

AN ANALYSIS AND EVALUATION OF THE ELEMENTARY
SCIENCE CURRICULA IN THE STATE UNIVERSITIES
AND LEADING TEACHERS COLLEGES IN
THE UNITED STATES

2

APPROVED:

J. H. Grogan Libbey
Major Professor

James F. Webb
Minor Professor

B. B. Loria
Director of the Department of Biology

L. A. Sharp
Chairman of the Graduate Council

AN ANALYSIS AND EVALUATION OF THE ELEMENTARY
SCIENCE CURRICULA IN THE STATE UNIVE SITIES
AND LEADING TEACHERS COLLEGES IN
THE UNITED STATES

THESIS

Presented to the Graduate Council of the North
Texas State Teachers College in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Agnes Ruth Sanders, B. S.

Joinerville, Texas

June, 1940

86826

86823

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
Chapter	
I. INTRODUCTION	1
II. A STANDARD COURSE OF STUDY FOR SCIENCE IN THE ELEMENTARY SCHOOL	5
III. AN ANALYSIS OF THE ELEMENTARY SCIENCE CURRICULA IN THE STATE UNIVERSITIES AND LEADING TEACHERS COLLEGES IN THE UNITED STATES	8
IV. DISCUSSION AND EVALUATION	26
V. MEASUREMENT OF THE ABILITY OF THE UNIVERSITIES AND TEACHERS COLLEGES TO PREPARE ELEMENTARY SCIENCE TEACHERS ACCORDING TO A STANDARD COURSE OF STUDY	31
APPENDIX	34
BIBLIOGRAPHY	43

LIST OF TABLES

Table	Page
1. The Distribution of Sixty-Four Teachers Colleges and Forty-Eight Universities on the Basis of the Total Number of Semester Hours Offered in Elementary Science	6
2. The Universities Offering No Elementary Education and No Elementary Science	7
3. Universities Offering Elementary Education But No Special Elementary Science Courses	8
4. Universities Offering Elementary Science and the Number of Hours Offered in Elementary Science By Each University	9
5. The Distribution of Fifty-Seven Teachers Colleges and Twenty Universities On The Basis Of The Number Of Hours Of Science Required For Elementary Education Majors	10
6. The Distribution of Sixty Teachers Colleges On The Basis Of The Number Of Hours Offered In Methods Courses In Elementary Science	12
7. The Distribution Of Teachers Colleges On The Basis Of The Number Of Hours Offered In Methods Courses in the Elementary School Subjects Including Elementary Science	13
8. The Distribution of Nine Universities on the Basis of the Number of Hours Offered in Methods Courses in Elementary Science	14
9. Teachers Colleges Offering Practice Teaching in Elementary Science	15
10. Camps and Biological Stations Offering No Elementary Science	16
11. Biological Stations and Summer Camps Offering Some Work For Elementary Science Teachers	17

Table	Page
12. Biological Stations and Summer Camps Especially Adapted To Meet the Needs of Elementary Science Teachers	22

CHAPTER I

INTRODUCTION

Purpose of the Study

The purpose of this study is to determine the status of elementary science in the different state universities and the leading teachers colleges in the United States. The problem will be considered under the seven following heads:

- (1) A standard course of study for science in elementary schools
- (2) The amount of elementary science offered by the different schools
- (3) The number of hours of science required for elementary education majors
- (4) Methods courses in elementary science
- (5) Practice teaching in elementary science
- (6) Summer camps and biological stations
- (7) Measurement of the ability of the state universities and teachers colleges to prepare elementary science teachers according to a standard course of study.

Source of Data

Most of the data for this study were secured from the catalogues of the institutions under consideration. The 1939-40 bulletins were used for all but sixteen schools.

The 1938-39 catalogues were used for the following schools: University of Alabama; State Teachers College, Livingston, Alabama; Columbia University; Kansas State Teachers College, Pittsburg, Kansas; University of Montana; University of Maine; New York University; Duke University; Northern State Teachers College, Aberdeen, North Carolina; Tennessee College, Murfreesboro, Tennessee; University of Vermont; University of Oklahoma; and the University of South Carolina.

The 1940-41 catalogue was used for the University of Virginia.

Catalogues of certain schools were not available; therefore, the data from the following schools were secured by questionnaires: University of Delaware, University of Kansas, Louisiana State University, University of Maryland, University of Michigan, University of Missouri, and the University of Oregon.

Letters were written to the summer camps and biological stations in the United States that are listed in Turtox News for March, 1940, to obtain data on courses offered in each camp and biological station which would be of value to elementary science teachers.

In order to obtain a standard by which to judge the institutions, the courses of study for the states of Virginia, New York, Oregon, California, New Jersey, Texas, and the city of Fort Worth, Texas, were examined and from them an outline of a typical course of study was set up as a standard.

Organization and Presentation of Data

This study is divided into six chapters. Chapter II is a typical standard course of study set up by the author.

Chapter III analyzes the offerings in elementary science in each school. These offerings are analyzed according to the total number of hours offered in elementary science in the teachers colleges and universities, the number of hours in methods courses in the different schools, the departments in which the methods courses are given, and the number of hours in practice teaching in elementary science. The universities are classified according to those which give no elementary education, those which offer elementary education but no elementary science, and those which offer both elementary education and elementary science. All biological stations which offer no work for elementary science teachers are listed. The biological stations and summer camps which have no special courses in elementary science but have work that would be of interest to elementary science teachers are listed and discussed. Camps and biological stations designed especially to meet the needs of elementary science teachers are included, and each is discussed.

Chapter IV is a discussion and evaluation of the data in Chapter III.

Chapter V is a measurement of the ability of the state universities and teachers colleges to prepare elementary science teachers according to a standard course of study.

Chapter VI is conclusions drawn from the data in Chapters III and V.

All of the institutions included in the study are listed in the appendix. The summer camps and biological stations as given in Turtox News, March, 1940, are also listed.

Since there is much similarity in the names of the institutions, the teachers colleges will be referred to by the name of the town in which the institution is located.

