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A Survey of the Attitudes of Biology Teachers in the State of New Mexico Toward the Biological Sciences Curriculum Study Program

Frizelle La-Gretta Aguilar

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Equilibrium, however, is not reached until the system has cooled to a temperature of approximately 100°C. The rate of cooling is controlled by the rate of heat transfer from the system to the surroundings. The rate of heat transfer is determined by the surface area of the system and the temperature difference between the system and the surroundings. The rate of heat transfer is also affected by the thermal conductivity of the material through which the heat is transferred.

The data obtained from the experiment are shown in the graph below. The graph shows the temperature of the system as a function of time. The temperature of the system decreases over time, as expected. The rate of cooling is highest at the beginning of the experiment and decreases as the system approaches equilibrium. The data points are shown as open circles, and a smooth curve has been drawn through them. The curve shows that the temperature of the system approaches a constant value of approximately 100°C.

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A SURVEY OF THE ATTITUDES OF BIOLOGY TEACHERS
IN THE STATE OF NEW MEXICO TOWARD THE
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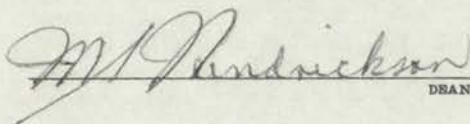
A Thesis
Presented to
the Faculty of the College of Education
The University of New Mexico

In Partial Fulfillment
of the Requirements for the Degree of
Master of Arts in Secondary Education

By
Frizelle La-Gretta Aguilar
May 1965

This thesis, directed and approved by the candidate's committee, has been accepted by the Graduate Committee of the University of New Mexico in partial fulfillment of the requirements for the degree of

MASTER OF ARTS


DEAN

DATE

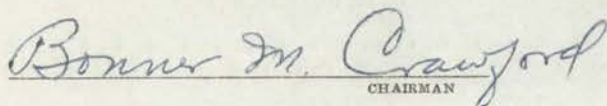
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**A SURVEY OF THE ATTITUDES OF BIOLOGY TEACHERS
IN THE STATE OF NEW MEXICO TOWARD THE
BIOLOGICAL SCIENCES CURRICULUM
STUDY PROGRAM**

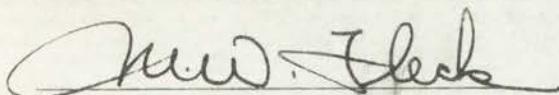
By

Frizelle La-Gretta Aguilar

Thesis committee


CHAIRMAN





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This thesis directed and approved by the candidate's com-
mittee, has been accepted by the Graduate Committee of the
University of New Mexico in partial fulfillment of the require-
ments for the degree of

DEPARTMENT OF ARTS

Edith M. ...
NAME

1952
YEAR

A SURVEY OF THE ATTITUDES OF BIOLOGY TEACHERS
IN THE STATE OF NEW MEXICO TOWARD THE
HIGHER EDUCATIONAL CURRICULUM
STUDY PROGRAM

BY

Edith M. ...

Thesis committee

Edith M. ...
MEMBER

Edith M. ...

Edith M. ...

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ACKNOWLEDGEMENTS

Special appreciation is herewith expressed to all those professors at the University of New Mexico who have personally helped me both in my major and minor fields during the past three years in Albuquerque, New Mexico.

I am grateful to Professors Gordon C. Hanson, George Comstock and D. R. Bezzi, of the University of Wichita, Wichita, Kansas, for encouraging me to continue my graduate work in education while I was a commissioned officer assigned to McConnell Air Force Base, SAC, Wichita, Kansas.

I appreciate the help and understanding shown by Doctors Bruce B. Boecker and Robert G. Thomas of Lovelace Foundation.

I am grateful to Mr. Dewitt Ivey, Chairman of the Biology Department at Sandia High School, Albuquerque, New Mexico, for his most able guidance and counsel in professional and practical aspects of teaching biology.

My appreciation is extended to Miss Clella Brady who helped in typing and mailing the questionnaires.

I am indebted to my husband, Henry Lawrence Riley, who made my graduate study possible.

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III. METHODS OF DATA ANALYSIS

The sample size was determined by the level of significance and the power of the test. The percentage of correct responses was calculated for each subject. The distribution of scores was examined by means of a chi-square test. The methods of analysis are described in detail in the following sections.

