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An Investigation of the Preparation of Junior High School General Science Teachers and Their Science Teaching Programs in the State of Washington

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AN INVESTIGATION OF THE PREPARATION OF JUNIOR HIGH SCHOOL GENERAL SCIENCE TEACHERS AND THEIR SCIENCE TEACHING PROGRAMS IN THE STATE OF WASHINGTON

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TABLE OF CONTENTS

CHAPTER PAGE

LIST OF TABLES

TABLE PAGE

CHAPTER I

THE PROBLEM, LIMITATIONS OF THE STUDY, AND METHODS OF RESEARCH

There has been much recent concern with the problem of science education. However, in the State of Washington little research has been conducted pertaining to junior high school science teachers and general science classes.

I. THE PROBLEM

Statement of the problem. The purposes of this study were to investigate (1) the academic background and teaching assignments of junior high general science teachers in the State of Washington and (2) the consistency of general science subject matter taught in junior high schools in the State of Washington.

Underlying purpose. The underlying purpose was to provide information that could be used to determine needs of prospective general science teachers.

Importance of the study. The tremendous pace at which man's knowledge advanced in the field of science after World War II staggered the imagination: a vaccine was discovered for polio; the number of deaths caused by

cancer was reduced; space travel became a possibility; and atomic power was harnessed for use in industry.

In every field of science there was a need for trained technicians. It became obvious that the science programs within our schools had not attracted or produced enough scientists to fill the demand. The need of a science curriculum planned to arouse the interest of potential technical workers became a grave concern. A. F. Nixon said in 1952:

> We hear all about us that this is the age of science. Only recently, however, I heard two eminent men in the field of science education decry the reduced enrollments in science in our junior and senior high schools. They gave interesting and all too well known statistics on the trend of enrollments in science and spoke of the great danger we face as a nation in the shortage of trained scientists, and the likelihood of a future untrained population living in an age of science (15:23).

This prediction was all too true; the impact of this lag was soon evident.

Other writers for magazines and newspapers, and commentators in radio and television also showed concern about the shortage of trained scientists. Numerous articles attribute the shortage to our educational system. However, the general effect of the clamor has been constructive. It has focused public attention upon the need to improve instruction in general and instruction in science and mathematics in particular (5:124). The

government has released money for the advancement of science in the public schools. Even though the junior high school science teacher holds a crucial position in the motivation and guidance of prospective scientists and technicians (10:139), much research has centered around improving the senior high school science programs. Pettit indicated twenty years ago that

> If there is to be a major revision of the sciences in the upper high school, it must be based upon the existing junior high school program. Until more definite agreement has been reached pertaining to content to be covered and the degree of completion to be achieved, the present program cannot be used to plan a senior high school course revision (16:776).

Little progress has been made in general science education in twenty years. At a recent meeting of the National Association for Research in Science Teaching, the plight of the junior high school was pointed out. Herbert A. Smith wrote:

> From the implications of the research that has been done, one must apparently conclude that the junior high school is still the stepchild of American education, frequently discriminated against in faculty and housing (21:37).

II. LIMITATIONS OF THE STUDY

This study had the following limitations.

1. The junior high schools in the State of Washington sampled in this study were those contained in a separate building under a principal, excluding junior-senior

high schools and eight-grade elementary schools.

2. Junior high teachers studied were those teaching general science as a separate subject one or more periods. Science teachers excluded were those teaching under the core program or in a self-contained classroom.

3. Summarization of training was limited to degrees held by the teachers and to training in biological science, physical science, and earth science, and excluded mathematics, psychology, and education courses other than science teaching methods.

4. Teaching assignments were identified in terms of subjects, grade levels, and the number of pupils in each class.

5. One hundred and eighteen selected science topics were used to determine the content of general science courses.

III. METHODS OF RESEARCH

To obtain quantitative data on the preparation of general science teachers and the amount of time spent on selected topics by these teachers, the survey method was used.

The questionnaire (See Appendix B) was constructed after studying similar research techniques and obtaining suggestions from staff members at Central Washington Col-

lege of Education and from science teachers in the Ellensburg Public Schools.

A preliminary questionnaire was prepared and distributed for completion to six staff members at Central Washington College, two science teachers in the Ellensburg Public Schools, and three students on the campus at Central Washington College. Suggestions from these persons were obtained, evaluated, and incorporated into the final questionnaire. The thesis committee checked and approved the final copy of the questionnaire.

The questionnaire was mimeographed and mailed. Two minor errors went unnoticed until the first returns were received. The errors occurred during mimeographing. The first error, in the teacher preparation area, read: "Zoology (other than listed under bot. or zoo.)." It should have read: "Biology (other than listed under bot. or zoo.)," and Zoology should have followed. The second error occurred in the section on content under AREA XVII. The second topic should have been "telephone" instead of "telegraph."

The mailing list was compiled in two ways: (1) names and addresses of junior high school principals were obtained from the Washington Educational Directory, 1959-1960 (24:15-66); (2) a letter (See Appendix A) was sent to the principals requesting them to submit the names of

general science teachers in their buildings that met the requirements described in the letter. One hundred and thirty-eight letters were sent to principals. Twenty-six principals indicated that their schools did not fit the limits of the study, and seventeen principals did not respond. The principals of the remaining ninety-five schools submitted the names of 213 general science teachers.

Of the 213 questionnaires mailed, 153 were returned, six of which were totally unusable for any part of the study. The 147 usable or partially usable questionnaires represented a 69 per cent return. The returned questionnaires came from teachers in eighty-two junior high schools.

IV. OVERVIEW OF THESIS

A brief summary of literature pertinent to the study will be given in Chapter II. Chapter III will present information regarding teaching assignment and pre-service training of general science teachers. The number and size of the general science classes and the content taught in them will be presented in Chapter IV. Chapter V will include a summary of the study with conclusions and recommendations based on the data.

CHAPTER II

REVIEW OF THE LITERATURE

Numerous studies have been conducted in other states and much has been written about the preparation of general science teachers and the content they teach. Some of the work done in these areas will be summarized in this chapter.

I. TEACHER PREPARATION

Studies (11:15) based on teachers in Kansas, Minnesota, Nebraska, Oklahoma, and Texas, indicate a lack of adequate academic qualifications on the part of many general science teachers. A study made by Brooks and Baker (1:277-80) indicates that 17 per cent of the general science teachers in Kansas had no biology, botany, or zoology; 56 per cent had no general biology; 31 per cent had no chemistry; and 53 per cent had no physics.

Studies made by Koelsche (10:136) and Warren (23:64) showed similar conditions. Shrader (20:154-55), studying the problems of beginning science teachers, found that in general they appeared to have attained an acceptable standard of preparation for teaching and that most of them were partially qualified for teaching science. He also pointed out that most of the general science teachers and more than

one half of the teachers teaching biology, physics, and chemistry had not earned sufficient quarter credits in specified courses (suggested by the National Society for the Study of Education) to be considered well qualified to teach science. Forty-one per cent of the teachers had not completed a course in science teaching methods.

McCain (12:41), in a survey of physical science teachers in the State of Washington, found that most had completed a major or a minor in physical science.

The Forty-Sixth Yearbook (13:284) of the National Society for the Study of Education offered these recommendations for the preparation of general science teachers:

1. Thirteen and one-half to 18 quarter hours of survey courses in the biological sciences, and 13 1/2 to 18 quarter credits in the physical and earth sciences.

2. An additional 13 1/2 to 18 quarter hours in each of the biological, physical, and earth sciences.

3. The total of 67 1/2 to 90 quarter hours was regarded as minimum.

A report from the Midwest Regional State College Conference on Science and Mathematics Teacher Education recommended a similar program (11:16).

A study by Ming (2:77-8) showed the concern of school administrators regarding the preparation of high school science teachers. The administrators suggested that

science teachers should have between 15 and 18 semester hours in each of the science areas they were expected to teach. The science teachers also should have at least an introductory course in meteorology, geology, and astronomy. They should have an extensive training in many fields rather than an intensive training in one field.

Herbert A. Smith (21:39) in a review of recent research indicated that since our certification laws were outdated, an action program should be developed to correct the blanket certification approach. Smith offered these suggestions: (1) specialized programs should be established for the training of junior high school science teachers; (2) better certification laws should be sought; and (3) a career concept of junior high school science teaching should be developed.

II. GENERAL SCIENCE COURSE CONTENT IN JUNIOR HIGH SCHOOLS

Most published research that dealt with course content for junior high school science apparently was conducted in the years prior to 1945. Only studies that appeared to be pertinent were reviewed.

Heiss, Obourn, and Hoffman (7:66) stated that the textbook, in the final analysis, was most influential in determining what was to be taught in any science.

Curtis (4:375-85) reviewed studies twenty years previous to 1942. The studies were mainly analyses of textbooks. It was evident in this review that there was little agreement among writers as to what should be included in a general science textbook.

Session (19:22-26) found that textbooks in seventh grade general science varied widely in their subject matter content; therefore, any one text is not a reliable source of information as to what to teach.

Graham (6:68) pointed out a slight tendency on the part of the authors to stress science interests of their own.

Hunter and Parker (9:869-77) gave a review of studies made in the content of general science. The review brought out these points: (1) health was moving into the general science program at that time; (2) there was disagreement on the part of textbook writers as to what should be taught; and (3) the physical sciences were considered to be the backbone of the general science program.

Robinson (17:418) brought out the nature of the problem faced by teachers of general science, summarized present thinking about general science, and gave a description of what seemed to be a more ideal general science course from the standpoint of the students. Robinson also reported that:

> Selection of content will become more and more a problem for teachers as further developments in science make it less possible to provide both a program which is modern and one which "surveys" the sciences.

The Forty-Sixth (13:Ch. XII) and Fifty-Ninth (14:86) Yearbooks of the National Society for the Study of Education offered information regarding areas of study for junior high general science pupils. The Fifty-Ninth Yearbook states:

> When general science courses are organized in a three-year sequence there is often a spiral arrangement requiring instruction in the same areas in each grade but at a different level of difficulty and from a different perspective.

In the Fifty-Ninth Yearbook (14:86), the New York State outline was presented as an example of the spiral pattern. The ten units of study suggested were:

1. Kinds of Living Things
2. Keeping Healthy
3. Lifting and Moving Things
4. Common Chemical Changes
5. Using Electricity
6. Energy from the Sun
7. The Atmosphere
8. The Earth and Sky
9. Rocks and Soil
10. Survival of Living Things

These suggested units were for grades seven, eight, and nine and were not designed for specific grade levels.