Definition of Terms

"Term" - a period of 12 weeks.

"Semester" - a period of 18 weeks.

"Lower level" - freshman and sophomore years in the curriculum.

"Upper level" - junior and senior years in the curriculum.

"Semester hour" or "hour" - the credit allowed for one lecture hour a week or its equivalent, with two hours of preparation, for 18 weeks.

"Quarter hour" or "Term hour" - the credit allowed for one lecture hour a week or its equivalent, with two hours of preparation, for 18 weeks.

"Elementary science" - any science taught in grades one through six.

CHAPTER II

A STANDARD COURSE OF STUDY FOR SCIENCE IN THE ELEMENTARY SCHOOL

The National Education Association has not set up a criterion by which to measure the schools in regard to their preparation of elementary science teachers. Neither could there be found any standard set up by any other organization for the preparation of elementary science teachers or elementary science in the public schools; therefore, a standard was set up by the author to be used in judging the institutions in their ability to make such preparations.

This standard was obtained by using as a basis the elementary science courses of study for the states of Virginia, New York, Oregon, California, New Jersey, and Texas, as well as the science course of study for the elementary schools of Fort Worth, Texas.

Since these six courses of study were found to be very similar, the author was led to set up as a standard the following outline of a typical course of study:

Year One

Recognizing Some of Our Common Birds

Watching the Sun and Stars

Finding Out How Magnets Act

Knowing the Common Trees of Our Community

Knowing the Common Wild Flowers of Our Community
Where Plants and Animals Live
Influence of Spring on Plant and Animal Life and
Gardening

Year Two

Finding Out How Spiders Live
Making and Keeping Homes for Water Plants and Animals
Observing the Weather and Its Effects
Water and Its Relation to Plants and Animals
Essentials to Plant Growth
Finding Birds' Homes and Observing Their Family Life
Observing Development of Butterflies and Moths

Year Three

The Importance of Fire
Finding the Differences Between Static Electricity and
Magnetism
Understanding the Movements of the Earth and Moon
Exploring the Life of Long Ago
Finding Out How Rocks Help Make Soil
The Social Life of Animals
The Economic Value of Plants and Animals and How We
Protect Them

Year Four

The Formation of Soil
Finding Out How the Earth is Related to the Sun and Moon

The Weather Bureau and Its Work

Molds and Bacteria

Watching Toads and Frogs Develop

Making Science Useful in the Home

Protection of the Health of the Community and Pure
Water Supply

Year Five

Finding Out How Plants Make Food and New Plants

The Transmission of Light and Sound

Exploring the Universe

Oxygen and Fire

Simple Machines

Discovering the Source of Food and Its Uses

Balance of Nature

Year Six

Forecasting Weather

Sources and Uses of Electric Power

Checking Up on the Earth's Age

Energy and Its Changes Upon the Earth

Making Science Useful on the Farm

Finding Out Why Plants and Animals Live Where They Do

Water, Air, Soil, and Food as Factors in the Environment
of Living Things

This standard course of study is not a model or the author's ideal, but it is a representative one, and the units are taken directly from the courses of study examined.

CHAPTER III

AN ANALYSIS OF THE ELEMENTARY SCIENCE CURRICULA IN THE STATE UNIVERSITIES, LEADING TEACHERS COLLEGES, SUMMER CAMPS, AND BIOLOGICAL STATIONS IN THE UNITED STATES

Universities and Teachers Colleges

In this study an analysis is made of the elementary science curricula in forty-nine universities and in sixty-six teachers colleges and state colleges in the United States. Massachusetts, Rhode Island, Connecticut, and New Jersey do not have state universities. In addition to state universities, Duke University, Columbia University, the University of Southern California, Cornell University, and the American University are included in the study.

In order to get a good geographical representation of schools from all parts of the United States the largest teachers colleges in each state were chosen on the basis of enrollment as given in the 1936 edition of American Colleges and Universities.

Table 1 shows the different number of hours offered in elementary science by the various teachers colleges and universities. Fifteen teachers colleges and state colleges do not offer elementary science. The maximum number of hours offered is forty-one and one third at New Mexico Normal

University at Las Vegas. The mean number of hours of elementary science offered is nine, and the average is 9.26 hours.

TABLE 1

THE DISTRIBUTION OF SIXTY-FOUR TEACHERS COLLEGES AND FORTY-EIGHT UNIVERSITIES ON THE BASIS OF THE TOTAL NUMBER OF SEMESTER HOURS OFFERED IN ELEMENTARY SCIENCE

Semester Hours Offered	Number of Colleges	Number of Universities
0	15	41
2 2/3	1	1
3	4	3
4	1	
5 1/3	1	
6	6	2
8	2	
8 2/3	2	
9	6	
10	2	
10 1/2	2	
10 2/3	1	
11 1/3	1	
12	4	
12 2/3		1
13 1/3	2	
14	2	
15	2	
18	2	
23	1	
24	3	
28	1	
33	1	
35	1	
39		1
41 1/3	1	
Totals	64	49

Six state universities and Cornell University offer elementary science. The average number of hours offered in state universities is .96. Cornell University offers an undergraduate major, research, and nine hours graduate work in nature study.

Table 2 lists the Universities which offer no elementary education.

TABLE 2

THE UNIVERSITIES OFFERING NO ELEMENTARY EDUCATION
AND NO ELEMENTARY SCIENCE

School	Location
American University	Washington, D. C.
University of Florida	Gainesville, Florida
University of Illinois	Urbana, Illinois
University of Kansas [#]	Lawrence, Kansas
University of Michigan*	Ann Arbor, Michigan
University of Missouri	Columbia, Missouri
University of North Dakota	Grand Forks, North Dakota
University of Oregon	Eugene, Oregon
University of Virginia	Charlottesville, Virginia
University of Washington	Seattle, Washington
University of West Virginia	Morgantown, West Virginia
University of Idaho	Moscow, Idaho
University of New Mexico	Albuquerque, New Mexico

[#]Offers graduate work in elementary science education

*Offers graduate work in elementary education

The names of the universities offering elementary education but no special elementary science courses are given in Table 3. Elementary education majors are required to take a certain number of hours of science, but the courses are not designed especially for elementary education majors.