IV. ANALYSIS OF THE DATA

1. Background. The purpose of this study was to determine the effect of instruction on the performance of a task. The subjects were divided into two groups: a control group and an experimental group. The experimental group received instruction before performing the task. The results of the task were compared between the two groups. Table I contains the data for the control group and the experimental group.

2. Analysis of the data

The data were analyzed by means of a chi-square test. The results are shown in Table II. The chi-square test indicates that there is a significant difference between the control group and the experimental group. The experimental group performed significantly better than the control group. The values of the chi-square test are as follows: $\chi^2 = 12.34$, $df = 1$, $p < 0.05$. The reasons for the difference between the two groups are discussed in the following sections. The objectives of the study were to determine the effect of instruction on the performance of a task. The results of the study indicate that instruction has a significant effect on the performance of a task. The students who received instruction performed significantly better than the students who did not receive instruction. Table II shows the results of the chi-square test. The chi-square test indicates that there is a significant difference between the control group and the experimental group. The experimental group performed significantly better than the control group.

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V. CONCLUSION

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CHAPTER I

INTRODUCTION

Let's change the biology curriculum.
Let's do this to the curriculum.
No, let's do that to the biology curriculum.
No, let's omit this and add the other.
Shall we ask the biology teachers?
Why ask the biology teachers?
We are the curriculum developers!
Of course we know what goes on in the classroom,
especially since we read about it sometimes.
We do not visit there very often.
Well, some of us have never been there truthfully.
Who needs to ask the teachers of New Mexico, or
even tell them about BSCS?
They will read about it somewhere.
Everybody knows about it anyway.¹

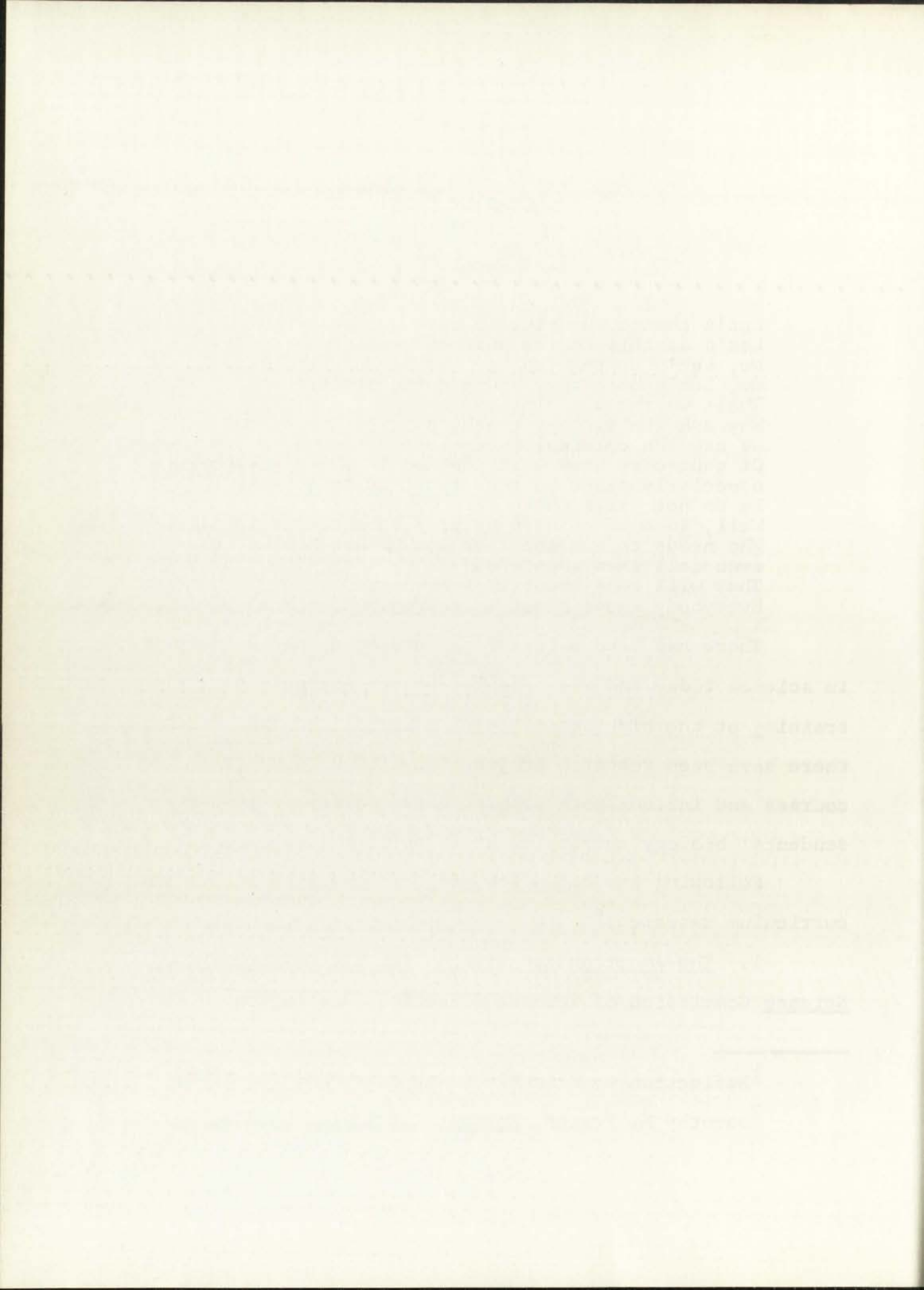
There has been a lot of discussion about the advances in science today and the need for better scientific training at the high school level. During the past decade, there have been research projects developed to up-grade the courses and include more sophisticated materials in the students' biology curriculum at an earlier grade level.