The Washington State Science Curriculum Guide for

Grades Seven, Eight and Nine (22:6) suggested the following outline for general science in the junior high school:

I. Grades Seven, Eight and Nine
   A. Exploring Space
II. Grade Seven
   A. Air
   B. Water
   C. Weather
   D. Rocks and Soil
   E. The Universe
III. Grade Eight
   A. Plants and Animals
   B. Sound
   C. Light
   D. How Airplanes Fly
   E. Introduction to Chemistry
   F. Introduction to Geology
IV. Grade Nine
   A. Geology
   B. Air and Meteorology
   C. Astronomy
   D. Energy
   E. Matter
   F. Biology
   G. New Worlds to Conquer

The outline seemed to indicate a spiral pattern in some areas.

III. SUMMARY

The review of the literature was concerned with only two aspects of general science. Brief descriptions were given of literature pertaining to the preparation of general science teachers and general science content.

The literature pertaining to teacher preparation generally stressed the need for a broad science training for general science teachers. It was mentioned that certification laws were out-dated, and that general science teachers should be specially prepared for that teaching assignment.

The literature on content showed numerous studies based on textbook analyses in the years previous to 1945. These studies pointed out that there was little agreement on the content of general science. Later studies suggested the need for more functional science programs.

CHAPTER III

TEACHING EXPERIENCE AND PRE-SERVICE TRAINING OF GENERAL SCIENCE TEACHERS IN THE STATE OF WASHINGTON

The data presented in this chapter pertained to the grade or grade levels of general science classes taught by the teachers and the teaching experience and pre-service training of the respondents. These data were derived from the responses on 147 questionnaires.

I. EXPERIENCE

Teaching assignments. Sixty-eight general science teachers taught one grade level of general science, 64 taught two grade levels of the subject, and 14 taught the seventh, eighth, and ninth grade general science. These data are presented in Table I. There were a total of 72 teachers teaching seventh grade, 87 teaching eighth grade, and 79 teaching ninth grade general science. One-third of the teachers taught only classes in general science.

Teaching experience. Fifty-seven per cent of the teachers had been in the teaching profession less than eight years, and 76 per cent had been teaching general science less than eight years. One teacher in five was a beginning science teacher.

TABLE I

THE NUMBER OF GENERAL SCIENCE TEACHERS GROUPED BY THE GRADE LEVEL(S) OF GENERAL SCIENCE TAUGHT

Grade level of general science taught	Number of teachers
7	25
8	19
9	24
7-8	23
7-9	10
8-9	31
7-8-9	14
No Response	1
	147

II. TRAINING

Degrees held by the general science teachers. All the general science teachers responding to the questionnaire held a bachelor's degree. Twenty-nine held the master's degree. Table II presents the distribution of the degrees.

Major and minor fields of study of the general science teachers. Eighty-six per cent of the respondents reported they had either a major and/or a minor area of emphasis in science. Thirteen per cent indicated they had not completed either a major or a minor in science areas. Twenty-seven per cent of the teachers had a minor in science areas and twenty-two per cent reported both a major and minor emphasis in science areas. Table III summarizes the information reported by the teachers.

General science teachers completing a science methods course. Ninety-two general science teachers reported they had completed a course in science methods. This represented sixty-two per cent of the total group.

Credits earned by the general science teachers. The Forty-Sixth Yearbook (13:234) recommended a program for the preparation of general science teachers. (See Chapter II, page 8.)

This program was used as a standard for determining the adequacy of the preparation submitted by the teachers.

TABLE II

ACADEMIC DEGREES HELD BY GENERAL SCIENCE TEACHERS

Degrees held	Number of teachers
Bachelor of Arts	36
Bachelor of Science	33
Bachelor of Education	32
Bachelor of Science in Education	2
Bachelor of Science and Bachelor of Education	2
Bachelor of Arts and Bachelor of Science	4
Bachelor of Arts and Bachelor of Education	7
Bachelor of Science and Master of Education	6
Bachelor of Arts and Master of Arts	4
Bachelor of Science in Education and Master of Education	3
Bachelor of Arts and Master of Education	2
Bachelor of Science in Education Master of Science in Education	2
Bachelor of Arts in Education and Master of Education	1
Bachelor of Arts and Master of Science	1
Bachelor of Science and Master of Arts	1

TABLE II (Continued)

Degrees held	Number of teachers
Bachelor of Arts, Bachelor of Education and Master of Education	4
Bachelor of Science, Bachelor of Education and Master of Science	2
Bachelor of Science, Bachelor of Education, Master of Education	1
Indicated Master of Education, did not indicate a bachelor's degree	2
Insufficient Data	2
	147

TABLE III

GENERAL SCIENCE TEACHERS GROUPED ACCORDING TO PREPARATION IN SCIENCE

Preparation of the teachers in science	Per cent of 72 7th grade teachers	Per cent of 87 8th grade teachers	Per cent of 79 9th grade teachers	Per cent of the 147 general science teachers
Neither a major or a minor in science	16.7	13.8	10.1	12.9
Major in science	61.6	56.3	59.5	59.2
Minor in science	20.8	28.7	30.4	27.2
Major and minor in science	18.0	26.4	26.6	21.8
Insufficient data	1.4	1.1		.68

The error which appeared on the questionnaire, (See Chapter II, page 5.), did not invalidate the data presented because the credits earned were grouped into biological, physical, and earth sciences.

The first impression received from the data was that the teachers were well prepared to teach general science. Ninety-four per cent had earned credits in the biological sciences, 90 per cent had some preparation in the physical sciences and 59 per cent had some training in the earth sciences. However, a closer examination of the data showed that many teachers had earned few credits in one or more areas. Only 20 of the 147 teachers, or 13.6 per cent, had earned sufficient science credits to meet the suggested standards for teaching general science described in the Forty-Sixth Yearbook (13:234). More than half of the general science teachers were teaching two or more grade levels; consequently, the data pertaining to preparation for teaching science were indicated for the entire group. Seven teachers did not supply adequate information regarding their pre-service training. Table IV indicates these data.

III. SUMMARY

Almost all of the general science teachers were teaching one or two grade levels of the subject. Only a

TABLE IV

QUARTER CREDITS EARNED BY GENERAL SCIENCE TEACHERS IN THE BIOLOGICAL, PHYSICAL, AND EARTH SCIENCES

Biological science credits earned	Physical science credits earned	Earth science credits earned	Number of teachers
Over 35	Over 35	18-35	1
Over 35	Over 35	10-17	1
Over 35	Over 35	5-9	1
Over 35	18-35	18-35	2
Over 35	18-35	10-17	2
Over 35	18-35	5-9	4
Over 35	18-35	1-4	1
Over 35	10-17	10-17	1
Over 35	10-17	5-9	5
Over 35	10-17	1-4	2
Over 35	5-9	18-35	1
Over 35	5-9	10-17	1
Over 35	5-9	5-9	2
18-35	Over 35	18-35	1
18-35	Over 35	10-17	1
18-35	Over 35	5-9	1
18-35	18-35	Over 35	1
18-35	18-35	10-17	1
18-35	18-35	5-9	4

TABLE IV (Continued)

Biological science credits earned	Physical science credits earned	Earth science credits earned	Number of teachers
18-35	10-17	18-35	1
18-35	10-17	10-17	2
18-35	10-17	5-9	5
18-35	5-9	18-35	1
18-35	5-9	5-9	2
10-17	Over 35	Over 35	1
10-17	Over 35	10-17	1
10-17	18-35	10-17	1
10-17	18-35	5-9	2
10-17	10-17	10-17	2
10-17	10-17	5-9	1
10-17	5-9	10-17	1
10-17	5-9	5-9	4
10-17	1-4	5-9	2
5-9	Over 35	Over 35	1
5-9	Over 35	18-35	1
5-9	Over 35	10-17	1
5-9	18-35	1-4	1
5-9	5-9	1-4	2
1-4	Over 35	18-35	1
1-4	Over 35	5-9	2
1-4	10-17	5-9	1

TABLE IV (Continued)

Biological science credits earned	Physical science credits earned	Earth science credits earned	Number of teachers
0	10-17	18-35	1
0	10-17	5-9	1
0	5-9	5-9	1
0	5-9	1-4	1
Over 35	0	18-35	2
Over 35	0	5-9	1
18-35	0	18-35	1
18-35	0	5-9	1
10-17	0	18-35	1
5-9	0	5-9	1
0	0	10-17	1
Over 35	Over 35	0	5
Over 35	18-35	0	3
Over 35	10-17	0	4
Over 35	5-9	0	1
Over 35	1-4	0	1
18-35	Over 35	0	6
18-35	18-35	0	5
18-35	10-17	0	4
18-35	5-9	0	2
10-17	Over 35	0	4
10-17	18-35	0	2

TABLE IV (Continued)

Biological science credits earned	Physical science credits earned	Earth science credits earned	Number of teachers
10-17	10-17	0	3
10-17	5-9	0	2
5-9	18-35	0	2
5-9	10-17	0	1
5-9	5-9	0	3
0	Over 35	0	2
0	18-35	0	2
Over 35	0	0	2
18-35	0	0	5
Insufficient data			7
			147

few teachers were required to teach seventh, eighth, and ninth grades. A high per cent of the teachers had been teaching science less than eight years.

All the teachers held the bachelor's degree; twenty-nine held a master's degree.

Eighty-seven per cent of the respondents had either a major or a minor in science. Most of the teachers had received some training in the biological and the physical sciences while less than sixty per cent indicated they had earned credits in the earth sciences. One in seven teachers had met the standards for teaching general science recommended in the Forty-Sixth Yearbook (12:284).

CHAPTER IV

THE NUMBER, SIZE AND GRADE LEVELS OF THE GENERAL SCIENCE CLASSES AND THE CONTENT TAUGHT

The data presented in this chapter pertain to the size and number of general science classes in 73 junior high schools, the number of semesters of general science offered in 66 schools and the content taught in the seventh, eighth, and ninth grade general science classes in 78 junior high schools. These schools are located in all parts of the state, in large and small communities. The inconsistencies in the number of schools resulted from the lack of sufficient data.

I. NUMBER AND SIZE OF CLASSES

One hundred and twenty teachers from seventy-three schools submitted usable information regarding class size and the number of classes taught. These teachers taught 455 general science classes in which 13,840 students were enrolled. The average class size for the total group was 30.4. The range in class size for the total group was 13 to 42. Slightly over half of the classes had enrollments over 30. Table V shows the classes grouped by grades.

TABLE V

NUMBER AND SIZE OF GENERAL SCIENCE CLASSES GROUPED BY GRADE

	Grade 7	Grade 8	Grade 9	Total Group
Number of classes	126	156	173	455
Number of pupils	4049	4737	5054	13,840
Average class size	32.1	30.4	29.2	30.41
Range in class size	14-42	14-42	13-41	13-42
Number of classes over 30	76	82	76	234

II. NUMBER OF SEMESTERS PROVIDED

The Forty-Sixth Yearbook (13:43) of the National Society for the Study of Education stated that general science should be required. It also stated: "No class in general science can be adequate which continues through less than a full year." Three semesters were regarded as a minimum requirement of general science in the junior high school.