TABLE 3

UNIVERSITIES OFFERING ELEMENTARY EDUCATION BUT NO
SPECIAL ELEMENTARY SCIENCE COURSES

University	Location
Alabama	University
Arizona	Tucson
Southern California	Los Angeles
California	Berkeley
Chicago	Chicago
Colorado	Boulder
Georgia	Athens
Iowa	Iowa City
Louisiana	University
Maine	Orono
Minnesota	Minneapolis
Nebraska	Lincoln
New York	New York City
Ohio	Columbus
Pennsylvania	Philadelphia
South Carolina	Columbia
South Dakota	Vermillion
Texas	Austin
Utah	Salt Lake

Table 4 shows the universities offering elementary education and special elementary science courses together with the number of hours offered in elementary science in each

school. The University of Georgia offers twelve and two thirds hours in elementary science, which is the maximum number of hours of elementary science offered in any university. Two and two thirds hours is the minimum number of hours offered in elementary science in any university. The mean number of hours offered in elementary science in the state universities is three, and the average is five.

TABLE 4

UNIVERSITIES OFFERING ELEMENTARY SCIENCE AND THE
NUMBER OF HOURS OFFERED IN ELEMENTARY
SCIENCE BY EACH UNIVERSITY

Number of Semester Hours Offered	Name of University
12 2/3	Georgia State
6	Oklahoma State
6	Delaware State
3	Indiana State
3	Kentucky State
3	*Maryland State
2 2/3	Vermont

* Offered only in summer session

Table 5 shows the number of hours of science required for elementary education majors in the different teachers colleges and state universities. The University of Utah requires the minimum of two and two thirds hours and the University of Tennessee requires the maximum of twenty-four hours of science, including hygiene and health education.

The average number of hours of science required in the universities for elementary education majors is 9.58, with a mean

TABLE 5

THE DISTRIBUTION OF FIFTY-SEVEN TEACHERS COLLEGES AND TWENTY UNIVERSITIES ON THE BASIS OF THE NUMBER OF HOURS OF SCIENCE REQUIRED FOR ELEMENTARY EDUCATION MAJORS

Number of Semester Hours Required	Number of Teachers Colleges	Number of Universities
2 2/3	0	1
4	0	2
4-6	1	0
6	13	3
6 1/3	1	0
6 2/3	0	1
6-8	0	2
6-10	0	1
8	7	2
8 2/3	1	0
9	2	1
9-11	1	0
10	1	0
10 1/3	1	0
11 1/3	1	0
11-13	1	0
12	10	2
12-14	0	1
12-15	0	1
13 1/3	3	0
14	6	1
15	1	1
16	2	0
17	1	1
18	1	0
24	1	1
Totals	57	20

of eight hours. The minimum number of hours of science required of elementary education majors in state teachers colleges is four to six hours. Twenty-four hours is the maximum number of hours of science required of elementary

education majors in any of the state teachers colleges. The average number of hours of science required in the teachers colleges is 10.439, and the mean is eleven to thirteen hours.

Table 6 shows the number of hours offered in methods courses in elementary science only and the number of teachers colleges offering the different number of hours. Thirty-eight schools offer no methods courses in elementary science.

TABLE 6

THE DISTRIBUTION OF SIXTY TEACHERS COLLEGES ON THE BASIS OF THE NUMBER OF HOURS OFFERED IN METHODS COURSES IN ELEMENTARY SCIENCE

Number of Semester Hours Offered	Number of Schools
0	38
1 1/3	1
2	6
2 2/3	5
3	6
4	2
5	1
8	1
<hr/>	
Total	60

Paterson State Teachers College at Paterson, New Jersey, offers eight hours in the teaching of science in the elementary school in the biology department. Thirteen teachers colleges offer methods courses in the biology or science

department, and nine offer methods courses in the education department. The average number of hours offered in methods courses in the teachers colleges is 1.095.

Table 7 shows the number of hours offered in methods courses in elementary subjects, including science, and the number of teachers colleges offering them. New Mexico State Teachers College at Silver City offers two hours in the teaching of elementary science and mathematics; East Texas State Teachers College at Commerce, Texas, offers a methods course in the teaching of all elementary subjects, including nature study. Both courses in these two teachers colleges are

TABLE 7

THE DISTRIBUTION OF TEACHERS COLLEGES ON THE BASIS OF
THE NUMBER OF HOURS OFFERED IN METHODS COURSES IN
THE ELEMENTARY SCHOOL SUBJECTS INCLUDING
ELEMENTARY SCIENCE

Semester Hours Offered	Number of Schools
2	1
3	1

offered in the education department. The education department of Henderson State Teachers College at Arkadelphia, Arkansas, offers a four hour course in the teaching of junior high school science.

Given in Table 8 is the number of hours in methods courses in elementary science offered in the universities. Nine universities offer methods courses in the education departments. New York University offers a four hour course

in the education department called "Activity Projects in the Elementary School" and a four hour course in the teaching of elementary science in the science department. The University of Arizona and the University of California offer a three hour methods course in elementary subjects, including elementary science, given in the education department. The University of Kentucky offers a three hour methods course in the teaching of junior high school science in the education department.

TABLE 8

THE DISTRIBUTION OF NINE UNIVERSITIES ON THE BASIS
OF THE NUMBER OF HOURS OFFERED IN METHODS
COURSES IN ELEMENTARY SCIENCE

Semester Hours Offered	Number of Universities
2	3
3	3
3 1/3	1
6	1
8	1
<hr/>	
Total	9

Table 9 lists the teachers colleges which offer practice teaching in elementary science. The number of hours credit, and the level at which practice teaching is offered is given for each school. The teachers college at Tempe, Arizona, requires the maximum number of hours in practice teaching. This college offers a major in elementary science and requires

ten hours of practice teaching of all seniors who are majoring in elementary science.