Following are but a few projects involved in current curriculum research:²

1. The American Association for the Advancement of Science Commission of Science Education, Washington, D.C.

¹Reflection by Frizelle L. Aguilar, May 12, 1964.

²Dorothy M. Fraser, Current Curriculum Studies in



Emphasis: Grades kindergarten through third. These materials, written by scientists and teachers, are published in an experimental edition, to be tried in 1963-1964 in twelve centers by about 120 teachers.

2. Biological Sciences Curriculum Study, University of Colorado, Boulder, Colorado. The writers' primary purpose was to prepare high school biology courses, suitable for wide use in the average high school, with average classes; to give students a basic understanding of science and of scientific processes, and in so doing, to build scientific literacy as an aid in the preparation of students for later responsible citizenship.

3. The Chemical Bond Approach Project, of Earlham College, Richmond, Indiana. Purpose: To give students a vital and true picture of Chemistry.

4. Chemical Education Material Study, University of California. Emphasis: Up-grade high school chemistry.

5. The Educational Service Incorporated (ESI) and the Elementary Science Study (ESS) of Watertown, Massachusetts. Purpose: To contribute to the enrichment of American education in physical sciences in the high school and its science curriculum in the elementary schools.

Academic Subjects (Washington, D. C.: National Education Association, 1962), pp. 6-25.

Department of Psychology, University of California, San Diego

Psychology 035, Experimental Psychology, Winter 1969

Experiment 1: The Effect of Practice on Reaction Time

of College Students. This experiment was designed to determine

whether the amount of practice affects the reaction time of

college students. The experiment was conducted in a laboratory

and the results are discussed in the following sections.

1. Introduction: Reaction time is an important measure of

the speed of information processing in the human brain.

It is the time interval between the presentation of a stimulus

and the initiation of a response. Reaction time is affected by

many factors, including the complexity of the task, the

motivation of the subject, and the amount of practice.

This experiment was designed to investigate the effect of

practice on reaction time. The experiment was conducted in a

6. The Elementary School Science Project, University of California, Berkeley, California. Purpose: To determine the scientific topics and the quantity appreciated by and appropriate for elementary school children.

7. National Science Teachers' Association (NTSA), of Washington, D. C. Purpose: To improve science instruction at all levels.

8. Princeton University Junior High School Project, Princeton, New Jersey, is designed to lead the student by direct observation and experiment to insights concerning the nature of the physical world they inhabit.

9. The Science Manpower Project of Columbia University, Teachers College, New York, New York, for grades kindergarten through twelve. It was designed to prepare students for the world of today and tomorrow, by providing children and young people with an opportunity to study science in each year of their formal schooling.

