught in junior high schools and senior high schools and who taught only science courses; group B, teachers who taught only in junior high schools and taught

only science courses; group C, teachers who taught science and non-science courses and who taught in junior high schools and senior high schools; and group D, teachers who taught only in junior high schools and who taught science and non-science courses. (The reader will note that these four groups will be designated by letters A through D).

ASSUMPTIONS OF THIS STUDY

The following assumptions are often made about the junior high school science teachers:

1. Schools with larger numbers of students have teachers teaching science who have more hours in: (a) biology, (b) geology, (c) physics, (d) chemistry, (e) general science, and (f) total science credit. The assumption is that the teachers in the larger schools have more science credit.

2. The teachers with more experience would have more total hours of science credit than teachers with fewer years of experience. There is a positive relationship between the teachers' years of experience and the teachers' total hours of science.

3. Many junior high school teachers are prepared to teach biology instead of junior high school science, so junior high science teachers have much more biology credit than physical science credit.

4. The teachers teaching only science courses, have more credit than the teachers teaching science and non-science courses. This is logical because to be certified to teach a subject a certain number of college credit hours are needed in that subject area. The more subjects a teacher is certified to teach the fewer credit hours the teachers can accumulate in each of these subject areas. Those teachers teaching in senior high schools and junior high schools have more credit in the various sciences than those teachers teaching only in junior high schools. This is another logical statement, only 15 hours of credit in the subject area is

necessary to be certified to teach a subject in a junior high school; and to teach a subject in a senior high school a larger number of credit hours in the subject area is necessary. For example, to teach science in a senior high school 24 semester hours of science credit from an accredited college or university with 12 of these hours in the specific area the teacher is teaching are necessary; whereas, to teach science in the junior high school, 15 hours of science credit from an accredited institution are all that is necessary.

The assumptions, then, would be that group A, those teachers teaching only science in a junior high school and a senior high school, would have the largest means in the various sciences: (a) biology hours, (b) geology hours, (c) physics hours, (d) chemistry hours, (e) general science hours, and (f) total science hours; group B, those teachers teaching only science and teaching only in the junior high school, would have the next largest means; group C, those teachers teaching science and non-science courses and teaching in a junior high school and a senior high school, would have the largest means; and group D, those teachers teaching science and non-science courses and teaching only in a junior high school, would have the smallest means.

HYPOTHESES

The following are the null hypotheses:

1. The mean (a) biology, (b) geology, (c) physics, (d) chemistry, (e) general science, and (f) total science semester hours of credit for group V, those junior high school science teachers who taught in schools with 1201 students and larger, are not significantly greater than the means for group IV, those teachers who taught in schools with 901-1200 students; the means for group IV are not significantly greater than the means for group III, those teachers who taught science in junior high schools with 601-900 students; the means for group III are not significantly greater than the means for group II, those teachers who taught in schools with 301-600 students; and the means for group II are not significantly greater than the means for group I, those teachers who taught science in junior high schools with 1-300 students.

2. No high positive relationship exists between the years of experience of the teachers and the total semester hours of science credit of the teachers.

3. The mean biology hours are not significantly greater than the mean physical science hours for group I, junior high school science teachers who taught in junior high schools with 1-300 students, group II, teachers who taught in schools with 301-600 students, group III, teachers who taught in schools with 601-900 students, group IV, teachers who taught in schools with 901-1200 students, group V, teachers who taught in schools with 1201 students and larger, and all the teachers.

4. The mean (a) biology, (b) geology, (c) physics, (d) chemistry, (e) general science, and (f) total science semester hours of credit for group A, those teachers who taught only science and who taught in junior high schools and senior high schools, are not significantly greater than the means for group B, those teachers who taught only science and who taught only in junior high schools; the means for group B are not significantly greater than the means for group C, those teachers who taught science and non-science courses and who taught in junior high schools and senior high schools; and the means for group C are not significantly greater than the means for group D, those teachers who taught science and non-science courses and who taught only in junior high schools.

5. The mean years of experience for group V, those teachers who taught science in junior high schools with 1201 students and larger, is not significantly greater than the mean for group IV, those teachers who taught in junior high schools with 901-1200 students; the mean for group IV is not significantly greater than the mean for group III, those teachers who taught in schools with 601-900 students; the mean for group III is not significantly greater than the mean for group II, those teachers who taught in schools with 301-600 students; the mean for group II is not significantly greater than the mean for group I, those teachers who taught in schools with 0-300 students.

Chapter 2

REVIEW OF THE LITERATURE

There are a number of reports on science teaching or teachers in the state of Kansas. Howard Haeker (1972), in an unpublished master's report, gathered much of the literature on science teaching in Kansas together in a research of the literature.

Some reports dealt only with elementary school science teaching (Odum, 1966); other reports dealt only with senior high school science (Breukelman, 1964), (Breukelman and Andrews, 1953), (Breukelman and Andrews, 1956), (George, 1965), (Novak and Brooks, 1959), (Peddicord, 1959), (Pringle and Durst, 1969), (Rolfs, 1964), (Rundus, 1966), (Splitter, 1969), (Walker, 1964), and (Watkins, 1963).

Some studies were about secondary science, and among these studies are several articles on the Kansas Academy of Sciences' Science Teacher Improvement Program (Breukelman, 1960), (Breukelman and Frazier, 1961b), (Breukelman and Frazier, 1962), and (Breukelman and Frazier, 1963a). The Science Teacher Improvement Program was a series of conferences with various educators from Kansas involved.

The first year of conferences dealt mainly with senior high school science teachers, but there was a recommendation of a minimum preparation for general science teachers in grades seven, eight, and nine. This recommendation was three hours of earth science, two hours of astronomy, ten hours of biological science, and ten hours of physical science (Breukelman, 1960).

Several things about the junior high school science teachers came out of that second year of conferences. It was concluded that science requirements for junior high school students are highly variable across the state, some schools

requiring no science and other schools requiring three years of science. The conferences stated a need for teacher education programs to offer a major in general science for junior high school teachers, this program being balanced with more earth science than is currently the practice. Also, it was recognized that the needs of urban and rural junior high school teachers were different. It was emphasized that studies were needed to help formulate college programs for science teachers (Breukelman and Frazier, 1961b).

The junior high school teachers' science preparation was considered in the following year's conferences. Breukelman and Frazier reported the need of a graduate program for junior high school science teachers. A need for separate certification of junior high school teachers was stated; and the need of a curriculum oriented to junior high school teaching was a necessary ingredient of colleges' teacher education programs. It was also stated that the prospective teachers should practice teach at the level they plan to teach. Curriculum planning for junior high school's science programs and better textbooks for junior high school science teaching were needed. The conference proposed the junior high school science teacher needed twelve hours of biological science, twelve hours of physical science, twelve hours of earth science, and eight hours of math (Breukelman and Frazier, 1962).