Teachers from sixty-six schools reported information regarding the number of semesters of general science, either required or elective, taught in their schools. In one-half of the schools less than three semesters of general science were required. However, only five schools fell below the recommended three semesters when elective semesters were included in the evaluation. These data are presented in Table VI.

III. CONTENT

Content taught in the general science classes. The data derived from the questionnaire served to give an indication of what was being taught in the junior high school general science classes in the State of Washington.

Until the time of this study the only recent indicators of the content in the junior high general science

TABLE VI

NUMBER OF JUNIOR HIGH SCHOOLS GROUPED ACCORDING TO SEMESTERS OF REQUIRED AND ELECTIVE GENERAL SCIENCE

Number of semesters of general science	Number of schools in which the indicated semesters of general science were required	Number of schools in which the indicated semesters of general science were entirely elective	Number of schools in which the indicated semesters of general science were provided
6	4	1	10
5	0	0	9
4	14	5	28
3 1/2	0	0	3
3	15	4	11
2	21	26	5
1 1/2	1	0	0
1	6	6	0
1/2	2	0	0
0	3	24	0
	66	66	66

programs were the science textbooks, school district courses of study, and the Washington State Curriculum Guide for Grades Seven, Eight and Nine (22:1-100).

The questionnaire contained 118 selected topics. The teachers were asked to indicate the approximate number of days spent on each topic. Some teachers used a check rather than a number in responding to the various items.

From these data it was possible to determine (1) the per cent of teachers who responded correctly who were teaching the topic and (2) the average number and range of days devoted to the topic by the respondents.

The tabulation of content taught was done by grade; consequently, there appeared to be more teachers represented than there were questionnaires received. This discrepancy was because more than one grade was taught by a number of science teachers. (See Chapter III, Table I.)

In the seventh, eighth, and ninth grades 64, 77, and 60 teachers, respectively, contributed usable data. Information reported by the remaining teachers was invalid for two reasons: (1) the teachers indicated time spent on general areas rather than specific topics and (2) the number of days spent on the topics totaled more than two hundred. The excess of 20 days over the 180 in the typical school year was allowed because of overlapping topics.

The data were analyzed for consistency of content for each grade level. Two levels of consistency were

established arbitrarily. The higher level was based upon 70 per cent or more teachers teaching the topic and the lower level upon a bare majority.

Content taught in the seventh grade general science classes. In the seventh grade the higher level of consistency in content was shown for only eleven topics of the 118. However, an additional 21 topics were added to the list when a majority of teachers teaching the topic was used to indicate consistency. These data were recorded in Table VII. Additional data pertaining to science topics in the seventh grade appear in Table X, the Appendix.

Content taught in the eighth grade general science classes. Over 70 per cent of the eighth grade science teachers were teaching 8 of the 118 topics. However, 49 of the 118 topics were taught by more than 50 per cent of the 78 eighth grade teachers. From these figures the content appeared to be more consistent for the eighth grade than for the seventh grade. These data are presented in Table VIII. Data from the 118 topics taught by the eighth grade teachers are recorded in Table XI in the Appendix.

Content taught in the ninth grade general science classes. The higher level of consistency was attained for 30 topics of the 118. An additional 39 topics were added

TABLE VII

SEVENTH GRADE TOPICS TAUGHT CONSISTENTLY AND LISTED ACCORDING TO PER CENT OF TEACHERS TEACHING THE TOPIC, THE RANGE OF DAYS, AND THE AVERAGE TIME SPENT

Topic	Per cent of the 64 teachers who were teaching topic	Per cent of the 64 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Science and superstitions	82.2	12.5	1-15	3.8
How science effects our lives	79.7	14.1	1-20	3.9
Composition and characteristics of water	75.0	12.5	1-15	2.7
The causes, effects and control of fire	75.0	7.8	1-15	2.7
Sources of heat	75.0	7.8	1-15	3.7
Temperature scales (Fahrenheit and Centrigrade)	75.0	10.9	1-5	2.2

TABLE VII (Continued)

Topic	Per cent of the 64 teachers who were teaching topic	Per cent of the 64 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Boiling point and pressure	75.0	9.4	1-3	2.0
The combustion process	73.4	6.3	1-15	2.4
History and famous men of science	71.9	12.5	1-15	3.9
Origin and formation of common fuels	71.9	6.3	1-5	2.2
Definition of physical and chemical changes	70.3	9.4	1-20	3.5
*Chemical elements and compounds	68.8	7.8	1-10	4.0
Cells and their functions	67.2	7.8	1-15	3.5
Construction of atoms and molecules	65.6	7.8	1-15	3.9

*Beginning of topics included when lower level of consistency was used.

TABLE VII (Continued)

Topic	Per cent of the 64 teachers who were teaching topic	Per cent of the 64 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Living and non-living things	65.6	12.5	1-30	5.3
Photosynthesis	65.6	7.8	1-5	2.5
Chemical composition of air	60.9	7.8	1-6	2.0
Acids, bases and salts	60.9	6.3	1-5	2.7
Adaptation of animals to their environment	60.9	7.8	1-10	3.0
Bacteria (non-reproductive aspects)	59.4	7.8	1-5	1.5
Reproduction of seed plants	57.8	6.3	1-5	2.2
Animal life and its distribution	56.3	6.3	1-30	5.4
Water cycle	56.3	9.4	1-7	2.2

TABLE VII (Continued)

Topic	Per cent of the 64 teachers who were teaching topic	Per cent of the 64 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Sources of water supply	56.3	10.9	1-15	2.6
Reproduction of non-seed plants	54.7	6.3	1-5	1.6
Insects and other arthropods	53.1	4.7	1-10	4.3
Industrial aspects of chemistry	53.1	7.8	1-5	1.9
Fungi (non-reproductive aspects)	53.0	6.3	1-5	1.5
Vertebrates other than man	51.6	4.7	1-20	4.1
Flowering plants (non-reproductive aspects)	51.6	4.7	1-10	2.5
Conservation of water	51.6	7.8	1-15	2.6
Air pressure and altitudes	51.6	6.3	1-10	1.9

TABLE VIII

EIGHTH GRADE TOPICS TAUGHT CONSISTENTLY AND LISTED ACCORDING TO PER CENT OF TEACHERS TEACHING THE TOPIC, THE RANGE OF DAYS, AND THE AVERAGE TIME SPENT

Topic	Per cent of the 77 teachers who were teaching topic	Per cent of the 77 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
The solar system	94.8	12.9	1-25	5.6
How earth movement effects us	93.5	12.9	1-7	2.8
The sun	93.5	12.9	1-7	2.3
The moon	92.2	12.9	1-10	2.4
Our galaxy, the Milky Way	88.3	11.7	1-11	2.5
Man's conquest of space	87.0	12.9	1-20	3.7
Eclipses and their causes	87.0	12.9	1-5	2.2
Air pressure and altitude	71.4	10.4	1-5	2.1

TABLE VIII (Continued)

Topic	Per cent of the 77 teachers who were teaching topic	Per cent of the 77 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
*How science effects our lives	67.5	9.1	1-25	4.0
Chemical composition of air	67.5	6.5	1-10	1.8
Winds and their causes	67.5	9.1	1-15	2.8
Water cycle	66.2	9.1	1-15	2.0
Digestive system	64.9	6.5	1-12	4.1
Skeletal system	63.6	5.2	1-10	3.7
Circulatory system	63.6	5.2	1-10	4.2
Respiratory system	62.3	5.2	1-10	3.4
Types of rock	62.3	11.6	1-15	2.6
Volcanoes	62.3	10.4	1-5	1.7

*Beginning of topics included when lower level of consistency was used.

TABLE VIII (Continued)

Topic	Per cent of the 77 teachers who were teaching topic	Per cent of the 77 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Composition of soil and types of soil	62.3	12.9	1-13	1.8
Mass, weight and gravity	62.3	9.1	1-10	2.3
Forms of energy	62.3	11.7	1-10	3.0
Science and the space age	62.0	7.8	1-30	8.2
Science and superstitions	61.0	6.5	1-10	2.6
Glaciers and their work	61.0	11.7	1-5	1.7
Growth and repair of the human body	59.7	7.8	1-6	2.4
Clouds, fog and rain	59.7	7.8	1-15	2.8
Soil conservation	59.7	12.9	1-10	1.9
Inertia and momentum	59.7	7.8	1-10	2.0
Velocity of light	59.7	9.1	1-2	1.2

TABLE VIII (Continued)

Topic	Per cent of the 77 teachers who were teaching topic	Per cent of the 77 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Cells and their functions	58.4	7.8	1-20	3.2
Fossils	58.4	10.4	1-5	1.6
Friction and resistance	57.2	6.5	1-10	1.9
Measuring and weighing	57.1	10.4	1-5	2.1
Nature of light	57.1	9.1	1-5	1.2
Earthquakes and their causes	57.1	10.4	1-5	1.9
History and famous men of science	55.8	7.8	1-14	3.6
Color and the spectrum	55.8	9.1	1-5	1.4
The Weather Bureau and its work	55.8	7.8	1-15	1.4
Excretory system	54.5	5.2	1-6	2.2

TABLE VIII (Continued)

Topic	Per cent of the 77 teachers who were teaching topic	Per cent of the 77 teachers who failed to indicate the number of days	Range of days topic was taught	Average number of days spent on each topic
Stimulants and narcotics	54.5	5.2	1-5	2.1
Mechanisms for changing energy	54.2	9.1	1-10	2.2
Saturation and dew point	53.2	7.8	1-15	1.9
Rockets and missiles	51.9	9.1	1-16	4.0
Living and non-living things	51.9	7.8	1-40	3.9
Sources of water supply	51.9	5.2	1-10	2.3
Earth as a magnet	51.9	9.1	1-5	2.0
Composition and characteristics of water	50.6	3.8	1-10	3.0
Geological eras	50.6	10.4	1-5	2.0
Refraction and lenses	50.6	9.1	1-5	1.6

when a majority of teachers teaching the topic was used as the basis for establishing consistency. This made a total of 69 topics taught by over half of the teachers. The content of the ninth grade general science classes appeared to be considerably more consistent than that in the seventh and eighth grades. These data are cited in Table IX. Information pertaining to the complete list of topics is recorded in Table XII in the Appendix.

IV. SUMMARY

Data obtained on class size pointed out that the average general science class was slightly over thirty.

Information from sixty-six schools showed the number of semesters of general science provided, either required or elective. In one-half of the schools the amount of science required did not meet the standard suggested by the National Society for the Study of Education. However, most schools provided electives to fulfill this requirement.