There are a few of the important research projects in the field of science in the school curriculum. These may seem tangential to the problem however, the purpose in listing here is for the reader to realize that the BSCS is only one of many science curriculum projects. It should be noted that it is the only project concentrating all of its efforts in the area of high school biology.

Various educators have written their descriptive

views about the Biological Sciences Curriculum Study however very few biology teachers actually in the classrooms have expressed their opinions and attitudes openly. There is nothing in the literature to indicate that a survey has ever been conducted to ascertain the attitudes of biology teachers in the state of New Mexico toward the Biological Sciences Curriculum Study program.

An attitude and opinion survey was used in this study as an instrument in appraising the status of the Biological Sciences Curriculum Study in the high schools of New Mexico, and possibly to enlighten teachers who are unfamiliar with this research activity in biology.

I. THE PROBLEM

Statement of the problem. The purpose of this study is to survey the attitudes of biology teachers in the state of New Mexico toward the Biological Sciences Curriculum Study. Answers are sought in this study to the following questions:

1. What are the characteristics of schools using the Biological Sciences Curriculum Study?
2. How long has BSCS been used in the schools?
3. What are the effects of BSCS on teachers and students?
4. What are the opinions of biology teachers toward the BSCS program and the three versions of texts involved?

It is noted that the first part of the paper is devoted to a discussion of the

importance of the problem and the methods used in the present study.

The second part of the paper is devoted to a description of the experimental

apparatus and the results obtained from the measurements.

The third part of the paper is devoted to a discussion of the results and

the conclusions drawn from the present study.

The fourth part of the paper is devoted to a discussion of the

conclusions drawn from the present study.

The fifth part of the paper is devoted to a discussion of the

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conclusions drawn from the present study.

The ninth part of the paper is devoted to a discussion of the

conclusions drawn from the present study.

The tenth part of the paper is devoted to a discussion of the

conclusions drawn from the present study.

5. What are the advantages and disadvantages of BSCS?
6. Are the original objectives of BSCS being accomplished by the average students involved in this program?
7. Why do biology teachers like or dislike BSCS?

The following hypotheses may be accepted or rejected after analysis of the data:

1. The biology teacher's knowledge about the BSCS is proportional to his scientific background and professional qualifications.
2. The participation in BSCS of the schools is directly proportional to the population of the school-community.
3. Many teachers are in favor of using BSCS but think they do not have adequate facilities, equipment, and student ability available.
4. Many teachers do not qualify to instruct the students in the BSCS program because of their lack of training and inadequate familiarity with the program.
5. Many schools have decided not to use BSCS because of the additional finance involved.
6. Many teachers feel that the three present versions of BSCS are above the ability of their high school students.
7. Many teachers are resistant to change and are satisfied with their present program and methods.
8. Most teachers in New Mexico are not informed about BSCS and therefore are either not using this program or have no opinions concerning it.

Delimitation of the problem. The study includes only public high schools in New Mexico, listed by the State Board

Public Health Service, Department of Health and Human Services

Division of Field Operations, Office of the Assistant Secretary for Health

Washington, D.C. 20492

Dear Sir:

Reference is made to your letter of the 10th day of August, 1968.

The following information is being furnished to you for your information:

1. The name of the person who is the subject of the information is _____.

2. The date of birth of the person is _____.

3. The sex of the person is _____.

4. The race of the person is _____.

5. The address of the person is _____.

6. The date of the information is _____.

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12. The date of the information is _____.

13. The source of the information is _____.

14. The date of the information is _____.

15. The source of the information is _____.

of Education, Santa Fe.

II. DEFINITION OF TERMS USED

BSCS = Biological Sciences Curriculum Study. For a very complete description of the Biological Sciences Curriculum Study see Chapter II of this study.

High school. In this study the term "high school" includes grades seven through twelve, nine through twelve, or ten through twelve. Where junior high schools exist in the larger cities, the high schools include only grades nine through twelve and ten through twelve.