Baker and Brooks (1957) published a report on 1177 science teachers from 650 high schools and 57 junior high schools in Kansas. The report was for the school year 1955-1956. The report examined the academic preparation of the teachers and the schools where the teachers taught. The academic preparation was examined in terms of ten basic courses in science. The report showed the teachers' preparation in relation to subjects taught, to age, and to class of school in which the teacher taught. The report showed the colleges where the teachers received their degrees, the major fields of academic preparation of

the teachers, and those holding master degrees. Several recommendations were made which pertain to junior high school science teachers: general science teachers should have a balanced program in biology and physical science and should have chemistry, physics, botany, zoology, physiology, human anatomy, genetics, geology, astronomy, and microbiology or at least as many of these courses as possible; and the prospective teacher should have a fifth year of courses to be adequately trained.

A group of studies dealt with the offerings and enrollments in senior high schools and junior high schools. Those prior to 1960 did not separate the junior high school data from the senior high school data, and very little junior high school data was included (Breukelman and Andrews, 1953) and (Breukelman and Andrews, 1956). Those after 1960 did separate the junior high school and the senior high school.

The 1960-1961 study showed the offerings in junior high school sciences, the science offerings by grades, the non-science courses taught by junior high school science teachers, the number of sections and class sizes, the enrollments in junior high school sciences, and full and part-time science teachers. Only separately organized junior high schools were included in the study. It was found that mathematics, physical education, health, and then social studies were the subjects most often taught with science (Breukelman and Frazier, 1961a).

The 1965-1966 study included junior high schools and the senior high schools. The same type of information as in the 1960-1961 study was presented in this study. Breukelman reported 110 separately organized junior high schools. Data was included on non-science courses taught by junior high school science teachers. Mathematics was the subject most often taught with science. It was followed by health, physical education, and social science (Breukelman, 1966).

In 1963, Breukelman and Frazier published a report of the same nature as

the above two, except it included only junior high schools. Breukelman and Frazier decided with the increase in numbers of separately organized junior high schools that the junior high schools were becoming important enough to be included in a report by themselves. This report included the same type of material as the two previously discussed reports. It also had the highest degree of the teachers and the type of certificate held by the teachers. The subjects taught most often with science were mathematics, health, physical education, social studies, and then English (Breukelman and Frazier, 1963b).

A report by Austin and Pierson (1968) which dealt only with junior high school science was a study of the seventh and eighth grade science programs and teachers in a six county area of north central Kansas. The counties involved in the study were Jewell, Osborne, Lincoln, Mitchell, Cloud, and Ottawa. None of the seventh and eighth grades were accredited as junior high schools. The report looked at the teacher's attitudes concerning whether he thought his science preparation was adequate or inadequate; whether he enjoyed, disliked, or felt neutral about his science class; and whether or not he would continue his science education. The equipment and facilities in the classrooms were rated during visits by the authors to the classrooms. The teacher's science preparation was considered. Several conclusions of the authors were that the teachers had completed more hours in biological science than physical science, and the teachers who had more science credit hours were teaching in larger class situations (Austin and Pierson, 1968:15). No data or means were shown for these statements and no tests were conducted to verify significance.. Forty-one teachers were involved in the study, 46% of these had 0 to 19 hours of science credit, 37% had 20 to 39 hours of science credit, and 17% had 40 to 60 hours of science credit (Austin and Pierson, 1968:15). The statement was also made that some of the teachers had most of their courses from a single discipline (Austin

and Pierson, 1968:19).

There are a number of articles which dealt with science teaching in Kansas. A few of these dealt with junior high school science and senior high school science, and two dealt only with junior high school science. These two reports were Breukelman and Frazier's 1963 study on the offerings and enrollments in junior high schools in Kansas, and Austin and Pierson's 1968 study on factors affecting eighth and ninth grade science.

Of the articles found only two articles had anything on the subject of the junior high school science teachers' academic science preparation. One of these studies was limited to north central Kansas and to non-accredited junior high schools with only seventh and eighth grades. Several unsubstantiated statements were made in this study which gave it questionable validity (Austin and Pierson, 1968). The other study, by Baker and Brooks, was for the 1955-1956 school year. It showed what the academic preparation of the junior high school science teacher was in ten basic science courses. It did not cover all the science credit the teachers had accumulated.

The lack of valid and recent information in the literature on the science preparation of junior high school science teachers in Kansas points to the need for a study which deals with the science preparation of the junior high school science teachers.

Chapter 3

METHODS

DESCRIPTION OF SAMPLE

The sample was all seventh, eighth, and ninth grade science teachers in Kansas in school districts reporting an organization of 6-3-3. The Kansas Educational Directory 1971-1972 was used to determine which unified school districts had organizations of 6-3-3. Using the Science Directory for Kansas Schools 1971-1972 the names of the teachers teaching in junior high schools in these districts were found. The Principal's Organizational Reports which are on file at the Kansas State Department of Education were used to find omissions and discrepancies. A list of the school districts and schools which were used in the study is in the appendix.

Out of the 311 unified school districts in Kansas, 59 reported 6-3-3 organizations. There were 118 junior high schools and 442 teachers in these 59 school districts. The State Department of Education report 123,081 seventh, eighth, and ninth grade students in schools with organizations of 6-3-3; this is 60.6% of the junior high school students in public schools in the state.

The number of districts, the number of seventh, eighth, and ninth grade students, the percent of the total number of seventh, eighth, and ninth grade students, and the number of students per district for each of the school organizations in Kansas are given in Table 1. The number of seventh, eighth, and ninth grade students for each district was obtained from the May 10, 1972 financial reports on file at the State Department of Education.

Table 1. Number of Districts, Number of Seventh, Eighth, and Ninth Grade Students, Percent of the Total Number of Seventh, Eighth, and Ninth Grade Students, and Number of Students per District for Each of the School Organizations in Kansas

School Organization	Number of Districts	Number of 7th, 8th, and 9th Graders	Percent of Total	Mean Number of Students Per District
6-3-3	59	74,587	60.6%	1265.88
8-4	156	26,210	21.3	161.60
K-12	52	7,651	6.2	147.13
6-2-4	17	7,423	6.0	436.64
6-6	18	4,296	3.5	249.78
5-3-4	5	1,675	1.4	335.00
4-4-4	3	655	0.5	218.00
5-4-3	1	584	0.5	584.00
	311	123,081		395.76

This study was limited to school districts reporting 6-3-3 organizations. Seventh and eighth grade science teachers in 8-4 and K-12 school systems are not required to meet certification requirements to teach science. The 6-3-3 school districts were used because they had a more homogenous group of junior high school teachers and the majority of the seventh, eighth, and ninth grade students in public schools in the state were in 6-3-3 districts.

Looking at the mean number of students per district in Table 1, it is noted that 6-3-3 districts had a mean of 1265.88 students per district and the next largest mean was 584.00 students per district. The four largest school districts in the state have 6-3-3 organizations and these four districts are largely responsible for the much larger mean number of students per district. Proof of this statement is provided by subtracting the number of seventh, eighth,

and ninth grade students in these four districts from the total number of junior high school students in 6-3-3 districts, and recalculating the number of students per district. The recalculated mean number of students per district was 647.91.

Table 2 presents the number of science teachers, the number of junior high schools, the number of science teachers per building, and the mean number of students per building. This information is given for each of the size groups of teachers (I-V) and for the total. The mean number of science teachers per junior high school was 3.75, and the mean number of students per junior high school was 621.57.