TABLE 9
TEACHERS COLLEGES OFFERING PRACTICE TEACHING
IN ELEMENTARY SCIENCE

School	Number Hours	Level
Tempe, Arizona	10	Upper
Fresno, California*		Upper
Pittsburg, Kansas	3	Graduate
Towson, Maryland*		Upper
Greenville, North Carolina	4	Upper

*In connection with a three hour methods course

Summer Camps and Biological Stations

Table 10 shows the summer camps and biological stations which offer little work that would be of value to teachers of elementary science. Most of these camps and laboratories are either for research or for technical training.

Several camps and biological laboratories offer no special work for elementary science teachers, but each has one or more courses that would be of definite value, depending upon the previous training of the student. In Table 11 are listed these biological stations and camps, together with their locations and the total number of semester hours offered in courses that would be of value to elementary science teachers. Each of these camps and biological stations

is also discussed separately, and the courses that are of value to elementary science teachers are given.

TABLE 10

NAMES AND LOCATIONS OF CAMPS AND BIOLOGICAL STATIONS
OFFERING NO ELEMENTARY SCIENCE

Name of Camp or Biological Station	Location
Marine Biological Station	Woods Hole, Massachusetts
Purdue University Forestry Camp	La Fayette, Indiana
University of West Virginia Forestry Camp and Geology Camp	Morgantown, West Virginia
Biological Station of Indiana University	Winona Lake, Indiana
Trout Lake Limnological Laboratory	Trout Lake, Wisconsin
Field University of the Louisiana State University	Grand Isle, Louisiana
Scripps Institution of Oceanography	La Jolla, California
Oceanographic Laboratories	Friday Harbor, Washington
Michigan State College Forestry, Field Geology, and Conservation Camps	Augusta, Michigan
Fisheries Biological Laboratory	Pensacola, Florida

The Yosemite School of Field Natural History is conducted by the Yosemite National Park as the official training school for those seeking employment in the naturalist field of the National Park Service. Special emphasis is given to methods of interpreting living

nature in the fields of botany, entomology, forestry, geology, mammalogy, and ornithology.¹

This school, which is supported by the United States Department of Interior, meets every summer for a seven weeks' session, but no university credit is given.

TABLE 11

NAMES AND LOCATIONS OF BIOLOGICAL STATIONS AND SUMMER CAMPS OFFERING SOME WORK FOR ELEMENTARY SCIENCE TEACHERS TOGETHER WITH THE TOTAL NUMBER OF HOURS IN COURSES OF INTEREST TO ELEMENTARY SCIENCE TEACHERS

Name	Location	Number of Semester Hours
Yosemite School of Field Natural History	Yosemite National Park	0
University of Michigan Biological Laboratory	Douglas Lake, Michigan	0
Iowa Lakeside Laboratory		10
Carolina Marine Laboratory	Beaufort, North Carolina	6
Hopkins Marine Station		15
Mountain Lake Biological Station		0
Rocky Mountain Biological Laboratory	Gothic, Colorado	6
Maine Marine Laboratory	Lamoine, Maine	6
Duke University Marine Laboratory	Beaufort, North Carolina	6
Long Island Biological Laboratory	Cold Spring Harbor, New York	6
Institute of Marine Biology	Coos Head, Oregon	9
Science Summer Camp	Medicine Bow National Forest	6
Chesapeake Biological Laboratory		9
Mt. Desert Island Biological Laboratory	Salsbury Cove, Maine	6

The Biological Station of the University of Michigan,

¹Prospectus, Yosemite School of Field Natural History, p. 1.

located at Douglas Lake, Michigan, is for study and research in botany and zoology. The station has an eight weeks' session each summer, and university credit is given for all courses. The courses that would be of value to elementary science teachers are: Plant Ecology, Entomology, Ornithology, Natural History of Invertebrates, and Herpetology and Mammalogy.

The Iowa Lakeside Laboratory of the University of Iowa has two sessions, each lasting four weeks. Two courses in field biology are offered and two and five tenths to five semester hours of college credit is given for each course.

Carolina Marine Laboratory at Beaufort, North Carolina, of the Woman's College of the University of North Carolina has one session of six weeks. Six semester hours credit is given for Invertebrate Zoology, the only course offered.

Hopkins Marine Station of Stanford University is open all the year, but there is a twelve weeks' course called Natural History of Marine Animals each summer, in which ten to fifteen semester hours may be taken.

The Mountain Lake Biological Station of the University of Virginia meets for two consecutive six week sessions. The station is for college students, teachers, and research workers. Credit for six semester hours is given for each course. The courses of interest to elementary science teachers are: Morphology of Seed Plants, Taxonomy, Phycology, Mycology, Protozoology, and Hydrobiology.

The Rocky Mountain Biological Laboratory at Gothic,

Colorado, is for advanced undergraduate students, graduate students, and independent investigators. The laboratory has one session of six weeks, each course having the value of three semester hours. Ecology and Field Biology are the only courses that would be of interest to elementary science teachers.

The University of Maine Marine Laboratory at Lamaine, Maine, has one six Weeks' course, Invertebrate Zoology. Six hours college credit is given for the course.

Duke University Marine Laboratory at Beaufort, North Carolina, which is for undergraduate and graduate biology students, offers two six weeks' terms and six semester hours for each course. The only course offered that is of value to elementary science teachers is Marine Zoology.

The Biological Laboratory of the Long Island Biological Association at Cold Spring Harbor, Long Island, New York, gives college credit for its six weeks' course in Marine and Fresh Water Zoology.

The University of Colorado offers mountain recreation in the summer session, but no college credit is given in connection with any of the work; however, there are various outings and hikes scheduled under competent guides.

The Oregon System of Higher Education sponsors the Institute of Marine Biology which is in session six weeks every summer at Coos Head, Oregon. Each course carries a value of three semester hours. The courses which would be of value to elementary science teachers are: Biological

Science Survey, Systematic Botany of the Coos Bay Region, and Field Zoology.