Participating teachers. Throughout this study, the term "participating teachers" applies to those teachers who are officially using the Biological Sciences Curriculum Study materials on a full scale as specified by BSCS and those teachers registered with the Area Consultant appointed by BSCS, University of Colorado. Mr. Marshall S. Floyd of Highland High School, Albuquerque, was appointed as 1964 Area Consultant for New Mexico. The BSCS teachers for 1962-1963 listed in the annual report of the BSCS Newsletter Number 17 were:

- | | |
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| 1. Harry L. Bishop | Valley High School
Albuquerque |
| 2. William Z. Dean | Albuquerque Indian
School, Albuquerque |

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| 3. Marshall S. Floyd | Highland High, Albuquerque |
| 4. Virgilio Martinez | Albuquerque High,
Albuquerque |
| 5. Lawrence Modrich | Raton High, Raton |

Current unpublished information is on page
in the Appendix.

Non-participating teachers. In this study,
"non-participating teachers" applies to all teachers of
biology who do not fit the specifications of the afore-
mentioned definition.

III. SOURCES OF THE DATA

Primary sources. There are three sources of primary
data in this study. Two major sources were questionnaires
completed by the chairmen of the various high school biology
departments and by teachers who are primarily teachers of
biology. The third source was provided by teachers who are
not primarily biology teachers, but are teaching one or two
biology classes. Since there is only a thread of difference
between the three primary sources, one may say that the
primary source of data was the responses listed on the
questionnaire Forms A and B by the teachers of biology.

Secondary sources. Secondary sources of data were
educational journals, reviews, periodicals, and newsletters.

1. Introduction

The purpose of this study is to investigate the relationship between the variables X and Y.

The study was conducted in a laboratory setting over a period of six months.

The results of the study indicate a strong positive correlation between X and Y.

These findings have important implications for the field of research.

The data in this study were collected from a sample of 100 subjects.

Cooperation from the participants and the staff of the department was essential for the success of the study.

The study was designed to explore the relationship between X and Y.

Between the two groups, there was a significant difference in the results.

Further research is needed to confirm the results of this study.

Additional journal articles on this topic can be found in the references.

Few texts contain coverage on BSCS because the program was only innovated in 1959. A complete coverage of the literature and publications concerning BSCS materials between 1959 and 1964 is given in Chapter II of this study. The need for a study of this nature was indicated. The history of biology in the curriculum is described to relate both the need for, and the ultimate development of the Biological Sciences Curriculum Study, by the American Institute of Biological Sciences sponsored by the National Science Foundation.

CHAPTER II

REVIEW OF THE LITERATURE

A survey of educational literature revealed several articles expressing the need for a second look at the status of science in the high schools. Such a survey reveals that many factors contributed to the formation of the Biological Sciences Curriculum Study by the American Institute of Biological Sciences with the support of the National Science Foundation. Sources that contribute valuable information to the present inquiry are studies dealing with the following: (1) the history and development of BSCS, (2) the history of biology in the curriculum of American schools, (3) the necessity for a "new" biology program, (4) trends of current educational surveys, (5) literature concerning BSCS, 1959-1964, (6) inferences from the literature.

History and development of BSCS. The Education Committee of the American Institute of Biological Sciences (AIBS) organized the BSCS in 1959. Its function was "to seek the improvement of biology education."¹

The major support for the BSCS has come from National

¹AIBS-BSCS, "About BSCS Biology," BSCS Newsletter, 17:7, March, 1963.

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Science Foundation grants totaling in excess of three million dollars as of October 1, 1962, and six million dollars as of May 31, 1964.² This figure was obtained from the Director of BSCS by telephone in June, 1964.

According to a Newsletter:

General policy for the BSCS was established by a 27-member Steering Committee, which includes research biologists, high school biology teachers, science supervisors, and university administrators. The Chairman of BSCS is H. Bentley Glass of Johns Hopkins University. The BSCS Director is Dr. Arnold B. Grobman, formerly at the University of Florida. Official headquarters and offices are on the University of Colorado campus at Boulder, Colorado.³

The first writing conference was held during the summer of 1960, to prepare the original materials to be used during the school year of 1960-1961. One hundred and five teachers and fourteen thousand students used this material and submitted their comments and suggestions.

The second writing conference was held during the summer of 1961 for seven weeks to make a thorough revision of the three versions. The three versions are:

1. The Green Version--usually considered ecological in approach.
2. The Yellow Version--considered developmental-evolutionary.