Table 2. Number of science Teachers, Number of Junior High Schools, Number of Teachers per Building, and Mean Number of Students per Building

Group Number	I	II	III	IV	V	Total
Number of Students	1-300	301-600	601-900	901-1200	1201-up	
Number of Junior High Schools	19 (16%)	41 (35%)	33 (28%)	21 (18%)	4 (3%)	118
Number of Science Teachers	44 (10%)	117 (26%)	140 (32%)	109 (25%)	32 (7%)	442
Number of Science Teachers per Building	2.32	2.85	4.24	5.19	8.00	3.75
Mean Number of Students	157.85	466.76	730.03	1022.10	1529.50	621.57

Figure 1, page 16 presents the location of the junior high schools used in the study, with the different symbols indicating which size group and the location of the school. The junior high schools in districts with 6-3-3 organizations were located across the state. All but one of the twenty schools

**THIS BOOK
CONTAINS
NUMEROUS PAGES
WITH DIAGRAMS
THAT ARE CROOKED
COMPARED TO THE
REST OF THE
INFORMATION ON
THE PAGE.**

**THIS IS AS
RECEIVED FROM
CUSTOMER.**

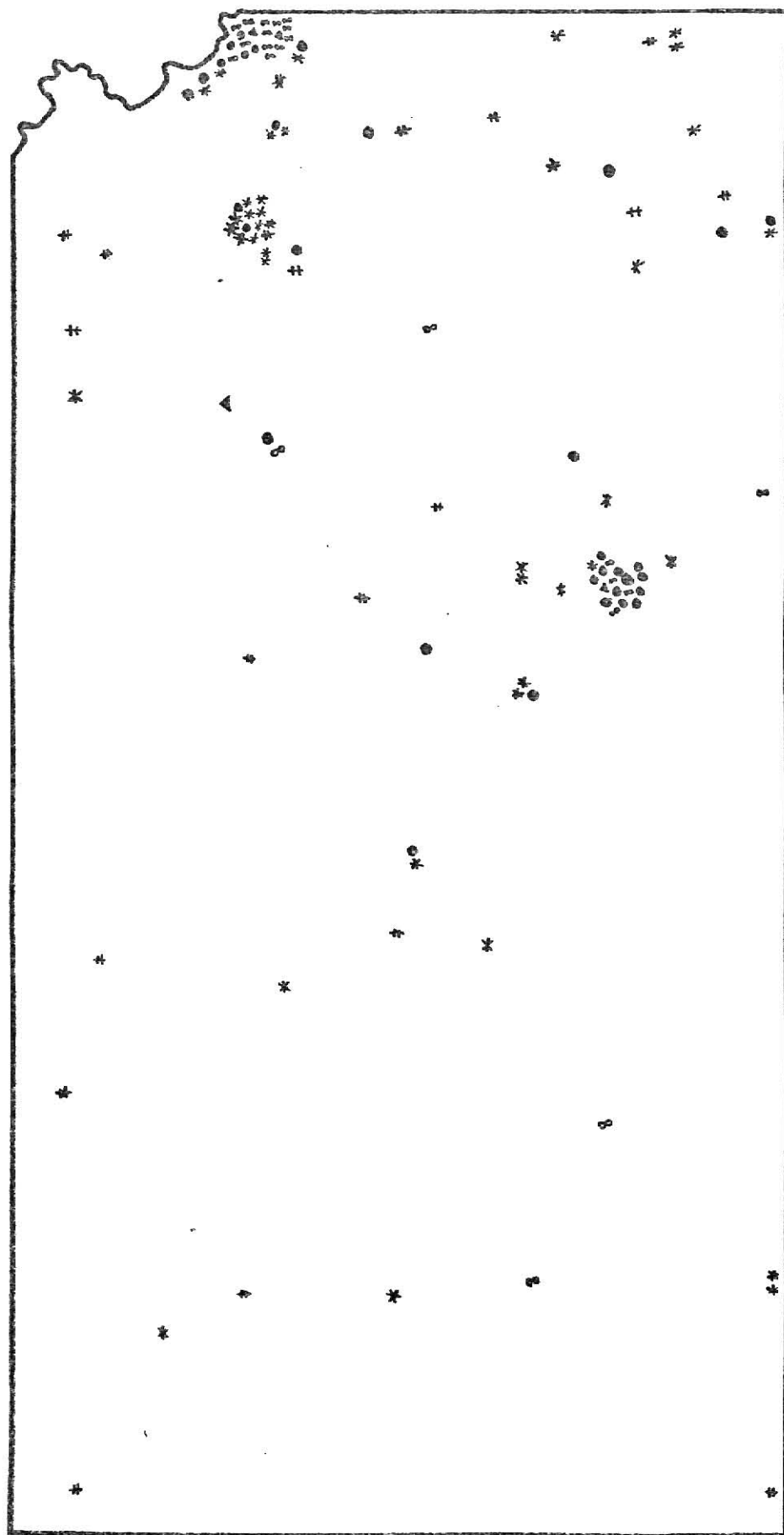


Figure 1. Map of Kansas Showing the Distribution of Junior High Schools from Unified School Districts with 6-3-3 Organization

- 1-300 students * - 301-600 students ● - 601-900 students
 8 - 901-1200 students ▲ - 1201 students and up

in group I, 1-300 students, were located in rural areas. The largest four schools, those in group V, were located in Kansas City, Manhattan, Shawnee Mission, and Wichita. The schools in the other groups were scattered around the state with many of the larger schools being in the larger cities. An exception to this was Topeka which had a large number of junior high schools in group II, 301-600 students. The largest school, Truesdall in Wichita, had 2152 students and the smallest school, Eastern Heights in Agra, had 61 junior high school students.

DATA COLLECTION

The Kansas Educational Directory 1971-1972 was used to find the number of students for each junior high school. The teachers' transcripts, on file at the Kansas State Department of Education, were the source for the number of hours each teacher had in biology, geology, physics, chemistry, and general science. The teachers' applications for certification were checked against the teachers' transcripts for accuracy. Teachers having the same first and last names, for example, there were two Richard Smiths, were confirmed by social security numbers obtained from the Principal's Organizational Reports. Years of experience and courses other than science taught by a teacher were obtained from the Principal's Organizational Reports. Also, those teaching in both a senior high school and a junior high school were confirmed by the Principal's Organizational Reports.

DATA ANALYSIS

The following data was compiled and keypunched on computer cards for each teacher: biology hours, geology hours, physics hours, chemistry hours, general science hours, total science hours, years of teaching experience, and the number of junior high school students in the school in which the teacher taught.

For hypotheses 1, 3, and 5 the teachers were divided into five groups

according to the number of junior high school students in the school in which the teachers taught. The five groups were: group I, 1-300 students; group II, 301-600 students; group III, 601-900 students; group IV, 901-1200 students; and group V, 1201 students and larger.

For hypothesis 1 an analysis of variance was run for each of the variables, (a) biology hours, (b) geology hours, (c) physics hours, (d) chemistry hours, (e) general science hours, and (f) total science hours. The analysis of variance made it possible to determine if the means were significantly different. A Scheffe test for multiple comparison's was used to find out which means were significantly different. The Scheffe test was used to determine if group V's means were significantly greater than group IV's means, group IV's means were significantly greater than group III's means, group III's means were significantly greater than group II's means, and group II's means were significantly greater than group I's means. An alpha level of .05 was used to test the null hypothesis.