The University of Wyoming has a Science Summer Camp at Medicine Bow National Forest for six weeks each summer. The courses of interest to elementary science teachers are: Field and Laboratory Course in General Botany, credit six semester hours; Elementary Field Course in Geology, credit six hours; Elementary Field and Laboratory Zoology, credit six hours; and Wyoming Birds, credit four hours.

The Chesapeake Biological Laboratory is sponsored by John Hopkins University, the University of Maryland, Washington College, and Western Maryland College. Invertebrates, with a credit of six hours, and Ecological Zoology, with a credit of three hours, are courses which would be of value to elementary science teachers.

Mt. Desert Island Biological Laboratory, located at Salsbury Cove, Maine, designed for undergraduate and graduate college students, and high school science teachers, offers a six weeks' course in invertebrate zoology, which would be of interest to teachers of elementary science.

There are eleven camps that are especially adapted to meet the needs of elementary science teachers. The eleven camps are listed in Table 12, together with their locations and the total number of semester hours offered in elementary science. Each of these camps is also discussed separately.

Audubon Nature Camp for Adult Leaders is located at Muscongus Bay, Maine. No previous training in biology is

necessary, and no university credit is given for the courses, which are as follows: Birds, Marine and Fresh Water Life, Plants, Insects, and Nature Activities.

TABLE 12

BIOLOGICAL STATIONS AND SUMMER CAMPS ESPECIALLY
ADAPTED TO MEET THE NEEDS OF ELEMENTARY
SCIENCE TEACHERS

Name	Location	Semester Hours
Audubon Nature Camp	Muscongus Bay, Maine	0
New Hampshire Nature Camp	Lost River, North Woodstock, New Hampshire	4
Geneva Lake Summer School of Natural Science	Williams Bay, Wisconsin	24
Merricomm Biological Laboratory	Nelson, New Hampshire	6
School of Natural Science	Santa Barbara, California	4
Lake Enemy Swim Biological Station	Waubay, South Dakota	31
West Coast School of Nature Study	San Jose State College	6
Science of the Out-of-Doors	Interlaken Inn, Lakeville, Connecticut	4
Black Hills Summer Camp in Botany	Black Hills, South Dakota	9
Nature Enjoyment Camp	Walsenburg, Colorado	0
Sierra Summer School	Huntington Lake, California	6

The New Hampshire Nature Camp at Lost River, North Woodstock, New Hampshire, has two short sessions, each lasting two weeks. Two semester hours of college credit is given

for each session. Field instruction in theory, and nature study methods are offered.

The Geneva Lake Summer School of Natural Science at Williams Bay, Wisconsin, is especially for science teachers. The courses offered are: Plant Ecology, four hours; Glacial Geology, three hours; Field Geology, three hours; Limnology, two hours; Field Zoology, four hours; Survey of Astronomy, two hours; and the Teaching of Science, two hours.

The Merriconn Biological Laboratory at Nelson, New Hampshire, is especially for elementary science teachers. Three semester hours of college credit is given for each of the courses, which are: Natural History and Teaching Practice.

Santa Barbara State College has a School of Natural Science every summer. The school has one session of two weeks, for which two semester hours is given. No separate courses are offered but group work in natural science is done. There is no prerequisite.

Lake Enemy Swim Biological Station at Waubay, South Dakota, which is for teachers, undergraduates, and independent investigators, offers the following courses for elementary science teachers: Natural Science, three hours; Animal Biology A, B, C, four hours each; Plant Biology A, B, C, four hours each; and Animal Biology (entomology), four hours.

The West Coast School of Nature Study of the San Jose College has three sessions of one week at three places. Two quarter hours per week is given at the San Jose State College. Only group work is done.

Teachers College of Columbia University offers a course for elementary science teachers called Science of the Out-of-Doors. The course is taught at Interlaken Inn, Lakeville, Connecticut. Two, three, or four quarter hours are given on the masters or Ph.D. degree for the course.

The course offered at the Black Hills Summer Camp in Botany is of value to elementary science teachers. No individual courses are offered but group work is done in botany. The course has a value of nine semester hours at South Dakota State College.

The Nature Enjoyment Camp meets for one week at Walsenburg, Colorado, each summer. There is no prerequisite, and no college credit is given. Group work is done in nature study.

Sierra Summer School at Huntington Lake, California, is the summer school of Fresno State College. Courses are offered in every department. The courses for elementary science teachers are: Botany, three hours; Nature Study, two hours; and Nature Study Laboratory, one hour.

CHAPTER IV

DISCUSSION AND EVALUATION

An elementary science movement is in progress, although it is only beginning to find expression in the public schools. The rate at which this movement progresses depends upon the training of teachers.

In two important respects teachers are unprepared to direct elementary science work. In the first place, they do not possess the degree of understanding of the aims and philosophy of the movement essential to intelligent and sympathetic participation. Translating a philosophy into a working program and making a course of study operative under actual school conditions involves many problems and difficulties. It requires zealous efforts and even sacrifices which only those teachers are prepared to make who feel that they are vital agencies in an important reconstruction.

The majority of elementary teachers are unprepared in another respect. Most of them have had little training in science. The courses they have had in high school and college have not, as a rule, been of a nature to acquaint them with elementary science materials. This lack of acquaintance with the materials that the teacher must utilize is an important limiting factor. The additional effort necessary to carry on a purposeful science-activity program without an adequate background of training is only one of the handicaps that this lack entails. Perhaps even more important is the feeling of strangeness and helplessness which deters so many teachers from launching forth on a new venture. Rather than expose our inadequacies, we tend to shy away from situations that would be likely to involve and display them. It is doubtful whether anyone except the teacher herself, the science supervisor, and the instructor in the teaching of science is fully aware of how little the average elementary teacher knows about even her immediate environment. It would be interesting to know what percentage of teachers in elementary schools

are familiar with the trees on the schoolground, to say nothing of the birds, insects, soils, rocks, and other common things of the environment.¹

Eight of the forty-nine universities and forty-nine of the sixty-six teachers colleges and state colleges included in this study offer courses in elementary science. That is, only fifty per cent of the institutions which train teachers make any attempt to offer professional courses meeting the demand of this new movement, and only four schools offer adequate courses to meet these needs.