²Ibid., p. 7.

³Ibid.

Scientific Institute of the Academy of Sciences of the USSR
Moscow, U.S.S.R.

Dear Sirs,
I have the honor to acknowledge the receipt of your letter of the 15th of June 1961, in which you inform me that you have received the manuscript of your paper on the synthesis of polyacetylene derivatives.

The paper is being read at the meeting of the Academy of Sciences of the USSR, which will be held in Moscow on the 20th of June 1961. I am sure that your work will be of great interest to the members of the Academy.

I am sending you a copy of the program of the meeting, which will be held in the Great Hall of the Palace of the Soviets. I am sure that you will find it of interest.

I am, Sir, very respectfully,
Yours faithfully,
S. P. Volynskiy

3. The Blue Version--considered physiological-biochemical.

During 1961-1962 the BSCS materials were tested in thirty-five centers, covering nineteen states from Vermont to Hawaii, from Washington to Florida. Three hundred and fifty teachers instructing over thirty thousand students used and tested the revised materials.

The third revision was during the summer of 1962, to prepare books for general adoption.⁴ The following BSCS texts are now available through commercial publishers:

(1) Green Version--High School Biology, Rand McNally Co., P. O. Box 7600, Chicago 80, Illinois; (2) Yellow Version--Biological Science: An Inquiry into Life, Harcourt, Brace and World Co., 757 Third Avenue, New York 17, New York:

(3) Blue Version--Biological Science: Molecules to Man, Houghton, Mifflin Co., 2 Park St., Boston, Massachusetts.

Many more publications are now available through commercial publishers for immediate use as a result of the three writing conferences and continuous work by the BSCS group.

The Chairman of BSCS indicates that:

The aim of the Biological Sciences Curriculum Study is to place biological knowledge in its fullest modern perspective. If we are successful

⁴Bentley Glass, "Renascent Biology: A Report on the AIBS Biological Sciences Curriculum Study," The School Review, 70:28, Spring, 1962.

THE CHAIRMAN OF THE BOARD OF DIRECTORS

OF THE NATIONAL ASSOCIATION OF REALTORS

1015 N. WASHINGTON STREET, WASHINGTON, D. C. 20004

DEAR MR. CHAIRMAN:

I am pleased to hear that the National Association of Realtors is planning to publish a new book on the subject of "Real Estate in the 1980's".

The book will be a valuable addition to the literature available to real estate professionals and the general public.

I am sure that the book will provide a comprehensive and up-to-date overview of the real estate market and the challenges it faces in the 1980's.

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students of the new biology should acquire not only an intellectual and esthetic appreciation for the complexities of living things and their interrelationships in nature, but also for the ways in which new knowledge is gained and tested, eliminated, and⁵ an ever closer approximation to truth attained.

What is the BSCS program that past efforts to improve the science curriculum of the secondary schools were not? One might say two principal things in reply. For the first time in the history of American education we now see a large number of research scientists, from the colleges and universities taking part in a co-operative effort with high-school teachers of science and science supervisors to replace an antiquated body of scientific knowledge and outlook with subject matter and perspective that are truly current.⁶

There were six general points of agreement on major issues prior to writing the BSCS materials:

1. Biology as it was taught in 1960 and even now is twenty years to a full century in arrears. Controversial biological subjects as organic evolution, the nature of individual and racial differences, sex and reproduction in the human species, and the problems of population growth and control will be presented by an appropriate scientific treatment.
2. Science is presented to students as if the knowledge of nature were static and crystallized, or was rapidly becoming so. The failure to teach up-to-date biology is the prevalent sin of teaching the life sciences. Current so-called laboratory work has degenerated for the most part into mnemonic exercises that stress only the names of structures and processes

⁵Ibid., p. 42.

⁶Ibid., p. 41.

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and textbook definitions and explanations.