A Pearson product moment correlation test was used to determine if a high positive relationship existed between the teachers' years of experience and the teachers' total semester hours of science credit. A correlation coefficient of .85 was necessary to indicate a high positive relationship.

A t-test for independent variables was used to determine if the means of the biology hours were significantly greater than the means of the physical science hours. Before the t-test could be used it was necessary to ascertain that the two variables were independent. A Pearson product moment correlation test was employed to determine if any relationship existed. An alpha level of .01 was set to test if the correlation coefficient was significantly greater than zero. The t-test was used on the biology hours and the physical science

hours of each group and the total. An alpha level of .05 was necessary to indicate significance for null hypothesis number 3.

Hypothesis 4 utilized a different set of groups. The groups (designated A through D) were divided by the level the teachers taught (junior high school or junior high school and senior high school) and whether the teachers taught only science or science and non-science courses. These groups were: group A, teachers who taught only science in both junior high schools and senior high schools; group B, teachers who taught only science and who taught only in junior high schools; group C, teachers who taught science and non-science courses and who taught in junior high schools and senior high schools; and group D, teachers who taught science and non-science courses in junior high schools. The mean credit hours for (a) biology, (b) geology, (c) physics, (d) chemistry, (e) general science, and (f) total science were compared between the groups to determine if group A's means were significantly greater than group B's means; group B's means were significantly greater than group C's means; and group C's means were significantly greater than group D's means. An analysis of variance was used to determine if the means were significantly different. A Scheffe test for multiple comparison's was utilized to check for significance between individual means. An alpha level of .05 was used to test the null hypothesis.

The last hypothesis asked if the teachers in group V, 1201 students and larger, had more years of experience than the teachers in group IV, 901-1200 students; if group IV's teachers had significantly more years of experience than group III's teachers, 601-900 students; if group III's teachers had significantly more years of experience than group II's teachers, 301-600 students; and if group II's teachers had significantly more years of experience than group I's teachers, 1-300 students. An analysis of variance was used to

determine if any of the means were significantly different. A Scheffe test for multiple comparison's was utilized to test for significant difference between individual means. An alpha level of .05 was required to indicate significance.

Chapter 4

RESULTS

The Certification Handbook for the State of Kansas for 1970-1971 states a minimum requirement of 15 hours of science credit is needed to be certified to teach science in a junior high school. Table 3 gives the number of teachers and the percent of teachers out of the total number of teachers with less than 15 semester hours of science for each size group and for the total sample. Group III, 601-900 students, had the largest percent of unqualified teachers, 7.8. The next largest percent of teachers with less than 15 hours of science credit, 6.7, was found in group I, 1-300 students. There were 23 teachers out of all the teachers who were unqualified to teach science because of insufficient science credits, this was 5.2% of the teachers.

Table 3. Numbers and Percents of Unqualified Teachers
(Teachers with less than 15 semester hours of science credit)
for Each Size Group and for the Total

Group Number	I	II	III	IV	V	Total
Number of Students	1-300	301-600	601-900	901-1200	1201-up	
Number of Teachers	44	117	140	109	32	442
Number of Unqualified Teachers	3	5	11	3	1	23
Percent of Unqualified Teachers	6.7	4.3	7.8	2.8	3.1	5.2

Table 4 on page 24 presents the means and standard deviations of biology, geology, physics, chemistry, general science, and total science semester hours of credit for each of the five size groupings of teachers and for all the

teachers. The table also gives the F -ratio for each science area: and the table shows which means were found to be significantly different by the Scheffe test for multiple comparison's.

Null hypothesis 1 was: group V's (a) biology, (b) geology, (c) physics, (d) chemistry, (e) general science, and (f) total science means were not significantly greater than group IV's means; group IV's means were not significantly greater than group III's means; group III's means were not significantly greater than group II's means; and group II's means were not significantly greater than group I's means.

The first part of hypothesis 1 dealt with biology hours. Table 4 shows group V had the largest mean biology hours 29.71. The means of group IV and III were next with 26.45 and 26.44 hours, respectively. Group II had the next smallest mean, 24.41 hours, and group I had the smallest mean 17.70 hours. The F -ratio indicated these means were significantly different at alpha equals .05, but a Scheffe test for multiple comparison's did not reveal any significant differences between any of the means. Null hypothesis 1(a) was retained.

The second part of hypothesis 1 dealt with the mean geology hours of the teachers in the five groups. Group IV had the largest mean, 9.85 hours, and this was significantly greater than the smallest mean of 4.90 hours, group II's mean, at an alpha level of .05 was indicated by a Scheffe test. Group IV's mean was also significantly greater than group III's mean, 5.98 hours, at an alpha level of .1 as indicated by a Scheffe test. None of the other means were significantly different; so null hypothesis 1(b) was retained, not all the geology means were significantly different from each other.

Null hypothesis 1(c) was retained, none of the groups' mean physics hours were significantly different from each other. The means ranged from 9.49 hours, group IV's mean, to 7.76 hours, group I's mean. The f -ratio which

retained the null hypothesis was 0.477.

Group IV had the largest mean chemistry hours, 14.80; and group I had the smallest mean, 9.27 hours. These were significantly different at alpha equals .1 as indicated by a Scheffe test for multiple comparison's. There were no other significant differences between the means. The mean for all the teachers was 12.95 hours. Null hypothesis 1(d) was retained; the mean chemistry hours of the different groups were not significantly different at alpha equals .05.

All the general science means were less than .5 hours. The largest mean, .45 hours was found in group III and the smallest mean, .18 hours, was found in group I. The mean for all the teachers was .35 hours. Null hypothesis 1(e) was retained because of a F-ratio of .373. The means are not significantly different.

The mean total science hours for all the teachers was 53.83 hours. Group IV had the largest mean total semester hours of science 60.92 hours, and group I had the smallest mean 40.20 hours. These means were significantly different at an alpha level of .01 as indicated by a Scheffe test for multiple comparison's. The other three means were 50.45, 54.31, and 58.69 hours; group II's, group III's, and group V's means respectively. Group I's mean was significantly different from group III's and group V's means at an alpha level of .1 as indicated by a Scheffe test for multiple comparison's. The null hypothesis was retained; only one set of means was significantly different at an alpha level of .05.

Hypothesis 2 stated there was not a high positive relationship between the teachers' total semester hours and the teachers' years of experience. The correlation coefficient, .1374, was not significantly greater than zero with 95% confidence. The null hypothesis was retained; there was no relationship between the years of experience and the total semester hours of science credit.