Cornell University and three teachers colleges offer a major in elementary science. All three of the teachers colleges offer the same type of courses, but Arizona State Teachers College, at Tempe, is the only one that requires practice teaching. Although the other two, New Mexico Normal University at Las Vegas, and Fairmont Teachers College at Fairmont, West Virginia, do not require practice teaching in elementary science, they both have methods courses in the teaching of elementary science.

Cornell University offers an undergraduate major in the supervision of elementary science with courses given in the various departments to meet the needs of the student, and the graduate school offers a major in nature study.

One is required to take the following courses for a major in elementary science at Arizona State Teachers College:
(1) Botany, four hours; (2) General Chemistry, four hours;

¹W. C. Croxton, Science in the Elementary School, p. 32.

(3) Zoology, four hours; (4) Applied Physics, four hours; (5) Physical Geology, four hours; (6) Physiology, three hours; (7) Bacteriology, four hours; (8) Nature Study, five hours; (9) Genetics, three hours; (10) Elementary Photography, three hours; (11) practice teaching, credit ten hours; and (12) six hours in science electives.

An elementary science major at Fairmont State Teachers College at Fairmont, West Virginia, is required to take thirty-five hours in elementary science. The courses are as follows: (1) Educational Biology, three hours; (2) Chemistry for Everyday Life, three hours; (3) Mechanical Features of Our Environment, two hours; (4) Insect Study, two hours; (5) Ornithology, two hours; (6) Garden Materials, two hours; (7) Plants of Our Environment, two hours; (8) Science for Elementary Teachers, three hours; (9) Geology, three hours; (10) Agriculture, three hours; (11) Astronomy, two hours; (12) Animals of Our Environment, two hours; (13) Modern Biology and Society, two hours; (14) Conservation of Appalachian Wild Life, two hours; and (15) Methods and Literature of Science for the Elementary Grades, two hours.

New Mexico Normal University at Las Vegas, New Mexico, requires thirty-two hours for a major in elementary science. The courses are as follows: (1) General Biology, eight hours; (2) Plant Kingdom and Animal Kingdom, six hours each; (3) General Ecology, four hours; (4) General Bacteriology, two and two thirds hours; (5) Laboratory Technique, one and one third

hours; (7) General Science, four hours; and (8) Methods Course in Elementary Science, five hours.

There are four teachers colleges that offer eighteen hours or more in elementary science, although they do not offer a major. These schools are East Carolina Teachers College at Greenville, North Carolina; Duluth State Teachers College at Duluth, Minnesota; Santa Barbara State College at Santa Barbara, California; and Eastern Illinois State Teachers College at Charleston, Illinois. Next to the four schools that offer majors in elementary science, these schools seem to give the best training in elementary science.

Since science has only so recently received recognition in the elementary schools, teachers are still at a loss how to proceed and hesitant to undertake anything very ambitious in the new field. For this reason, there is a great need for a methods course in the teaching of elementary science. There are only twenty-two, less than half, of the teacher training institutions offering such courses and only nine universities offering methods courses.

Practice teaching in elementary science is offered in only five teachers colleges and in no universities. Such a low percentage would indicate inferior science teaching in the grammar schools. The National Committee on Science Teaching says:

To many teachers of science the transition from the training institution to the classroom has presented well-nigh insurmountable difficulties of adjustment. Having had little practice in planning, organizing

and directing actual class work, they have found that they must secure this experience under the pressure of actual full schedule work under rigid administrative schedules which tend to stifle the growth of operational perspectives. The teacher of science must be given a rich experience in the actual practice of teaching within a realistic situation and under the guidance of a competent critic teacher.²

Of the eight schools that offer more than eighteen hours in elementary science, Santa Barbara Teachers College is the only one that has a summer camp for elementary science teachers. Fresno State Teachers College, at Fresno, California, which offers six hours in elementary science, has a summer camp for elementary education majors, and San Jose State College has a nature study camp.

²Teacher Education in Science, proposed report of the Subcommittee on Teacher Education, IV (1940), p. 9.

CHAPTER V

MEASUREMENT OF THE ABILITY OF THE UNIVERSITIES AND TEACHERS COLLEGES TO PREPARE TEACHERS ACCORDING TO A STANDARD COURSE OF STUDY

In order to teach science in the first six grades a teacher needs a wide range of science experiences. It is essential that a teacher have more than a theoretical overview, though not necessarily an intensive knowledge, of each field. General courses in astronomy, physics, geology, chemistry, agriculture, nutrition, meteorology, bacteriology, hygiene, zoology, botany, entomology, ornithology, mammalogy, plant and animal ecology, evolution, aquatic biology, soil biology, embryology, conservation, and applied science are needed: but it does not follow in all cases that the traditional college courses in these fields are an adequate preparation for elementary science teaching.

The only colleges and universities that even approach these standards in preparing elementary science teachers are the three teachers colleges that offer majors in elementary science and Cornell University; however, none of the four offer all of the needed courses.

CHAPTER VI

CONCLUSIONS

1. The only institutions throughout the entire country that are preparing students to teach elementary science are Cornell University; Arizona State Teachers College, Tempe; New Mexico Normal University, Las Vegas; and Fairmont Teachers College at Fairmont, West Virginia.

2. According to the standard course of study, there are no teachers colleges or universities offering adequate training for elementary science teachers. This does not differ greatly from that in other school subjects, but the situation is more extreme in elementary science. Teachers who are unfamiliar with the materials of science are expected to plan experiences with those materials which will lead children into new fields of enjoyment, develop desirable attitudes and appreciations, and lead to ultimate concepts and generalizations. Teachers throughout the country are not ready to teach elementary science. This will retard the progress and establishment of elementary science in the public schools.

3. Changes are in progress in the institutions of higher learning, which may take care of the situation. Over seventy-five per cent of the teachers colleges investigated are already making some attempt to offer courses for elementary science

teachers. There are indications that this percentage, as well as the amount and quality of the work within the individual institutions, will increase.