Criteria for determining consistency of content were established. The content of the seventh and eighth grades did not appear to be as consistent as the content in the ninth grade general science classes.

TABLE IX

NINTH GRADE TOPICS TAUGHT CONSISTENTLY AND LISTED ACCORDING TO PER CENT OF TEACHERS TEACHING TOPIC, THE RANGE OF DAYS, AND THE AVERAGE TIME SPENT

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Construction of atoms and molecules	91.7	13.3	1-14	4.1
Chemical elements and compounds	88.3	13.3	1-10	1.8
Atomic energy and electricity	86.6	13.3	1-30	5.3
Forms of energy	85.0	11.6	1-10	3.3
Structure and function of the eye, vision	85.0	13.3	1-7	2.5
Nature of light	83.3	11.7	1-5	2.3
Velocity of light	83.3	11.7	1-3	1.2
Refraction and lenses	83.3	11.7	1-5	2.3

TABLE IX (Continued)

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Transmission of sound	83.3	13.3	1-5	2.2
Structure and function of the ear	83.3	13.3	1-5	2.3
Current electricity	83.3	13.3	1-20	5.9
Color and the spectrum	81.7	11.7	1-6	2.0
Static electricity	81.7	13.3	1-20	5.9
Definition of physical and chemical changes	80.0	13.3	1-7	2.8
Simple chemical equations	80.0	8.3	1-10	3.0
Inertia and momentum	80.0	8.3	1-7	2.2
Simple machines	80.0	11.7	1-20	5.7
Mechanisms for changing energy	76.6	11.7	1-10	3.8
Acids, bases and salts	75.0	8.3	1-14	3.2

TABLE IX (Continued)

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Pitch, tone and overtone	75.0	11.7	1-3	1.8
Cells and their functions	75.0	11.6	1-6	3.0
Mitosis, meiosis and heredity	75.0	10.0	1-30	7.9
Magnets and their use	75.0	10.0	1-7	4.8
Friction and resistance	75.0	11.8	1-6	2.1
Science and the space age	73.3	13.3	1-20	4.4
Composition and characteristics of water	73.3	13.3	1-5	2.4
Complex machines and their uses	73.3	10.0	1-6	2.7
Industrial aspects of chemistry	71.7	11.7	1-10	2.5
Measuring and weighing	71.7	10.0	1-7	2.6

TABLE IX (Continued)

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Mass, weight and gravity	70.0	10.0	1-7	2.6
*Chemical composition of the air	68.3	15.0	1-5	1.8
Speech and formation of speech	68.3	11.7	1-3	1.6
Earth as a magnet	66.7	10.0	1-4	1.5
Radio and television	66.7	13.3	1-9	3.2
Human behavior	65.0	8.3	1-30	7.6
How science effects our lives	65.0	11.7	1-10	3.9
Telegraph	63.3	11.7	1-5	2.0
Air pressure and altitude	61.7	11.7	1-5	2.1

*Beginning of topics included when the lower level of consistency was used.

TABLE IX (Continued)

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Brain and nervous system	61.7	11.7	1-25	5.6
Temperature scales (Fahrenheit and Centrigrade)	61.7	13.3	1-5	1.9
Plant adaptations to environment	60.0	6.7	1-5	2.3
Rockets and missiles	60.0	11.7	1-14	4.3
Science and superstitions	58.3	8.3	1-3	1.9
Living and non-living things	58.3	10.0	1-8	2.9
Photosynthesis	58.3	8.3	1-5	1.8
Diffusion and osmosis	58.3	11.7	1-6	1.8
Care of eyes	58.3	10.0	1-3	1.3
Endocrine glands	58.3	8.3	1-30	4.6
Sources of heat	58.3	10.0	1-4	1.9

TABLE IX (Continued)

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Sources of water supply	56.7	8.3	1-10	1.9
Conservation of water	56.7	11.7	1-4	1.6
Winds and their causes	56.7	10.0	1-5	1.3
Water cycle	56.7	10.0	1-3	1.3
Displacement and buoyancy	56.7	11.7	1-6	3.1
Aviation	56.7	10.0	1-10	3.2
Growth and repair of human body	56.7	11.7	1-5	1.7
Clouds, fog and rain	55.0	8.3	1-3	1.6
Combustion process	55.0	11.7	1-3	1.6
Reproduction in animals	55.0	6.7	1-5	2.8

TABLE IX (Continued)

Topic	Per cent of the 60 teachers who were teaching topic	Per cent of the 60 teachers who failed to provide the number of days	Range of days each topic was taught	Average number of days spent on each topic
Reproduction of seed plants	55.0	8.3	1-5	1.7
History and famous men of science	53.3	6.7	1-10	3.9
Chemistry of protoplasm	53.3	6.7	1-10	3.9
Wireless	53.3	11.7	1-6	3.1
Saturation and dew point	53.3	8.3	1-6	1.8
Distribution of water, dams and reservoirs	51.7	8.3	1-5	1.8
The Weather Bureau and its work	51.7	8.3	1-5	1.9
Origin and formation of common fuels	51.7	10.0	1-3	1.6
Bacteria (non-reproductive aspects)	51.7	6.7	1-14	2.2
Stimulants and narcotics	51.7	10.0	1-7	2.0

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The purposes of the study were (1) to investigate the academic background and teaching assignments of the general science teachers in the State of Washington and (2) to investigate the consistency of general science subject matter taught in the junior high schools in the State of Washington. The underlying purpose was to provide data that could be used to determine academic needs of prospective general science teachers.

The study was limited to specifically defined junior high schools and general science teachers.

These data were obtained by the use of a questionnaire. The questionnaire was constructed after studying similar research techniques and obtaining suggestions from authorities.

A mailing list of 213 general science teachers was compiled from names supplied by 95 junior high school principals. One hundred and forty-seven, or 69 per cent, usable or partially usable questionnaires were returned. The returned questionnaires came from 82 junior high schools.

In the total of 147 general science teachers, 72 were teaching seventh grade, 87 were teaching eighth grade,

and 79 were teaching ninth grade general science. Obviously, over one-half of the teachers taught two or more grade levels of general science. One-third of the teachers taught only classes in general science.

Fifty-seven per cent of the teachers had taught less than eight years, and 76 per cent had been teaching general science less than eight years. One in five was teaching science for the first time.

Most of the teachers had received some training in the biological and the physical sciences while less than 60 per cent had earned credits in the earth sciences. However only one in seven teachers had sufficient credits in science subject areas to be considered well qualified to teach general science. Sixty-two per cent of the 147 teachers had taken a course in science teaching methods.

The average size of general science classes was slightly over thirty. Most schools provided at least three semesters of general science either required and/or elective.

Two levels of consistency regarding subject matter content were established. The higher level was set at 70 per cent or more of the teachers teaching a topic, and the lower level was set at 50 per cent or more of the teachers teaching the topic.

The content in the seventh and eighth grades was quite inconsistent at the higher level. Less than 45 per cent of the topics were taught consistently by more than 50 per cent of either the seventh or eighth grade teachers.

In the ninth grade almost 60 per cent of the topics were taught by more than one-half of the teachers who responded.

II. CONCLUSIONS

1. It seemed evident that general science teachers were concerned about the content taught in the junior high school, judging from the high percentage of returns.

2. Junior high school principals were concerned about the teaching of general science, judging from their cooperation.

3. From the standpoint of academic degrees, general science teachers are well qualified to teach school.

4. The large majority of general science teachers had completed a major or a minor in science.

5. Science majors and/or minors and academic degrees were not indicative of the quality of preparation for teaching general science.

6. A major in a specific area in science would not be adequate preparation for teaching general science.

7. The majority of general science teachers were not prepared to teach general science according to the

standards suggested by the National Society for the Study of Education.

8. Most general science teachers had received training in science methods.

9. It was quite probable that a junior high general science teacher could expect to teach more than one grade of general science.

10. Most general science teachers could expect to teach classes larger in size than twenty-five pupils.

11. The amount of general science required in one-half of the junior high schools in the State of Washington was inadequate.

12. Science topics taught in seventh and eighth grade general science classes were not presented in the respective grades with a high degree of consistency.

13. Science topics in the ninth grade were taught with a greater degree of consistency than was anticipated.

14. Aspects of the physical and earth sciences were taught more consistently in all grades than were the topics related to the biological sciences.

III. RECOMMENDATIONS

1. Content studies similar to the present one should be conducted on all science teaching levels over a period of years to determine the fluctuation of content taught. In

this way it might be possible to design an adequate program for the preparation of general science teachers.

2. Prospective general science teachers should earn a minimum of 25 quarter hours in the biological sciences, 25 quarter hours in the physical sciences, and 10 quarter hours in the earth sciences.

3. A minimum of four semesters of general science should be required of all junior high school students in the State of Washington.

4. A State curriculum science coordinator should work closely with science specialists in the junior high schools.

5. A continuous effort should be made to develop a program of related science areas for each of the grades seven, eight, and nine to augment the existing State Curriculum Guide for General Science.

6. A carefully constructed standardized test using local or state norms should be developed and used to determine the progress of general science students.

7. The size of general science classes should not exceed twenty-seven pupils.

8. A prospective science teacher should receive a broad training in science since he will probably have the opportunity of teaching general science.

9. A study should be made to determine the advisability of certifying teachers to teach science.

10. The personnel of the colleges concerned with the training of science teachers should make a concentrated effort to prepare science teachers to teach those areas of science consistently taught in the junior high schools and adjust the preparation as a greater consistency develops.

The study has pointed out the need for further research directed toward determining an adequate course of study for prospective general science teachers. The need for more consistency of general science content in grades seven, eight, and nine was apparent, and additional research in establishing a more consistent general science program is needed. It is hoped that subsequent investigations will be aimed toward these aspects.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Baker, Weldon N., and Merle E. Brooks. "A Study of Academic Preparation of the Secondary Science Teachers in the State of Kansas," The Science Teacher, 24:277-280, October, 1957.

2. Buck, Jacqueline V., and George G. Mallinson. "Some Implications and Practical Applications of Recent Research in the Teaching of Science at the Secondary School Level," Science Education, 38:77-8, February, 1954.

3. Cureton, Edward E. "The Aim and Content of the Course of Study in General Science for Junior High Schools." Unpublished Master's Thesis, Stanford University, Palo Alto, 1927.

4. Curtis, F. D. "Teaching of Science in Grade VII, VIII," Review of Educational Research, XII, 375-85, October, 1942.

5. Fitzpatrick, Frederick L. "The Science Manpower Project," Science Education, 43:121-25, March, 1959.

6. Graham, Charles C. "Some Data Pertinent to Textbooks of General Science," Science Education, 25:65-68, February, 1941.