A Pearson product moment correlation coefficient was calculated to determine if a relationship existed between the physical science hours and the

Table 4. Means, Standard Deviations, and F-ratios for Biology, Geology, Chemistry, General Science, and Total Science Semester Hours of Credit by Size Groupings

Group Number	I	II	III	IV	V	Total	
Number of Students	0-300	301-600	601-900	901-1200	1200-up		
Number of Teachers	44	117	140	109	32	442	
							F-ratio
Biology Hours	17.70 (13.06)	24.41 (18.40)	26.44 (20.57)	26.45 (19.93)	29.71 (17.72)	2.473 ^b	25.27 (19.12)
Geology Hours	5.28 (8.01)	4.90 ¹ (7.75)	5.98 ² (8.80)	9.85 ^{1,2} (16.12)	6.80 (7.35)	3.527 ^c	6.64 (10.83)
Physics Hours	7.76 (7.78)	8.07 (8.12)	8.75 (9.74)	9.49 (9.72)	8.32 (8.37)	0.477	8.62 (9.02)
Chemistry Hours	9.27 ³ (8.28)	12.76 (11.92)	12.70 (9.99)	14.80 ³ (10.09)	13.47 (12.52)	2.202 ^a	12.95 (10.65)
General Science	0.18 (0.87)	0.32 (1.22)	0.45 (1.79)	0.33 (1.09)	0.40 (1.08)	0.373	0.35 (1.36)
Total Science	40.20 ^{4,5,6} (22.06)	50.45 (26.77)	54.31 ⁴ (30.41)	60.92 ⁵ (29.10)	58.69 ⁶ (26.68)	4.981	53.83 (28.61)

Standard deviations are in parentheses.

^aF-ratio significant at .1 level.

^cF-ratio significant at .01 level.

^bF-ratio significant at .05 level.

^dF-ratio significant at .001 level.

¹Significantly different at .05 level.

³Significantly different at .1 level.

⁵Significantly different at .01 level.

²Significantly different at .1 level.

⁴Significantly different at .1 level.

⁶Significantly different at .1 level.

biology hours. The coefficient for each group was: .0698 for group I, 1-300 students; -.0092 for group II, 301-600 students; .1262 for group III, 601-900 students; -.1282 for group IV, 901-1200 students; -.1303 for group V, 1201 students and larger; and .0139 for all the teachers. None of these correlation

coefficients were significantly different from zero, so no relationship existed between a teacher's physical science hours and biology hours. Because no relationship exists, the criterion that the variables are independent was satisfied, allowing for the use of a t-test for independent variables to determine if the mean biology hours are greater than the mean physical science hours.

Null hypothesis 3 was the mean biology hours are not significantly greater than the mean physical science hours in groups I, II, III, IV, V, and all the teachers. Table 5 is the means and standard deviations for the biology and physical science hours by groups and for the total. Also, Table 5 presents the t-statistics for comparison of the means. The mean physical science hours exceeded the mean biology hours in all groups except group V. The mean physical science hours for all teachers, 28.210, was larger than the mean biology hours 25.270 for all the teachers. These means were significantly different at alpha equals .025. Group I's and the group IV's biology and physical science hours were significantly different. In group I the mean physical science hours, 22.311, was significantly greater than the mean biology hours, 17.704, at an alpha level of .1. Group IV's mean physical science hours 34.148 was significantly greater than group IV's mean biological science hours, 26.448, at an alpha level of .005. The null hypothesis was retained; the mean biology hours are not significantly greater than the mean physical science hours. However, in the cases that were significant the physical science hours exceeded the biology hours.

The teachers were divided according to the level they taught (junior high school or junior high school and senior high school) and according to what they taught (science or science and non-science courses). The groups were: group A, teachers who taught only science and who taught in junior high schools and senior high schools; group B, teachers who taught only science and who

Table 5. Means, Standard Deviations, and T-Statistics for Biology and Physical Science Hours by Size Groups and Total

Group Number	I	II	III	IV	V	Total
Number of Students	1-300	301-600	601-900	901-1200	1201-up	
Number of Teachers	44	117	140	109	32	442
Biology Hours	17.70 (13.06)	24.41 (18.40)	26.44 (20.57)	26.45 (19.93)	29.71 (17.72)	25.27 (19.15)
Physical Science Hours	22.31 (16.95)	25.73 (19.68)	27.43 (19.41)	34.15 (23.63)	28.59 (21.43)	28.21 (20.78)
T-statistic	-1.428 ^a	-0.531	-0.414	-2.601 ^c	0.228	-2.188 ^b

Standard deviations are in parentheses.

^aT-statistic significant at the .1 level.

^bT-statistic significant at the .025 level.

^cT-statistic significant at the .005 level.

taught only in junior high schools; group C, teachers who taught science and non-science courses and who taught in junior high schools and senior high schools; and group D, teachers who taught science and non-science courses and who taught only in junior high schools.

Table 6 gives the total number of teachers for each of the above groups and it also presents the number of teachers in each size category who were in each one of these groups. Only 20% of the teachers in schools with 1-300 students taught only science and taught only in junior high schools; whereas, 66% of the teachers in schools with 301-600 students taught only in a junior high school and taught only science courses. The percents of those who taught science and non-science courses and taught only in a junior high school, group D, show an interesting relationship; in group I, 50% of the teachers taught

only in the junior high school and taught science and non-science courses. In groups II and III, 26% and 23% of the teachers were in this category. In groups IV and V, 8% and 9% of the teachers were in this category. Out of the 442 teachers 320, or 72%, taught only science and taught only in the junior high school. Ninety-seven, or 22% of the total number of teachers taught science and non-science courses and taught only in the junior high school. Of all the teachers, 417, or 94%, taught only in junior high schools. Three hundred thirty-seven teachers, or 76%, of the total number of teachers taught only science courses.

Table 6. Numbers and Percents of Teachers in the Four Groups Divided According to the Level and What the Teachers Taught

Group	I	II	III	IV	V	Total
Number of Students	1-300	301-600	601-900	901-1200	1201-up	
Group						
A	6 (14%)	8 (7%)	3 (2%)	-	-	17 (4%)
B	9 (20%)	77 (66%)	105 (75%)	100 (92%)	29 (91%)	320 (72%)
C	7 (16%)	1 (1%)	-	-	-	8 (2%)
D	22 (50%)	31 (26%)	32 (23%)	9 (8%)	3 (9%)	97 (22%)
total	44	117	140	109	32	442

Group A -teachers who taught only science and who taught in junior high schools and senior high schools.

Group B -teachers who taught only science and who taught only in junior high schools.

Group C -teachers who taught science and non-science courses and who taught in junior high schools and senior high schools.

Group D -teachers who taught science and non-science courses and who taught only in junior high schools.

Table 7, page 29, shows the non-science subjects that were taught by the junior high school science teachers. Some teachers taught courses in as many as five of these areas. For example, one teacher taught courses in mathematics, history, language arts, home economics, and civics. Mathematics was the subject most often taught by junior high school science teachers. Physical education and health, English and language arts, and then history and geography were the subjects that followed mathematics in being the non-science course areas most often taught by science teachers.

Table 8, page 31 shows the mean biology, geology, physics, chemistry, general science, and total science semester hours of credit for the four groups of teachers divided according to the subject and the level they taught. Group A had the largest biology mean, 30.35 hours, followed closely by group B with a mean of 28.67 hours. The next largest mean was group C's, it was 19.42 hours. The smallest mean was group D's; it was 13.65 hours. The Scheffe test for multiple comparison's revealed two pairs of means to be significantly different. Group A's mean was significantly greater than group D's mean at an alpha level of .01; and group B's mean was significantly greater than group D's mean at an alpha level of .001. Null hypothesis 4(a) was retained; not all the biology means were significantly different at an alpha level of .05.