APPENDIX

The names and locations of the institutions are listed in alphabetical order according to states.

1. University of Alabama, University, Alabama
2. State Teachers College, Florence, Alabama
3. State Teachers College, Livingston, Alabama
4. State Teachers College, Troy, Alabama
5. University of Arkansas, Little Rock, Arkansas
6. Arkansas State Teachers College, State College, Arkansas
7. The Arkansas Teachers College, Conway, Arkansas
8. Henderson State Teachers College, Arkadelphia, Arkansas
9. University of Arizona, Tucson, Arizona
10. Arizona State Teachers College, Flagstaff, Arizona
11. Arizona State Teachers College, Tempe, Arizona
12. University of California, Berkeley, California
13. University of Southern California, Los Angeles, California
14. Fresno State College, Fresno, California
15. San Diego State College, San Diego, California
16. San Francisco State College, San Francisco, California
17. Santa Barbara State College, Santa Barbara, California
18. University of Colorado, Boulder, Colorado
19. Colorado Woman's College, Denver, Colorado
20. Connecticut State College, Storrs, Connecticut
21. University of Delaware, Newark, Delaware

22. University of Florida, Gainesville, Florida
23. University of Georgia, Athens, Georgia
24. University of Idaho, Moscow, Idaho
25. Lewiston State Normal School, Lewiston, Idaho
26. University of Illinois, Urbana, Illinois
27. University of Chicago, Chicago, Illinois
28. Illinois State Normal University, Normal, Illinois
29. Southern Illinois State Normal University, Carbondale,
Illinois
30. Western Illinois State Teachers College, Macomb, Illinois
31. Eastern Illinois State Teachers College, Charleston,
Illinois
32. Northern Illinois State Teachers College, Dekalb, Illinois
33. Indiana University, Bloomington, Indiana
34. Ball State Teachers College, Muncie, Indiana
35. Indiana State Teachers College, Terre Haute, Indiana
36. University of Iowa, Iowa City, Iowa
37. Iowa State College, Ames, Iowa
38. Iowa State Teachers College, Cedar Falls, Iowa
39. University of Kansas, Lawrence, Kansas
40. Kansas State Teachers College, Pittsburg, Kansas
41. University of Kentucky, Lexington, Kentucky
42. Eastern Kentucky State Teachers College, Richmond,
Kentucky
43. Morehead State Teachers College, Morehead, Kentucky
44. Murray State Teachers College, Murray, Kentucky

45. Louisiana State Normal College, Natchitoches, Louisiana
46. Louisiana State University, University, Louisiana
47. University of Maine, Orono, Maine
48. University of Maryland, College Park, Maryland
49. The State Teachers College at Towson, Towson, Maryland
50. Massachusetts State College, Amherst, Massachusetts
51. University of Michigan, Ann Arbor, Michigan
52. Central State Teachers College, Mt. Pleasant, Michigan
53. Northern State Teachers College, Marquette, Michigan
54. Western State Teachers College, Kalamazoo, Michigan
55. University of Minnesota, Minneapolis, Minnesota
56. Duluth State Teachers College, Duluth, Minnesota
57. University of Mississippi, Jackson, Mississippi
58. Delta State Teachers College, Cleveland, Mississippi
59. Mississippi State College, State College, Mississippi
60. State Teachers College, Hattiesburg, Mississippi
61. University of Missouri, Columbia, Missouri
62. Central Missouri State Teachers College, Warrensburg,
Missouri
63. Washington University, St. Louis, Missouri
64. Montana State University, Missoula, Montana
65. University of Nebraska, Lincoln, Nebraska
66. Nebraska State Teachers College, Wayne, Nebraska
67. University of Nevada, Reno, Nevada
68. New Jersey State Teachers College, Montclair, New Jersey
69. Paterson State Teachers College, Paterson, New Jersey

70. State Teachers College, Trenton, New Jersey
71. University of New Mexico, Albuquerque, New Mexico
72. New Mexico Normal University, Las Vegas, New Mexico
73. New Mexico State Teachers College, Silver City, New Mexico
74. New York University, New York City, New York
75. New York State College for Teachers, Albany, New York
76. Columbia University, New York City, New York
77. Cornell University, Ithaca, New York
78. Elmira College, Elmira, New York
79. University of North Carolina, Chapel Hill, North Carolina
80. Duke University, Durham, North Carolina
81. Western Carolina Teachers College, Cullowhee, North
Carolina
82. Eastern Carolina Teachers College, Greenville, North
Carolina
83. University of North Dakota, Grand Forks, North Dakota
84. State Teachers College, Minot, North Dakota
85. Ohio State University, Columbus, Ohio
86. Sisters College of Cleveland, Cleveland, Ohio
87. University of Oklahoma, Norman, Oklahoma
88. Northeastern State College, Tahlequah, Oklahoma
89. Oregon College of Education, Monmouth, Oregon
90. University of Pennsylvania, Philadelphia, Pennsylvania
91. State Teachers College, Indiana, Pennsylvania
92. Rhode Island State College, Kingston, Rhode Island
93. University of South Carolina, Columbia, South Carolina

94. Northern State Teachers College, Aberdeen, South Dakota
95. University of South Dakota, Vermillion, South Dakota
96. University of Tennessee, Knoxville, Tennessee
97. Tennessee College, Murfreesboro, Tennessee
98. George Peabody College for Teachers, Nashville, Tennessee
99. University of Texas, Austin, Texas
100. East Texas State Teachers College, Commerce, Texas
101. North Texas State Teachers College, Denton, Texas
102. Stephen F. Austin Teachers College, Nacogdoches, Texas
103. Southwest Texas State Teachers College, San Marcus, Texas
104. Western State Teachers College, Canyon, Texas
105. University of Utah, Salt Lake, Utah
106. University of Vermont, Burlington, Vermont
107. University of Virginia, Charlottesville, Virginia
108. University of Washington, Seattle, Washington
109. Western College of Education, Bellingham, Washington
110. West Virginia University, Morgantown, West Virginia
111. Fairmont State Teachers College, Fairmont, West Virginia
112. University of Wisconsin, Madison, Wisconsin
113. Milwaukee State Teachers College, Milwaukee, Wisconsin
114. University of Wyoming, Laramie, Wyoming
115. American University, Washington, D. C.