7. Heiss, Elwood D., Ellsworth S. Obourn, and Charles W. Hoffman. Modern Science Teaching. New York: The MacMillan Company, 1950. 462 pp.

8. Hillway, Tyrus. Introduction to Research. Boston: The Riverside Press, 1956. 271 pp.

9. Hunter, George W., and Alice L. Parker. "The Subject Matter of General Science," School Science and Math, XLII, 869-77, December, 1942.

10. Koelsche, Charles L. "The Academic and Teaching Backgrounds of Secondary Science Teachers in the State of Ohio," Science Education, 43:134-39, March, 1959.

11. Mallinson, George G. "Promising Practices in Teacher Education: A Report from the Midwest Regional State College Conference on Science and Mathematics Teacher Education," School Science and Math, LVII, 15-16, January, 1958.

12. McCain, Wendell Merle. "A Study of the Curricular Offerings, Student Enrollments, Teacher Preparation and Teaching Loads in the Physical Science in the Public Senior High Schools in the State of Washington," College of Education Record, XXIII, 40-42, March, 1956. University of Washington.

13. The National Society for the Study of Education, Science Education in American Schools, 306 pp. Forty-Sixth Yearbook, Part I. Chicago: The University of Chicago Press, 1947.

14. _____. Rethinking Science Education, 338 pp. Fifty-Ninth Yearbook, Part I. Chicago: The University of Chicago Press, 1960.

15. Nixon, A. F. "Are Our Schools Preparing for the Scientific Age?" Science Education, 36:23-4, February, 1952.

16. Pettit, Donald D. "The Content of Junior High School Science," School Science and Math, October-November, 1940, pp. 763-776.

17. Robinson, James T. "General Science in the Secondary Schools," Science Education, 43:415-19, December, 1959.

18. Rodman, George I. "A Suggestive Science Course of Study for Grades Seven and Eight for the West Valley Schools." Unpublished research paper, Central Washington College of Education, Ellensburg, 1958. Pp. 37-40.

19. Session, Jerome C. "Selecting Functional Subject Matter for a General Science Course," Science Education, February, 1943, pp. 22-26.

20. Shrader, John S. "An Investigation of Instructional Problems Encountered by Beginning Secondary School Science Teachers in the Pacific Northwest." Unpublished Doctor's thesis, The University of Washington, Seattle, 1957. 164 pp.

21. Smith, Herbert A. "Some Implications of Research for the Training of the Junior High School Science Teacher," Science Education, 44:37-39, 1960.

22. Superintendent of Public Instruction. "Washington State Curriculum Guide for Grades Seven, Eight and Nine." Olympia, Washington. 100 pp.

23. Warren, Percy H. "The Education of High School Science Teachers at Madison College," Science Education, 38:64-66, 1954.

24. Washington Education Association. Washington Educational Directory, 1959-60. Pp. 15-66.

APPENDICES

APPENDIX A

C
O
P
Y

A Letter to the Junior High School Principals

Requesting The Names of the General Science

Teachers in Their Buildings

February 23, 1960

Dear Principal:

I am a graduate student at Central Washington College of Education. I plan to conduct a study of junior high school general science programs in the State of Washington.

The junior high schools to be sampled in this study are those contained in a separate building under a principal and excluding junior-senior high schools and eight grade elementary schools.

If your school does not fit within these limits please indicate below and return this letter.

If your school does fall within the requirements described above, please list below the name or names of your general science teachers that fit the following description: a junior high school general science teacher is one teaching science as a separate subject and not in a core program or a self-contained classroom.

I am enclosing a stamped self-addressed envelope for your convenience. Thank you very much for your cooperation.

Yours truly,

William H. Bliss
Box 669 CWCE
Ellensburg, Washington

_____ This school does not fit within the limits of the study.

Please list below the name or names of the general science teachers to be used in this study.

_____	_____
_____	_____
_____	_____

APPENDIX B

The Questionnaire

March 18, 1960

Dear Science Teacher:

There has been much recent concern in this country with the problem of science education. A study is being conducted at Central Washington College of Education to determine if a more adequate science education program is needed.

You and other selected teachers are best able to provide valuable data. Will you kindly assist by filling out this questionnaire?

The names of persons or schools will not be used in reporting the information. Most of the responses can be made by a check, number or a word.

It will be greatly appreciated if you will return your completed questionnaire within ten days.

Thank you very much for your cooperation.

Yours truly,

William H. Bliss

If you are interested in receiving a summary of this study please indicate by a check here. _____

QUESTIONNAIRE

SECTION I PRE-SERVICE TRAINING

1. What degrees do you hold? _____

2. What were your undergraduate major and minor fields or areas in college?
   Major _____

   Minor(s) _____ _____ _____

3. Approximately how many semester and (or) quarter credits did you earn in each of these sciences in college?

	sem.	qtr.		sem.	qtr.
anthropology	____	____	astronomy	____	____
botany	____	____	meteorology	____	____
zoology (other than listed under bot. or zoo.)	____	____	geology	____	____
			chemistry	____	____
			physics	____	____
			other:		
			_____	____	____
			_____	____	____

4. Did you complete a course in science teaching methods in college? Yes____ No____

SECTION II YOUR TEACHING ASSIGNMENT

1. Please indicate your total weekly schedule: title of subject, grade level, number of pupils in each class, and the number of days per week subject is taught.

subject	grade level	No. of pupils	No. of days taught per week
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. How many semesters of general science may a pupil complete in your school in each grade?

	Required				Elective		
Grade	0 sem.	1 sem.	2 sem.	Grade	0 sem.	1 sem.	2 sem.
7	_____	_____	_____	7	_____	_____	_____
8	_____	_____	_____	8	_____	_____	_____
9	_____	_____	_____	9	_____	_____	_____

3. Counting this year, how many years have you been teaching?_____

4. Counting this year, how many years have you been teaching at least one or more classes in general science?_____

SECTION III CONTENT OF GENERAL SCIENCE COURSES

Below is a list of topics which might be taught in general science. Please indicate under the correct grade level or levels the approximate number of days you spend on each topic. If you do not happen to include a topic in the grade or grades you teach, please put a zero in the proper space or spaces. Please scan the remainder of the questionnaire before completing it. This will help you to see how the topics are organized.

AREA I WHY WE TEACH SCIENCE AND THE VALUE OF SCIENCE STUDY	7th grade	8th grade	9th grade
1. Science and superstitions	_____	_____	_____
2. How science effects our lives	_____	_____	_____
3. History and famous men of science	_____	_____	_____
4. Science and the space age	_____	_____	_____
5. Aviation	_____	_____	_____
6. Rockets and missiles	_____	_____	_____
7. Others:			
_____	_____	_____	_____
_____	_____	_____	_____

AREA II ASPECTS OF LIVING THINGS	7th grade	8th grade	9th grade
1. Living and non-living things			
2. Cells and their functions			
3. Mitosis, meiosis and heredity			
4. Chemistry of protoplasm			
5. Diffusion and osmosis			
6. Others:			
_____			
_____			
AREA III THE ANIMAL KINGDOM			
1. Animal life and its distribution			
2. Adaptation of animals to their environment			
3. Protozoa			
4. Insects and other arthropods			
5. Other invertebrates			
6. Chordates other than vertebrates			
7. Vertebrates other than man			
8. Reproduction in animals			
9. Others:			
_____			
_____			
AREA IV THE PLANT KINGDOM			
1. Algae (non-reproductive aspects)			
2. Bacteria (non-reproductive aspects)			
3. Fungi (non-reproductive aspects)			
4. Mosses and liverworts (non-reproductive aspects)			

THE PLANT KINGDOM (continued)	7th	8th	9th
5. Club-Mosses, horsetails and ferns (non-reproductive aspects)			
6. Conifers and allies (non-reproductive aspects)			
7. Flowering plants (non-reproductive aspects)			
8. Reproduction of non-seed plants			
9. Reproduction of seed plants			
10. Photosynthesis			
11. Plant adaptations to environment			
12. Other: _____			

AREA V THE HUMAN BODY			
1. Skeletal system			
2. Digestive system			
3. Respiratory system			
4. Circulatory system			
5. Excretory system			
6. Brain and Nervous system			
7. Reproduction			
8. Growth and repair of human body			
9. Pathological diseases			
10. Non-pathological diseases			
11. Stimulants and narcotics			
12. Human behavior			
13. Endocrine glands			
14. Other: _____			

AREA VI WATER AND ITS USE			
1. Composition and characteristics of water			
2. Sources of water supply			
3. Conservation of water			
4. Distribution of water, dams and reservoirs			

WATER AND ITS USE (continued)	7th grade	8th grade	9th grade
5. Other:			
_____	____	____	____
AREA VII ELECTRICITY AND MAGNETS			
1. Static electricity	____	____	____
2. Current electricity	____	____	____
3. Atomic energy and electricity	____	____	____
4. Magnets and their uses	____	____	____
5. Earth as a magnet	____	____	____
6. Navigation	____	____	____
7. Other:			
_____	____	____	____
AREA VIII ATMOSPHERE AND OUR CLIMATE			
1. Chemical composition of air	____	____	____
2. Air pressure and altitudes	____	____	____
3. Winds and their causes	____	____	____
4. Clouds, fog and rain	____	____	____
5. Water cycle	____	____	____
6. The weather bureau and its work	____	____	____
7. Saturation and dew point	____	____	____
8. World climate	____	____	____
9. Others:			
_____	____	____	____
_____	____	____	____
AREA IX HOW THE EARTH IS RELATED TO HEAVENLY BODIES			
1. The solar system	____	____	____
2. How earth movement effects us	____	____	____
3. The sun	____	____	____
4. The moon	____	____	____
5. Our galaxy or milky way	____	____	____

HOW THE EARTH IS RELATED TO HEAVENLY BODIES (continued)	7th grade	8th grade	9th grade
6. Man's conquest of space	____	____	____
7. Eclipses and their causes	____	____	____
8. Others:			
_____	____	____	____
_____	____	____	____

AREA X FIRE AND HEAT

1. The causes, effects and control of fire	____	____	____
2. Sources of heat	____	____	____
3. Combustion process	____	____	____
4. Origin and formation of common fuels	____	____	____
5. Temperature scales (Fahrenheit and Centrigrade)	____	____	____
6. Boiling point and pressure	____	____	____
7. Others:			
_____	____	____	____
_____	____	____	____

AREA XI ROCKS AND SOILS

1. Types of rock	____	____	____
2. Composition of soil and soil types	____	____	____
3. Fossils	____	____	____
4. Volcanoes	____	____	____
5. Glaciers and their work	____	____	____
6. Soil conservation	____	____	____
7. Radioactive minerals	____	____	____
8. Geological eras	____	____	____
9. Earthquakes and their causes	____	____	____
10. Others:			
_____	____	____	____
_____	____	____	____