Group C had the largest geology mean, 8.17 hours, and group D had the smallest mean, 3.29 hours. Group A's mean was 4.65 hours and group B's mean was 7.72 hours. The F-ratio was significant at an alpha level of .005. Group B's mean was significantly greater than group D's mean at an alpha level of .01 as indicated by a Scheffe test. No other means were significantly different. The null hypothesis was retained; all the means were not significantly different from each other.

The mean physics hours ranged from 12.59 hours, group A's mean, to 5.50

Table 7. Number of Non-Science Subjects Taught by Junior High School Science Teachers by Size Groups and Total

Group Number	I	II	III	IV	V	Total
Number of Students	1-300	301-600	601-900	901-1200	1201-up	
Mathematics	9	16	16	6	2	49
Physical Education and Health	10	8	3	2	-	23
Language Arts and English	2	3	12	4	-	21
History and Geography	1	3	10	3	-	17
Industrial Arts and Shop	4	3	3	1	-	11
Social Science and Psychology	5	2	3	-	-	10
Civics	-	1	4	2	-	7
Home Economics	2	1	4	-	-	7
Art	-	2	3	2	-	7
Drivers Education	4	-	1	-	-	5
Business and Economics	2	1	-	-	-	3
Foreign Language	-	-	2	-	-	2
Vocational Agriculture	1	-	-	-	-	1
Unified Studies	-	-	1	-	1	2
Superintendent	1	-	-	-	-	1
Guidance	-	-	1	-	1	2

hours, group C's mean. The F-ratio was 2.169 which was not significant at an alpha level of .05. So null hypothesis 4(c) was retained. The mean physics hours were not significantly different between group A, B, C, and D.

The F-ratio for the means of the chemistry hours of groups A, B, C, and D was highly significant at an alpha level of .001. The Scheffe test for multiple comparison's showed two pairs of means to be significantly different. Group A's mean, 19.00 hours, was significantly greater than group D's mean, 7.26 hours, at an alpha level of .001. Group B's mean, 14.48 hours, was significantly greater than group D's mean at an alpha level of .001. Not all the means were significantly different, so the null hypothesis was retained.

Null hypothesis 4(e) was retained. The general science means were not significantly different. The F-ratio was 1.161. The largest mean was .42 hours and it occurred in group B.

Group A had the largest total science mean, 56.65 hours. Group B was next with a mean of 60.18 hours. Group C's mean was 40.58 hours, the third largest; and group D's was 31.74 hours. The F-ratio was 31.614 which was significant at an alpha level of .001. After a Scheffe test for multiple comparison's was run, two pairs of means were found to be significantly different at an alpha level of .001. Group A's mean was significantly greater than group D's mean; and group B's mean was significantly greater than group D's mean. The null hypothesis was retained because not all the means were significantly different.

Null hypothesis 5 stated that the years of experience of the teachers in group V was not significantly greater than the years of experience of the teachers in group IV, the years of experience of the teachers in group IV was not significantly greater than the years of experience of the teachers in group III, the years of experience of the teachers in group III was not significantly greater than the years of experience of the teachers in group II, and the years of

Table 8. Means and Standard Deviations of Group A, B, C, and D for Biology, Geology, Physics, Chemistry, General Science, and Total Science Credit Hours, and F-ratio for Comparison of the Means

Group Number	A	B	C	D	Total	
Number of Teachers	17	320	8	97	442	
	F-ratio					
Biology Hours	30.35 ¹ (24.42)	28.67 ² (18.94)	19.42 (10.95)	13.65 ^{1,2} (14.20)	17.725 ^b	25.27 (19.12)
Geology Hours	4.65 (6.79)	7.72 ³ (12.05)	8.17 (12.65)	3.29 ³ (4.69)	4.503 ^a	6.64 (10.83)
Physics Hours	12.59 (11.63)	8.88 (8.63)	5.50 (5.71)	7.34 (9.82)	2.169	8.62 (9.02)
Chemistry Hours	19.00 ⁴ (10.75)	14.48 ⁵ (10.82)	7.50 (7.25)	7.26 ^{4,5} (7.80)	15.268 ^b	12.95 (10.65)
General Science Hours	0.06 (0.24)	0.42 (1.53)	0.00 (0.00)	0.20 (0.80)	1.161	0.35 (1.36)
Total Science Hours	66.65 ⁶ (24.41)	60.18 ⁷ (27.51)	40.58 (21.62)	31.74 ^{6,7} (21.24)	31.614 ^b	53.83 (26.61)

Standard deviations are in parentheses.

^aF-ratio significant at the .005 level.

^bF-ratio significant at the .001 level.

- ¹Significantly different at .01 level. ²Significantly different at .001 level.
³Significantly different at .01 level. ⁴Significantly different at .001 level.
⁵Significantly different at .001 level. ⁶Significantly different at .001 level.
⁷Significantly different at .001 level.

experience of the teachers in group II was not significantly greater than the years of experience of the teacher in group I. The means, standard deviations, F-ratio, and the significant differences found when a Scheffe test for multiple comparison's was run are presented in Table 9. The analysis of variance produced a F-ratio of 2.983 which is significant at an alpha level of .025. The Scheffe test for multiple comparison's determined that group III's mean, 8.05 hours, was

Table 9. Means, and Standard Deviations of the Years of Experience of the Teachers by Groups

Group Number	I	II	III	IV	V	Total
Number of Students	0-300	301-600	601-900	901-1200	1201-up	
Number of Teachers	44	117	140	109	32	442
					F-ratio	
Years of Experience	5.89	5.97 ¹	8.05 ¹	6.51	6.81	2.983 ^a 6.81
Standard Deviations	(5.08)	(5.08)	(5.69)	(5.46)	(5.13)	(5.42)

^aF-ratio significant at the .025 level.

¹Significantly different at .1 level.

significantly greater than group II's mean, 5.97 hours, at an alpha level of .1.

The null hypothesis was retained; the years of experience of the teachers does not vary with the size of the school.

CONCLUSIONS

The sample was of the junior high school science teachers from school districts that had a 6-3-3 organization. These schools ranged in size from 61 to 2152, seventh, eighth, and ninth grade students. The schools were located across the state of Kansas, from Elkhart (southwestern corner of the state) to St. Francis (northwestern corner of the state) to Pittsburg (southeastern corner of the state) to Sabetha (northeastern corner of the state). The schools ranged from rural areas of sparse population to urban areas of dense population. For these reasons this study can be applied to all separately organized junior high schools in Kansas.

The first thing to be considered was the unqualified teachers teaching science in the state of Kansas. There were 23 teachers with less than 15 semester hours of science credit (See Table 3, page 21). The largest percent of these teachers taught in schools of 601-900 students. The second largest percent of unqualified teachers taught in schools of 1-300 students. It is much easier to explain the occurrence of unqualified teachers in the smaller schools where 66% of the teachers taught non-science courses. Because of less teachers in the smaller school, the teachers often need to teach several subjects. The Wichita school system had 12 of the 23 unqualified teachers. Olathe had the next largest number with three science teachers with insufficient preparation. For a thorough explanation of this occurrence, the school the teachers taught in would have to be contacted. Upon inquiry at the State Department of Education, little was found about this. They did show their awareness of the large percent of the unqualified teachers being in the Wichita school system.