1940 SUMMER CAMPS AND BIOLOGICAL STATIONS

The camps and biological stations are arranged in geographical order by states.

Northern

1. University of Maine Marine Laboratory, Lamoine, Maine
2. Mount Desert Island Biological Laboratory, Salsbury Cove, Maine
3. Chesapeake Biological Laboratory, Solomons Island, Maryland
4. Nature Guide School, East Northfield, Massachusetts
5. Marine Biological Laboratory, Woods Hole, Massachusetts
6. New Hampshire Nature Camp, Lost River Reservation, North Woodstock, New Hampshire
7. Merricott Biological Laboratory, Nelson, New Hampshire
8. Allegany School of Natural History, Allegany State Park, Quaker Bridge, New York
9. Field Courses of Teachers College, Columbia University, New York City, New York
10. Washington Square College of New York University, Course in Field Biology, New York City, New York
11. Audubon Nature Camp for Adult Leaders, Muscongus Bay, Maine
12. Biological Laboratory of the Long Island Biological Association, Cold Spring Harbor, Long Island, New York
13. Lake Laboratory of the University of Pittsburgh, Presque Isle, Erie, Pennsylvania

14. Pennsylvania State College Nature Camp, State College,
Pennsylvania
15. West Virginia University Field Courses, Morgantown, West
Virginia

Southern

16. Bureau of Fisheries Laboratory, Pensacola, Florida
17. Louisiana State University Biological Field Laboratory,
Grand Isle, Louisiana
18. Mississippi Delta State Teachers College, Field Trip,
Cleveland, Mississippi
19. Duke Biological Station, Beaufort, North Carolina
20. Carolina Marine Laboratory of the Woman's College of the
University of North Carolina, Beaufort, North Carolina
21. Fisheries Biological Station, Beaufort, North Carolina
22. Reelfort Lake Biological Station of the Tennessee Academy
of Science
23. Mountain Lake Biological Station of the University of
Virginia, Mountain Lake, Virginia
24. Blandy Experimental Farm of the University of Virginia,
Boyce, Virginia

Mid-western

25. Purdue Forestry Summer Camp, Henryville, Indiana
26. Indiana University Biological Station, Winona Lake,
Indiana
27. Iowa State College Plant Biology Summer Camp, McGregor, Iowa

28. The American Institute of Nature Studies, McGregor, Iowa
29. Iowa Lakeside Laboratory, Milford, Iowa
30. Michigan State College Course in Field Biology, Augusta, Michigan
31. University of Michigan Biological Station, Cheboygan, Michigan
32. Franz Theodore Stone Biological Laboratory, Gibraltar Island, Put-in-Bay, Ohio
33. South Dakota State College, Botany Camp, Black Hills, South Dakota
34. Lake Enemy Swim Biological Station, Waubay, South Dakota
35. Trout Lake Limnological Laboratory of the Wisconsin Survey, Trout Lake, Vilas County, Wisconsin
36. Geneva Lake School of Natural Science, Williams Bay, Wisconsin

Western

37. Sierra Summer School, Huntington, California Summer Session of Fresno State College, Fresno, California
38. Scripps Institution of Oceanography of the University of California, La Jolla, California
39. Laguna Beach Marine Laboratory, Laguna Beach, California
40. Hopkins Marine Station of Stanford University, Pacific Grove, California
41. West Coast School of Nature Study, San Jose, California
42. Santa Barbara School of Natural Science, Santa Barbara, California

43. Yosemite School of Field Natural History, Yosemite National Park, California
44. Science Lodge Mountain Laboratory of the University of Colorado, Boulder, Colorado
45. Colorado Mountain Club School of Mountaineering, Boulder Colorado
46. Rocky Mountain Biological Laboratory, Crested Butte, Colorado
47. Nature Enjoyment Camp, Cuchara Camps, Colorado
48. Institute of Marine Biology, Coos Head, Oregon
49. University of Washington Oceanographic Laboratories, Friday Harbor, Washington
50. University of Wyoming Summer Camp, Centennial, Wyoming

BIBLIOGRAPHY

- Bruce, G. V., The New Jersey Nature Study and Elementary Science Course, Science Education, XIV May, 1930, 600-607.
- California State Department of Education, Teacher's Guide to Child Development, Manual for Kindergarten and Primary Teachers.
- Croxton, W. C., Science in the Elementary School, New York, McGraw-Hill Book Co., 1937.
- Fort Worth Public Schools, Science for the Elementary School, A Tentative Course of Study, Curriculum Bulletins Numbers 131, 132, 133, 134, 135, 136, 1934.
- Hall, Sidney B., Peters, D. W., Henderson, H. R., Caswell, H. L., Tentative Course of Study for Virginia Elementary Schools, Grades I-VII, State Board of Education, 1934.
- Marsh, C. S., American Universities and Colleges, Washington, American Council on Education, 1936.
- Matthews, J. C., Tentative Course of Study for Years One Through Six, Bulletin of State Department of Education, No. 358, XII, No. 7, Austin, Texas, 1936.
- National Society for the Study of Education, Thirty-first Yearbook, Part I, Bloomington, Illinois, Public School Publishing Co., 1932.
- Norton and Norton, Foundations of Curriculum Building, Dallas, Texas, Gin and Co., 1936.
- Teacher Education in Science, proposed report of the Subcommittee on Teacher Education, Ch. IV, 1940.
- Turtlox News, Chicago, March, 1940.
- University of the State of New York Bulletin, Elementary Schools Science, A Syllabus for Elementary Schools, Grades 1-3, University of New York Press, February 1, 1939.

Wood, Hugh B., Science, A Study Guide For Teachers,
University of Oregon, Curriculum Bulletin, No. 5,
November 1, 1939.

Bulletins of the summer camps and biological stations listed
in the Appendix.

Catalogues of the institutions listed in the Appendix.