AREA XII ELEMENTARY MECHANICS	7th grade	8th grade	9th grade
1. Forms of energy	____	____	____
2. Mechanisms for changing energy	____	____	____
3. Inertia and momentum	____	____	____
4. Mass, weight and gravity	____	____	____
5. Measuring and weighing	____	____	____
6. Friction and resistance	____	____	____
7. Simple machines	____	____	____
8. Complex machines and their uses	____	____	____
9. Displacement and buoyancy	____	____	____
10. Others:			
_____	____	____	____
_____	____	____	____

AREA XIII LIGHT, THE EYES AND THEIR CARE			
1. Nature of light	____	____	____
2. Velocity of light	____	____	____
3. Refraction and lenses	____	____	____
4. Color and the spectrum	____	____	____
5. Structure and function of the eye, vision	____	____	____
6. Care of eyes	____	____	____
7. Others:			
_____	____	____	____
_____	____	____	____

AREA XIV SIMPLE CHEMISTRY			
1. Industrial aspects of chemistry	____	____	____
2. Definition of physical and chemical changes	____	____	____
3. Chemical elements and compounds	____	____	____
4. Construction of atoms and molecules	____	____	____
5. Acids, bases and salts	____	____	____
6. Simple chemical equations	____	____	____

SIMPLE CHEMISTRY (continued)	7th grade	8th grade	9th grade
7. Others:			
_____	____	____	____
_____	____	____	____
AREA XV HYGIENE, SANITATION AND FIRST AID			
1. Rules of health	____	____	____
2. Care of infants	____	____	____
3. Community hygiene and sanitation	____	____	____
4. First aid	____	____	____
5. Care of sick and injured	____	____	____
6. Poisons and their antidotes	____	____	____
7. Safety	____	____	____
8. Others:			
_____	____	____	____
_____	____	____	____
AREA XVI SOUND, PRODUCTION OF SOUND AND HEARING			
1. Transmission of sound	____	____	____
2. Speech and formation of speech	____	____	____
3. Pitch, tone and over-tone	____	____	____
4. Structure and function of the ear	____	____	____
5. Others:			
_____	____	____	____
_____	____	____	____
AREA XVII INSTRUMENTS OF COMMUNICATION			
1. Telegraph	____	____	____
2. Telegraph	____	____	____
3. Wireless	____	____	____

INSTRUMENTS OF COMMUNICATION (continued)	7th grade	8th grade	9th grade
4. Radio and television	_____	_____	_____
5. Others:			
_____	_____	_____	_____
_____	_____	_____	_____

REMARKS: (Write here any information you feel is needed to clarify your responses)

_____

_____

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APPENDIX C

C
O
P
Y

The Follow-up Letter Sent to the General Science Teachers Who Did Not Return the Questionnaire In Three Weeks

April 11, 1960

Dear Science Teacher:

Several weeks ago a questionnaire was sent to selected junior high school science teachers in Washington. It is possible that the one sent to you was mis-addressed, so I am sending another one.

I realize that a teacher's time is very valuable; however, you and the other selected teachers are the only people who can provide the desired information. These data can be most useful in determining the type of preparation needed by prospective junior high school science teachers.

Your efforts in completing the questionnaire as soon as possible will be greatly appreciated.

Yours truly,

William H. Bliss

TABLE X

118 TOPICS TAUGHT BY THE SEVENTH GRADE TEACHERS AND LISTED ACCORDING TO PER CENT OF TEACHERS TEACHING THE TOPIC, THE RANGE OF DAYS AND THE AVERAGE TIME SPENT ON THE TOPIC

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA I WHY WE TEACH SCIENCE AND THE VALUE OF SCIENCE STUDY				
1. Science and superstitions	82.8	12.5	1-15	3.8
2. How science effects our lives	79.7	14.0	1-20	3.9
3. History and famous men of science	71.9	12.5	1-15	3.9
4. Science and the space age	39.1	3.1	1-30	5.0
5. Aviation	25.0	3.1	1-2	1.5
6. Rockets and missiles	23.4	3.1	1-3	3.0
AREA II ASPECTS OF LIVING THINGS				
1. Living and non-living things	65.6	12.5	1-30	5.3

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA II (Continued)				
2. Cells and their functions	67.2	7.8	1-15	3.5
3. Mitosis, meiosis and heredity	20.3	3.1	1-5	1.4
4. Chemistry of protoplasm	31.3	6.3	1-5	1.7
5. Diffusion and osmosis	28.1	3.1	1-5	2.3
AREA III THE ANIMAL KINGDOM				
1. Animal life and its distribution	56.3	6.3	1-30	5.4
2. Adaptation of animals to their environment	60.9	7.8	1-10	3.0
3. Protozoa	48.4	4.7	1-5	2.3
4. Insects and other arthropods	53.1	4.7	1-10	4.3
5. Other invertebrates	46.9	4.7	1-20	4.0
6. Chordates other than vertebrates	32.8	4.7	1-5	1.9

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA III (Continued)				
7. Vertebrates other than man	51.6	4.7	1-20	4.1
8. Reproduction in animals	26.6	4.7	1-5	1.9
AREA IV THE PLANT KINGDOM				
1. Algae (non-reproductive aspects)	46.9	6.3	1-5	1.4
2. Bacteria (non-reproductive aspects)	59.4	7.8	1-5	1.6
3. Fungi (non-reproductive aspects)	53.1	6.3	1-5	1.5
4. Mosses and liverworts (non-reproductive aspects)	45.3	6.3	1-5	1.7
5. Club-Mosses, horse-tails and ferns (non-reproductive aspects)	43.8	4.7	1-5	1.6

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA IV (Continued)				
6. Conifers and allies (non-reproductive aspects)	46.9	4.7	1-5	2.0
7. Flowering plants (non-reproductive aspects)	51.6	4.7	1-10	2.5
8. Reproduction of non-seed plants	54.7	6.3	1-5	1.6
9. Reproduction of seed plants	57.8	6.3	1-5	2.2
10. Photosynthesis	65.6	7.8	1-5	2.5
11. Plant adaptations to environment	46.9	4.7	1-6	1.8
AREA V THE HUMAN BODY				
1. Skeletal system	18.8	4.7	1-5	2.0
2. Digestive system	25.0	4.7	1-6	2.5
3. Respiratory system	28.1	4.7	1-5	1.7
4. Circulatory system	18.8	4.7	1-5	2.2
5. Excretory system	15.6	3.1	1-2	1.3
6. Brain and nervous system	18.8	1.6	1-5	2.1

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA V (Continued)				
7. Reproduction	10.9	0	1-3	1.6
8. Growth and repair of human body	26.6	6.3	1-5	2.1
9. Pathological diseases	15.6	1.6	1-5	2.2
10. Non-pathological diseases	17.2	3.1	1-3	1.6
11. Stimulants and narcotics	20.3	1.6	1-3	1.6
12. Human behavior	18.8	0	1-5	3.3
13. Endocrine glands	6.3	1.6	1-2	1.6
AREA VI WATER AND ITS USE				
1. Composition and characteristics of water	75.0	12.5	1-5	2.7
2. Sources of water supply	56.3	10.9	1-15	2.6
3. Conservation of water	51.6	7.8	1-15	2.5
4. Distribution of water, dams and reservoirs	35.9	7.8	1-15	3.4

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA VII ELECTRICITY AND MAGNETS				
1. Static electricity	40.6	3.1	1-3	1.5
2. Current electricity	43.8	3.1	1-14	3.0
3. Atomic energy and electricity	29.7	3.1	1-5	1.7
4. Magnets and their uses	48.4	4.7	1-15	3.9
5. Earth as a magnet	45.3	3.1	1-14	2.4
6. Navigation	14.1	1.6	1-3	1.3
AREA VIII ATMOSPHERE AND OUR CLIMATE				
1. Chemical composition of air	60.9	7.8	1-6	2.0
2. Air pressure and altitudes	51.6	6.3	1-10	1.9
3. Winds and their causes	43.8	6.3	1-5	2.3
4. Clouds, fog and rain	48.4	4.7	1-7	2.1
5. Water cycle	56.3	9.4	1-7	2.2
6. The weather bureau and its work	35.9	6.3	1-5	1.7

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA VIII (Continued)				
7. Saturation and dew point	42.2	4.7	1-5	1.8
8. World climate	12.5	0	1-5	1.9
AREA IX HOW THE EARTH IS RELATED TO HEAVENLY BODIES				
1. The solar system	31.3	4.7	1-5	2.4
2. How earth movement effects us	34.4	6.3	1-3	1.9
3. The sun	28.1	4.7	1-3	1.6
4. The moon	23.4	3.1	1-2	1.5
5. Our galaxy or milky way	21.9	3.1	1-4	1.8
6. Man's conquest of space	25.0	3.1	1-4	2.1
7. Eclipses and their causes	25.0	3.1	1-2	1.4
AREA X FIRE AND HEAT				
1. The causes, effects and control of fire	75.0	7.8	1-15	3.7
2. Sources of heat	75.0	7.8	1-15	2.4
3. Combustion process	73.4	6.3	1-15	2.7

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA X (Continued)				
4. Origin and formation of common fuels	71.9	6.3	1-5	2.2
5. Temperature scales (Fahrenheit and Centrigrade)	75.0	10.9	1-5	2.1
6. Boiling point and pressure	75.0	9.4	1-3	2.0
AREA XI ROCKS AND SOILS				
1. Types of rock	34.4	3.1	1-10	3.5
2. Composition of soil and soil types	29.7	3.1	1-4	1.9
3. Fossils	37.5	3.1	1-3	1.3
4. Volcanoes	29.7	3.1	1-3	1.3
5. Glaciers and their work	39.1	3.1	1-5	1.6
6. Soil conservation	39.1	6.1	1-10	2.3
7. Radioactive minerals	12.5	3.1	1-2	1.0
8. Geological eras	10.9	3.1	1-5	2.2
9. Earthquakes and their causes	26.6	3.1	1-2	1.2

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XII ELEMENTARY MECHANICS				
1. Forms of energy	43.8	6.3	1-9	3.5
2. Mechanisms for changing energy	29.7	3.1	1-12	2.2
3. Inertia and momentum	21.9	3.1	1-2	1.3
4. Mass, weight and gravity	34.4	3.1	1-5	1.8
5. Measuring and weighing	43.8	7.8	1-6	2.7
6. Friction and resistance	28.1	3.1	1-3	1.5
7. Simple machines	21.9	3.1	1-4	2.0
8. Complex machines and their uses	17.2	3.1	1-3	3.3
9. Displacement and buoyancy	20.3	1.6	1-7	1.8
AREA XIII LIGHT, THE EYES AND THEIR CARE				
1. Nature of light	25.0	0	1-2	1.4
2. Velocity of light	20.0	0	1-5	1.8
3. Refraction and lenses	23.4	0	1-2	1.5
4. Color and the spectrum	28.1	1.6	1-3	1.8