The first hypothesis, dealing with the mean biology, geology, physics,

chemistry, general science, and total science hours by size groups, was retained because few of the means were significantly different from each other. Only two pairs of means were significantly different at an alpha level of .05. It was not significantly different but there does seem to be a trend of the larger means of the various sciences being in the larger schools. The large range of hours in each one of the various sciences except the general science hours had definite bearing on the lack of significance found.

No significant relationship exists between the years of experience of a teacher and the total semester hours of science credit.

The third hypothesis was to test the assumption that junior high school teachers have more biology credit than physical science credit. This assumption was proved false. The biological science and physical science means for each of the five size groups and for all the teachers were tested for significant differences. A t-test for independent samples indicated group IV's, 901-1200 students, mean physical science hours was significantly greater than group IV's mean biological science hours at an alpha level of .005. The biological science and physical science means for all the teachers teaching science in junior high schools in districts with 6-3-3 organizations were significantly different at an alpha level of .025, and the physical science mean was greater than the biology mean. It could safely be concluded from this that the average teacher has more physical science credit than biology credit.

Null hypotheses 4 (a), (b), (c), (d), (e), and (f) were retained, but some interesting things were found. The teachers that taught only science and only in junior high schools had significantly greater biology, geology, chemistry, and total science hours than the teachers that taught science and non-science and only in junior high schools. The differences between these two groups was one group taught science and non-science courses and the other group taught only

science courses. The biology, chemistry, and total science means of Group A was significantly greater than the biology, chemistry, and total science means of group D. In group A were the teachers who taught in junior high schools and senior high schools and who taught only science; in group D were the teachers who taught only in junior high schools and who taught science and non-science courses. A conclusion of the above was that the teachers who taught only science had more biology, chemistry, and total science hours than teachers who taught only in the junior high school and who taught science and non-science courses.

The non-science subjects taught most often were mathematics, physical education and health, language arts, and then general shop in that order. Breukelman in his most recent study found the non-science area most often taught in was mathematics, followed by health, physical education, social science, and then history (Breukelman, 1966:27). Breukelman and Frazier's 1962-1963 study revealed mathematics was the area most often taught followed by health and physical education, social studies, and then English (Breukelman and Frazier, 1963b:14). Mathematics was the subject taught with science the most often in 1960-1961; physical education, health, and then social studies were the subjects that followed mathematics in being the most often taught by science teachers (Breukelman and Frazier, 1961a:27). Looking at these and the results obtained in this study mathematics has been the subject most often taught with junior high school science by junior high school science teachers over the last 11 years. Physical education and health has been the next most often taught non-science subject by junior high school science teachers. The other subjects vary over the years as to which follow physical education and health.

Null hypothesis 5 was retained. The years of experience of the teachers in the size groups are not significantly different from each other at alpha equals .05. There is not a trend of the less experienced teachers teaching in the smaller schools as assumed prior to the study.

SUMMARY

What the study said about the junior high school science teacher was:

1. The mean biology, geology, physics, chemistry, general science, and total science hours did not differ significantly with the different size schools in which the teacher taught.
2. The teachers' total hours of science credit was not related to the teachers' years of experience.
3. The junior high school science teacher had significantly more physical science hours of college credit than biology hours of college credit.
4. The teachers who taught non-science courses in the junior high school had fewer credit hours of science preparation in biology, chemistry, and total science than the teachers who taught only science (either in a junior high school or in a junior high school and a senior high school).
5. The non-science subject most often taught was mathematics followed by physical education and health; previous studies indicate this to be unchanged over the last 11 years.
6. The years of experience of the teachers does not differ significantly with the size of school in which the teachers taught.
7. The mean semester hours of college credit were: 25.27 hours of biology, 6.04 hours of geology, 8.62 hours of physics, 12.95 hours of chemistry, .35 hours of general science, and 53.83 hours of total science.

REFERENCES CITED

- Austin, Arthur A., and David W. Pierson. 1968. "Certain Facts Affecting Seventh and Eighth Grade Science Programs in North Central Kansas," Transactions of the Academy of Science, 71(1): 13-19.
- Baker, Weldon N., and Merle E. Brooks. 1957. "Background and Academic Preparation of the Teachers of Science in the High Schools in Kansas," Emporia State Research Studies, 6(2): 1-40.
- Breukelman, John. 1960. "The Science Teacher Improvement Program of the Kansas Academy of Science," Transactions of the Kansas Academy of Science, 63(Supplement): 1-60.
- Breukelman, John. 1964. "Teaching Combinations of the High School Biology Teachers of Kansas. 1963-1964," Transactions of the Kansas Academy of Science, 67(92): 379-388.
- Breukelman, John. 1966. "Offerings and Enrollments in the Secondary School Sciences in Kansas in 1965-1966," Emporia State Research Studies, 14(4): 1-48.
- Breukelman, John, and Ted F. Andrews. 1953. "Offerings and Enrollments in the Secondary School Sciences in Kansas in 1951-1952," Emporia State Research Studies, 4(3): 1-32.
- Breukelman, John, and Ted F. Andrews. 1956. "Offerings and Enrollments in Secondary School Sciences in Kansas in 1954-1955," Emporia State Research Studies, 4(3): 1-38.
- Breukelman, John, and Ralph P. Frazier. 1961a. "Offerings and Enrollments in the Secondary Sciences in Kansas in 1960-1961," Emporia State Research Studies, 10(16): 1-48.
- Breukelman, John, and Ralph P. Frazier. 1961b. "The Science Teacher Improvement Program of the Kansas Academy of Science (Second Report)," Transactions of the Kansas Academy of Science, 64(3): 237-257.
- Breukelman, John, and Ralph P. Frazier. 1962. "The Science Teacher Improvement Program of the Kansas Academy of Science (Third Report)," Transactions of the Kansas Academy of Science, 65(2): 154-177.
- Breukelman, John, and Ralph P. Frazier. 1963a. "The Science Teacher Improvement Program of the Kansas Academy of Science (Fourth Report)," Transactions of the Kansas Academy of Science, 66(2): 315-333.
- Breukelman, John, and Ralph P. Frazier. 1963b. "Offerings and Enrollments in Junior High School Science in Kansas in 1962-1963," Emporia State Research Studies, 12(2): 1-19.
- Bruce, Matthew H. 1969. "Teacher Education in Science," Review of Educational Research, 39(4): 415-427.