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XIII (Continued)				
5. Structure and function of the eye, vision	21.9	1.6	1-3	1.8
6. Care of eyes	14.1	0	1-2	1.4
AREA XIV SIMPLE CHEMISTRY				
1. Industrial aspects of chemistry	53.1	7.8	1-5	1.9
2. Definition of physical and chemical changes	70.3	9.4	1-20	3.5
3. Chemical elements and compounds	68.8	7.8	1-10	4.0
4. Construction of atoms and molecules	65.6	7.8	1-5	3.9
5. Acids, bases and salts	60.9	6.3	1-5	2.7
6. Simple chemical equations	56.3	6.3	1-8	2.5

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XV HYGIENE, SANITATION AND FIRST AID				
1. Rules of health	28.1	6.3	1-10	3.3
2. Care of infants	1.6	0	1	1.0
3. Community hygiene and sanitation	18.8	3.1	1-10	2.7
4. First Aid	12.1	1.6	1-5	1.9
5. Care of sick and injured	10.9	3.1	1-5	1.8
6. Poisons and their antidotes	18.8	3.1	1-5	2.1
7. Safety	29.7	4.7	1-5	2.1
AREA XVI SOUND, PRODUCTION OF SOUND AND HEARING				
1. Transmission of sound	28.1	1.6	1-5	1.9
2. Speech and formation of speech	9.4	0	1-2	1.5
3. Pitch, tone and over-tone	10.9	0	1-5	2.3
4. Structure and function of the ear	25.0	4.7	1-4	1.7

TABLE X (Continued)

Topic	Per cent of the 64 teachers teaching topic	Per cent of the 64 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XVII INSTRUMENTS OF COMMUNICATION				
1. Telegraph	4.7	0	1	1.0
2. Telephone	Invalid due to error on questionnaire			
3. Wireless	15.6	1.6	1-5	1.7
4. Radio and television	3.1	1.6	1-2	1.3

TABLE XI

118 TOPICS TAUGHT BY THE EIGHTH GRADE TEACHERS AND LISTED ACCORDING TO PER CENT OF TEACHERS TEACHING THE TOPIC, THE RANGE OF DAYS AND THE AVERAGE TIME SPENT ON THE TOPIC

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA I WHY WE TEACH SCIENCE AND THE VALUE OF SCIENCE STUDY				
1. Science and superstitions	61.0	6.5	1-10	2.6
2. How science effects our lives	67.5	9.1	1-25	4.0
3. History and famous men of science	55.8	7.8	1-14	3.6
4. Science and the space age	62.3	7.8	1-30	8.2
5. Aviation	44.2	9.1	1-36	4.2
6. Rockets and missiles	51.9	9.1	1-16	4.0
AREA II ASPECTS OF LIVING THINGS				
1. Living and non-living things	51.9	7.8	1-40	3.9

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA II (Continued)				
2. Cells and their functions	58.4	7.8	1-20	3.2
3. Mitosis, meiosis and heredity	36.4	9.1	1-5	2.3
4. Chemistry of protoplasm	33.8	6.5	1-5	2.5
5. Diffusion and osmosis	44.2	6.5	1-5	2.1
AREA III THE ANIMAL KINGDOM				
1. Animal life and its distribution	29.9	1.3	1-10	3.2
2. Adaptation of animals to their environment	37.7	2.6	1-15	3.6
3. Protozoa	31.2	5.2	1-5	1.7
4. Insects and other arthropods	23.4	2.6	1-10	5.2
5. Other invertebrates	27.3	3.8	1-5	2.1
6. Chordates other than vertebrates	22.1	2.6	1-5	1.7
7. Vertebrates other than man	35.1	6.5	1-14	3.3

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA III (Continued)				
8. Reproduction in animals	36.4	3.8	1-10	3.1
AREA IV THE PLANT KINGDOM				
1. Algae (non-reproductive aspects)	27.3	3.8	1-5	1.9
2. Bacteria (non-reproductive aspects)	37.7	5.2	1-4	2.1
3. Fungi (non-reproductive aspects)	27.3	3.8	1-4	1.6
4. Mosses and liverworts (non-reproductive aspects)	14.3	2.6	1-3	1.9
5. Club-Mosses, horsetails and ferns (non-reproductive aspects)	10.4	1.3	1-3	1.9
6. Conifers and allies (non-reproductive aspects)	15.6	1.3	1-4	2.2

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA IV (Continued)				
7. Flowering plants (non-reproductive aspects)	28.6	5.2	1-14	3.2
8. Reproduction of non-seed plants	33.8	6.5	1-5	2.4
9. Reproduction of seed plants	45.5	6.5	1-7	3.5
10. Photosynthesis	45.5	6.5	1-10	2.3
11. Plant adaptations to environment	35.1	3.8	1-5	2.5
AREA V THE HUMAN BODY				
1. Skeletal system	63.6	5.2	1-10	3.7
2. Digestive system	64.9	6.5	1-12	4.1
3. Respiratory system	62.3	5.2	1-10	3.4
4. Circulatory system	63.6	5.2	1-10	4.2
5. Excretory system	54.5	5.2	1-6	2.2
6. Brain and nervous system	49.4	2.6	1-10	3.6
7. Reproduction	42.9	1.3	1-10	2.7
8. Growth and repair of human body	59.7	7.8	1-6	2.4
9. Pathological diseases	41.6	3.8	1-5	2.2

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA V (Continued)				
10. Non-pathological diseases	36.4	2.6	1-4	2.1
11. Stimulants and narcotics	54.5	5.2	1-5	2.1
12. Human behavior	28.6	1.3	1-10	2.8
13. Endocrine glands	33.8	1.3	1-5	1.8
AREA VI WATER AND ITS USE				
1. Composition and characteristics of water	50.6	3.8	1-10	3.0
2. Sources of water supply	51.9	5.2	1-10	2.3
3. Conservation of water	46.8	5.2	1-10	2.3
4. Distribution of water, dams and reservoirs	40.3	5.2	1-10	1.9
AREA VII ELECTRICITY AND MAGNETS				
1. Static electricity	36.4	6.5	1-5	2.1

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA VII (Continued)				
2. Current electricity	41.6	6.5	1-15	4.5
3. Atomic energy and electricity	33.8	9.1	1-6	2.3
4. Magnets and their uses	37.7	6.5	1-5	2.5
5. Earth as a magnet	51.9	9.1	1-5	2.0
6. Navigation	35.1	9.1	1-5	2.1
AREA VIII ATMOSPHERE AND OUR CLIMATE				
1. Chemical composition of air	67.5	6.5	1-10	1.8
2. Air pressure and altitudes	71.4	10.4	1-5	2.1
3. Winds and their causes	67.5	9.1	1-15	2.8
4. Clouds, fog and rain	59.7	7.8	1-15	2.8
5. Water cycle	66.2	9.1	1-15	2.0
6. The weather bureau and its work	55.8	7.8	1-15	2.8
7. Saturation and dew point	53.2	7.8	1-15	1.9
8. World climate	41.6	6.5	1-15	2.3

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA IX HOW THE EARTH IS RELATED TO HEAVENLY BODIES				
1. The solar system	94.8	12.9	1-25	5.6
2. How earth movement effects us	93.5	12.9	1-7	2.8
3. The sun	93.5	12.9	1-7	2.3
4. The moon	92.2	12.9	1-10	2.4
5. Our galaxy or milky way	88.3	11.7	1-11	2.5
6. Man's conquest of space	87.0	12.9	1-20	3.7
7. Eclipses and their causes	87.0	12.9	1-5	2.2
AREA X FIRE AND HEAT				
1. The causes, effects and control of fire	36.4	6.5	1-5	2.5
2. Sources of heat	38.9	6.5	1-10	2.1
3. Combustion process	37.7	6.5	1-10	2.2
4. Origin and formation of common fuels	49.4	7.8	1-8	2.1
5. Temperature scales (Fahrenheit and Centrigrade)	48.1	7.8	1-4	1.5

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA X (Continued)				
6. Boiling point and pressure	44.2	6.5	1-3	1.6
AREA XI ROCKS AND SOILS				
1. Types of rock	62.3	11.6	1-15	2.6
2. Composition of soil and soil types	62.3	12.9	1-13	1.8
3. Fossils	58.4	10.4	1-5	1.6
4. Volcanoes	62.3	10.4	1-5	1.7
5. Glaciers and their work	61.0	11.7	1-5	1.7
6. Soil conservation	59.7	12.9	1-10	1.9
7. Radioactive minerals	41.6	9.1	1-3	1.4
8. Geological eras	50.6	10.4	1-5	2.0
9. Earthquakes and their causes	57.1	10.4	1-5	1.9
AREA XII ELEMENTARY MECHANICS				
1. Forms of energy	62.3	11.7	1-10	3.0

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XII (Continued)				
2. Mechanisms for changing energy	54.5	9.1	1-10	2.2
3. Inertia and momentum	59.7	7.8	1-10	2.0
4. Mass, weight and gravity	62.3	9.1	1-10	2.3
5. Measuring and weighing	57.1	10.4	1-5	2.1
6. Friction and resistance	57.2	6.5	1-10	1.9
7. Simple machines	44.2	7.8	1-15	2.5
8. Complex machines and their uses	28.6	3.8	1-15	2.3
9. Displacement and buoyancy	42.9	6.5	1-10	2.4
AREA XIII LIGHT, THE EYES AND THEIR CARE				
1. Nature of light	57.1	9.9	1-5	1.2
2. Velocity of light	59.7	9.1	1-2	1.2
3. Refraction and lenses	50.6	9.1	1-5	1.6
4. Color and the spectrum	55.8	9.1	1-5	1.4

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XIII (Continued)				
5. Structure and function of the eye, vision	42.9	11.7	1-4	2.1
6. Care of eyes	32.5	9.1	1-5	1.6
AREA XIV SIMPLE CHEMISTRY				
1. Industrial aspects of chemistry	23.4	0	1-10	2.0
2. Definition of physical and chemical changes	37.6	3.8	1-10	2.3
3. Chemical elements and compounds	48.1	7.8	1-10	2.2
4. Construction of atoms and molecules	46.8	7.8	1-15	2.8
5. Acids, bases and salts	33.8	4.9	1-5	1.7
6. Simple chemical equations	35.1	5.2	1-4	1.7

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XV HYGIENE, SANITATION AND FIRST AID				
1. Rules of health	49.4	3.8	1-10	2.5
2. Care of infants	10.4	0	1-3	1.5
3. Community hygiene and sanitation	45.5	3.8	1-5	2.0
4. First Aid	40.3	1.3	1-20	4.9
5. Care of sick and injured	20.8	1.3	1-4	1.7
6. Poisons and their antidotes	27.3	0	1-3	1.5
7. Safety	28.6	2.6	1-5	2.3
AREA XVI SOUND, PRODUCTION OF SOUND AND HEARING				
1. Transmission of sound	46.8	7.8	1-6	1.9
2. Speech and formation of speech	20.8	3.8	1-6	1.8
3. Pitch, tone and over-tone	25.9	5.2	1-6	2.1
4. Structure and function of the ear	31.2	6.5	1-10	2.0

TABLE XI (Continued)

Topic	Per cent of the 77 teachers teaching topic	Per cent of the 77 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XVII INSTRUMENTS OF COMMUNICATION				
1. Telegraph	22.1	3.8	1-3	1.6
2. Telephone	Invalid due to error on questionnaire.			
3. Wireless	22.1	5.2	1-5	1.6
4. Radio and television	25.9	6.5	1-5	2.0

TABLE XII

118 TOPICS TAUGHT BY THE NINTH GRADE TEACHERS AND LISTED ACCORDING TO PER CENT OF TEACHERS TEACHING THE TOPIC, THE RANGE OF DAYS AND THE AVERAGE TIME SPENT ON THE TOPIC

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA I WHY WE TEACH SCIENCE AND THE VALUE OF SCIENCE STUDY				
1. Science and superstitions	58.3	8.3	1-3	1.9
2. How science effects us	65.0	11.7	1-10	3.9
3. History and famous men of science	53.3	6.7	1-10	3.9
4. Science and the space age	73.3	13.3	1-20	4.4
5. Aviation	56.7	10.0	1-10	3.2
6. Rockets and missiles	60.0	11.7	1-14	4.3
AREA II ASPECTS OF LIVING THINGS				
1. Living and non-living things	58.3	10.0	1-8	2.9

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA II (Continued)				
2. Cells and their functions	75.0	11.7	1-6	3.0
3. Mitosis, meiosis and heredity	75.0	10.0	1-30	7.9
4. Chemistry of protoplasm	53.3	10.0	1-5	1.8
5. Diffusion and osmosis	58.3	11.7	1-6	1.8
AREA III THE ANIMAL KINGDOM				
1. Animal life and its distribution	35.0	3.3	1-10	2.7
2. Adaptation of animals to their environment	50.0	6.7	1-6	2.4
3. Protozoa	41.7	6.7	1-4	2.5
4. Insects and other arthropods	31.7	5.0	1-10	2.6
5. Other invertebrates	30.0	5.0	1-5	1.7
6. Chordates other than vertebrates	28.3	5.0	1-5	1.7
7. Vertebrates other than man	36.7	6.7	1-10	2.5

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA III (Continued)				
8. Reproduction in animals	55.0	6.7	1-5	2.8
AREA IV THE PLANT KINGDOM				
1. Algae (non-reproductive aspects)	38.3	6.7	1-5	1.7
2. Bacteria (non-reproductive aspects)	51.7	6.7	1-14	2.2
3. Fungi (non-reproductive aspects)	38.3	6.7	1-5	1.8
4. Mosses and liverworts (non-reproductive aspects)	26.7	5.0	1-5	1.5
5. Club-Mosses, horse-tails and ferns (non-reproductive aspects)	25.0	3.3	1-2	1.1
6. Conifers and allies (non-reproductive aspects)	30.0	6.7	1-3	1.7
7. Flowering plants (non-reproductive aspects)	36.7	6.7	1-5	2.1

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA IV (Continued)				
8. Reproduction of non-seed plants	40.0	6.7	1-5	1.7
9. Reproduction of seed plants	55.0	8.3	1-5	2.0
10. Photosynthesis	58.3	8.3	1-5	1.8
11. Plant adaptations to environment	60.0	6.7	1-5	2.3
AREA V THE HUMAN BODY				
1. Skeletal system	35.0	6.7	1-3	2.1
2. Digestive system	36.7	10.0	1-3	1.8
3. Respiratory system	38.3	10.0	1-3	1.9
4. Circulatory system	38.3	10.0	1-4	2.1
5. Excretory system	33.3	8.3	1-20	2.9
6. Brain and Nervous system	61.7	11.7	1-25	5.6
7. Reproduction	38.3	10.0	1-21	3.5
8. Growth and repair of human body	56.7	11.7	1-5	1.7
9. Pathological diseases	40.0	10.0	1-7	1.8
10. Non-pathological diseases	35.0	11.7	1-5	1.9
11. Stimulants and narcotics	51.7	10.0	1-7	2.0

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA V (Continued)				
12. Human behavior	65.0	8.3	1-30	7.6
13. Endocrine glands	58.3	8.3	1-30	4.6
AREA VI WATER AND ITS USE				
1. Composition and characteristics of water	73.3	13.3	1-5	2.4
2. Sources of water supply	56.7	8.3	1-10	1.9
3. Conservation of water	56.7	11.7	1-4	1.6
4. Distribution of water, dams and reservoirs	51.7	8.3	1-5	1.8
AREA VII ELECTRICITY AND MAGNETS				
1. Static electricity	81.7	13.3	1-5	2.4
2. Current electricity	83.3	13.3	1-20	5.9
3. Atomic energy and electricity	86.7	13.3	1-30	5.3
4. Magnets and their uses	75.0	10.0	1-7	4.8

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA VII (Continued)				
5. Earth as a magnet	66.7	10.0	1-4	1.5
6. Navigation	48.3	6.7	1-3	1.4
AREA VIII ATMOSPHERE AND OUR CLIMATE				
1. Chemical composition of air	68.3	15.0	1-5	1.8
2. Air pressure and altitudes	61.7	11.7	1-5	2.1
3. Winds and their causes	56.7	10.0	1-5	2.1
4. Clouds, fog and rain	55.0	8.3	1-3	1.6
5. Water cycle	56.7	10.0	1-3	1.3
6. The weather bureau and its work	51.7	8.3	1-5	1.9
7. Saturation and dew point	53.3	8.3	1-6	1.8
8. World climate	43.3	10.0	1-4	1.9

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA IX HOW THE EARTH IS RELATED TO HEAVENLY BODIES				
1. The solar system	45.0	6.7	1-7	3.0
2. How earth movement effects us	48.3	8.3	1-4	1.9
3. The sun	46.7	8.3	1-3	1.7
4. The moon	45.0	6.7	1-3	1.6
5. Our galaxy or milky way	41.7	5.0	1-4	1.9
6. Man's conquest of space	46.7	10.0	1-5	2.3
7. Eclipses and their causes	43.3	8.3	1-7	1.4
AREA X FIRE AND HEAT				
1. The causes, effects and control of fire	50.0	6.7	1-3	1.8
2. Sources of heat	58.3	10.0	1-4	1.9
3. Combustion process	55.0	11.7	1-3	1.6
4. Origin and formation of common fuels	51.6	10.0	1-3	1.6

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA X (Continued)				
5. Temperature scales (Fahrenheit and Centrigrade)	61.7	13.3	1-5	1.9
6. Boiling point and pressure	46.7	1.7	1-5	1.9
AREA XI ROCKS AND SOILS				
1. Types of rock	41.7	8.3	1-5	2.0
2. Composition of soil and soil types	40.0	6.7	1-5	1.8
3. Fossils	41.7	6.7	1-5	1.7
4. Volcanoes	28.3	6.7	1-2	1.4
5. Glaciers and their work	40.0	8.3	1-2	1.1
6. Soil conservation	43.3	6.7	1-5	1.6
7. Radioactive minerals	51.7	10.0	1-5	1.8
8. Geological eras	30.0	3.3	1-5	1.8
9. Earthquakes and their causes	41.7	6.7	1-3	1.4
AREA XII ELEMENTARY MECHANICS				
1. Forms of energy	85.0	11.7	1-10	3.3

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XII (Continued)				
2. Mechanisms for changing energy	76.7	11.7	1-10	3.8
3. Inertia and momentum	80.0	8.3	1-7	2.2
4. Mass, weight and gravity	70.0	10.0	1-7	2.4
5. Measuring and weighing	71.7	10.0	1-7	2.6
6. Friction and resistance	75.0	11.7	1-6	2.1
7. Simple machines	80.0	11.7	1-20	5.7
8. Complex machines and their uses	73.3	10.0	1-6	2.7
9. Displacement and buoyancy	56.7	11.7	1-6	3.1
AREA XIII LIGHT, THE EYES AND THEIR CARE				
1. Nature of light	83.3	11.7	1-5	2.3
2. Velocity of light	83.3	11.7	1-3	1.2
3. Refraction and lenses	83.3	11.7	1-5	2.3
4. Color and the spectrum	81.7	11.7	1-6	2.2

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XIII (Continued)				
5. Structure and function of the eye, vision	85.0	13.3	1-7	2.5
6. Care of eyes	58.3	10.0	1-3	1.3
AREA XIV SIMPLE CHEMISTRY				
1. Industrial aspects of chemistry	71.7	11.7	1-10	2.5
2. Definition of physical and chemical changes	80.0	13.3	1-7	2.2
3. Chemical elements and compounds	88.3	13.3	1-10	1.8
4. Construction of atoms and molecules	91.7	13.3	1-14	4.1
5. Acids, bases and salts	75.0	8.3	1-14	3.2
6. Simple chemical equations	80.0	8.3	1-10	3.0
AREA XV HYGIENE, SANITATION AND FIRST AID				
1. Rules of health	25.0	5.0	1-3	1.6

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XV (Continued)				
2. Care of infants	6.7	1.7	1-3	1.7
3. Community hygiene and sanitation	25.0	3.0	1-5	2.2
4. First Aid	10.0	3.3	1-2	1.8
5. Care of sick and injured	11.7	1.7	1-4	1.7
6. Poisons and their antidotes	21.6	5.0	1-3	1.6
7. Safety	20.0	5.0	1-4	2.1
AREA XVI SOUND, PRODUCTION OF SOUND AND HEARING				
1. Transmission of sound	83.3	13.3	1-5	2.2
2. Speech and formation of speech	68.3	11.7	1-3	1.6
3. Pitch, tone and over-tone	75.0	11.7	1-3	1.8
4. Structure and function of the ear	83.3	13.3	1-5	2.3

TABLE XII (Continued)

Topic	Per cent of the 60 teachers teaching topic	Per cent of the 60 teachers who failed to note the days spent	Range of days spent on each topic	Average number of days spent on each topic
AREA XVII INSTRUMENTS OF COMMUNICATION				
1. Telegraph	63.3	11.7	1-5	2.0
2. Telephone	Invalid due to error on questionnaire.			
3. Wireless	53.3	11.7	1-5	1.9
4. Radio and television	66.7	13.3	1-9	3.2