- Conant, James Bryant. 1960. Recommendations for Education in the Junior High School Years. 1st ed. Princeton, New Jersey: Educational Testing Service.
- George, Kenneth D. 1965. "The Education of the High School Biology Teacher," The University of Kansas Bulletin of Education, 19(2): 67-70.
- Haeker, Howard Paul. 1972. "A Report of the Available Research on the Status of Science Teaching in the State of Kansas 1936-1971," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.
- Kansas Educational Directory 1971-1972. Kansas State Department of Education, Bulletin 340.
- Certificate Handbook for the State of Kansas, January 1, 1970. Kansas State Department of Education.
- Novak, Joseph D., and Merle F. Brooks. 1959. "College Preparation of Science Teachers," The Science Teacher, 26(7): 473-477.
- Odum, Mildred. 1966. "The Preparation of Kansas Elementary Teachers in Science," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.
- Peddicord, Rita Rae. 1959. "Enrollment in High School Mathematics and Science in Kansas," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.
- Pringle, James, and Harold Durst. 1969. "Status of BSCS Biology in Kansas 1967-1968," Transactions of the Kansas Academy of Science, 72(3): 394-398.
- Rolfe, Ronald Dale. 1964. "The Academic and Professional Preparation of the Beginning High School Biology Teacher in Kansas," Unpublished Master's Report, Kansas State University.
- Rundus, Timothy Amos. 1966. "A Study of the Academic and Professional Preparation of the First Year Secondary School Physics Teachers in Kansas," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.
- Science Directory for Kansas Schools 1971-1972. Prepared by Gary Schmedeman, Kansas State Department of Education.
- Splitter, Jackie Lee. 1969. "A Study of BSCS in the State of Kansas 1968-1969," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.
- Walker, Randol Rex. 1964. "A Study of Academic Preparation of Biology and General Science Teachers in Relation to School Size in Kansas," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.
- Watkins, Marilyn Mauck. 1963. "Academic Preparation in Science of Chemistry Teachers in the Kansas High Schools 1962-1963," Unpublished Master's Report, Kansas State University, Manhattan, Kansas.

APPENDIX

List of School Districts and Junior High Schools Involved in Study

District	School
202 Turner	Pierson Junior High Highland Junior High
207 Fort Leavenworth	Patton Junior High
211 Norton	Norton Junior High
218 Elkhart	Elkhart Junior High
232 Desoto	Desoto Junior High
233 Olathe	Millbrooke Junior High Santa Fe Trail Junior High
234 Fort Scott	Fort Scott Junior High
239 Minneapolis	Delphos Public Schools
249 Frontenac	Washington High
250 Pittsburg	Lakeside Junior High Roosevelt Junior High
253 Emporia	Lowther Junior High
257 Iola	Iola Junior High
259 Wichita	Allison Junior High Roosevelt Junior High Truesdell Junior High Hadley Junior High Hamilton Junior High Jardine Junior High Mayberry Junior High Coleman Junior High Brooks Junior High Curtis Junior High Horace Mann Junior High Mead Junior High Marshall Junior High Pleasant Valley Junior High Robinson Junior High Wilbur Junior High
260 Derby	Carlton Junior High Derby Junior High
262 Valley Center	Valley Center Junior High
263 Mulvane	Mulvane Junior High
274 Oakley	Oakley Junior High
288 Richmond	Central Heights Junior High
290 Ottawa	Ottawa Junior High
297 St. Francis	St. Francis Junior High
306 Southeast of Saline	Southeast of Saline High
308 Hutchinson	Central Junior High Liberty Junior High Sherman Junior High
315 Colby	Colby Junior High
324 Kirwin	Eastern Heights High

345 Seaman	Logan Junior High
364 Marysville	Northern Hills Junior High
373 Newton	Marysville Junior High
383 Manhattan	Chisholm Junior High
387 Altoona Wilson	Santa Fe Junior High
402 Augusta	Manhattan Junior High
403 Otis Bison	Altoona Junior High
408 Marion	Augusta Junior High
413 Chanute	Otis Bison Junior High
418 McPherson	Florence Junior High
428 Great Bend	Royster Junior High
437 Washburn	McPherson Junior High
441 Sabetha	Roosevelt Junior High
443 Dodge City	Harrison Junior High
445 Coffeyville	Jay Shideler Junior High
446 Independence	Auburn Junior High
447 Cherryvale	Sabetha Junior High
450 Tecumseh	Wetmore Junior High
451 Baileyville	Dodge City Junior High
453 Leavenworth	Roosevelt Junior High
457 Garden City	McKinley Junior High
466 Scott City	Independence Junior High
470 Arkansas City	Cherryvale High
475 Junction City	Shawnee Heights Junior High
479 Kincaid	St. Benedict Junior High
480 Liberal	West Junior High
484 Fredonia	East Junior High
489 Hays	Garden City Junior High
490 El Dorado	Scott City Junior High
495 Ft. Larned	Arkansas City Junior High
497 Lawrence	Junction City Junior High
500 Kansas City	Fort Riley Junior High
	Crest Junior High
	West Junior High
	South Junior High
	Fredonia Junior High
	Hays Junior High
	El Dorado Junior High
	Larned Junior High
	West Junior High
	Central Junior High
	South Junior High
	Argentine Junior-Senior High
	Rosedale Junior-Senior High
	Arrowhead Junior High
	Coronado Junior High
	Northwest Junior High
	Central Junior High
	West Junior High
	Northeast Junior High
501 Topeka	Capper Junior High
	Crane Junior High
	East Topeka Junior High

(501 Topeka Continued)

503 Parsons

512 Shawnee Mission

French Junior High
Eisenhower Junior High
Highland Park Junior High
Boswell Junior High
Holliday Junior High
Jardine Junior High
Roosevelt Junior High
Curtis Junior High
Landon Junior High
Parsons Junior High
Indian Creek Junior High
Trailridge Junior High
Hillcrest Junior High
Meadowbrook Junior High
Milburn Junior High
Old Mission Junior High
Broadmoor Junior High
Nallwood Junior High
Höcker Grove Junior High
Indian Hills Junior High

THE ACADEMIC PREPARATION OF JUNIOR HIGH SCHOOL
SCIENCE TEACHERS IN KANSAS FOR THE YEAR 1971-1972

by

JOHN BASYE YOST

B. S., Kansas State University, 1971

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

A review of the literature on the academic preparation of junior high school science teachers revealed a lack of research in this area, pointing to a need for a study to determine the science preparation of the junior high school science teachers in the state of Kansas.

All seventh, eighth, and ninth grade teachers in school districts having school organizations of 6-3-3 were used in this study. Four hundred forty-two science teachers taught in school districts with organizations of 6-3-3 in 1971-1972, and this included 119 schools and 74,587 seventh, eighth, and ninth grade students or 60% of all the seventh, eighth, and ninth grade students in public schools in Kansas. The biology, geology, physics, chemistry, general science and total semester hours of science credit of these 442 science teachers were examined.

The teachers were divided into groups according to (a) the number of students in the junior high school in which the teachers taught, and (b) the level (junior high school or junior high school and senior high school) taught at and whether the teacher taught only science courses or science courses and non-science courses. The mean hours of the various sciences of these different groups were examined.

The means of the science hours were not significantly different when compared by size groups. When compared by the level and subject the junior high school science teacher taught, it was found that the science teachers who taught non-science courses and science courses had significantly fewer semester hours of science credit than the teachers who taught only science. The junior high school science teachers' physical science credit hours significantly exceeded the teachers' biological science credit hours. The years of experience of the teachers did not differ significantly between the groups of teachers divided according to the number of students in the junior high school in which the

teachers taught. The mean semester hours of college credit were: 25.27 hours of biology, 6.04 hours of geology, 8.62 hours of physics, 12.95 hours of chemistry, .35 hours of general science, and 53.83 hours of total science.