3. There is no way to organize a high school course in biology. One can take the analytical, physicochemical approach of a biochemist or biophysicist or the organismal approach of the student of behavior or the supra-organismal view of the ecologist who deals with communities and ecosystems. It was therefore decided to explore a variety of approaches and types of organization of the subject matter to be taught.
4. The nature of science as an increasingly important aspect of human history--including the development of science through the correction of past errors, discovery of new evidence, and synthesis of new concepts--is to be stressed. This principle means that the biological themes of the interdependence of structure and function, regulation and homeostasis, the genetic continuity of life, its evolution, the diversity of type together with unity of pattern, the biological roots of behavior, and the relation of organism to environment must be treated at all levels of organization, from the molecular level to the ecosystem, and at all stages of process from the chemical reaction through the growth and development of the individual to the ultimate evolutionary changes with time. To do this is most difficult and has never really been attempted. But to achieve it is fundamental to a modern view of the life sciences.
5. As George Sarton, our greatest historian of science, has said, "It is not at all necessary that the average man should be acquainted with the latest theory of the universe or the newest hormone, but it is very necessary that he should understand as clearly as possible the purpose and the methods of science. This is the business of our schools, not simply of the colleges but of all the schools from the kindergarten up." Only by engaging in the steps of scientific inquiry may a student

become able to discern the true difference between sound experiment that provides evidence and complex instrumentation that offers a show--between evidence and authority, between science and magic. The schools should offer a real participation in scientific inquiry, and as full a participation as possible.

6. A sound biological understanding is the inalienable right of every child who, when adult, will need to cope with individual problems of health and nutrition; with family problems of sex and reproduction and parenthood and with the citizens' problems of wise management of national resources, the biological hazards of nuclear agents in peace and in war, and governmental support of science as the primary source of national strength and well-being in the scientific ear.⁷

A current BSCS Newsletter says:

Each year there are at least 750,000 tenth-graders who either take a special slow-learner course in biology or who are assigned to a rather elementary type of special "general science" course because the school considers them not academically suited for regular biology. There is a large group of tenth-grade students for whom the regular BSCS biology materials are not suitable. The BSCS has taken the position that the basic aim of a course for these students should be the same as that for the average and above-average students in the BSCS biology versions--that is, developing in the students, insofar as possible, the degree of scientific literacy needed by adults in society, using biology as the vehicle for this purpose.⁸

⁷ Ibid., pp. 19-20.

⁸ AIBS-BSCS, "BSCS Special Material for the Slow Learner," BSCS Newsletter, 21:36, April, 1964.



The first BSCS Special Materials (SM) Program was developed during the summer of 1963. This BSCS Special Materials experimental edition is ready for classroom use in 1964-65, provided the teachers obtain special preparation at a BSCS-SM Briefing Session.⁹ This material is designed for the student who is below the fortieth percentile on the national norms on the Differential Ability Test (DAT) total score (Verbal Reasoning + Numerical Ability). The second writing conference, scheduled for the summer of 1964, revised the existing units for the 1964-1965 school term. However, it did not complete units for one full year course.

There has been developed a second year biology course called BSCS Biology, Second Course. It was used in the 1963-1964 experimental edition and will continue to be used in 1964-1965. In 1965 a commercial edition of BSCS Biology, Second Course will be released for the 1965-1966 school year.

It is easily seen that BSCS is not standing still in its development. It is continually progressing and developing longitudinally and vertically in logical sequence.

History of biology in the curriculum of American schools. Only a brief tracing of the history of biology in the American schools will be given here. The question

⁹Ibid., p. 37.

The following information was obtained from the records of the
National Archives and Records Administration, Washington, D.C.
in 1964, concerning the activities of the National Security
Council, Office of Special Operations, during the period
designated for the purpose of this report. The information
presented in this report is based on the records of the
Office of Special Operations, National Security Council, and
Office of Special Operations, Department of Defense, during
the period of 1954 to 1964. The information is presented
in this report in the form of a summary of the activities
of the Office of Special Operations, National Security Council,
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concerning the proper subjects for the elementary or high school curriculum hardly existed before the middle of the nineteenth century. Three R's--reading, writing, and arithmetic, with spelling and grammar, were without any rivals. In fact, the average school included only reading, spelling, and English grammar, while those of a superior sort added writing, arithmetic, geography, and history.¹⁰

Horace Mann, in 1837, wrote The Common School Revival which helped introduce science into the curriculum. The first subject of scientific character was geography. By 1832, geographies and atlases were prepared for school use. The second scientific subject in the elementary curriculum was physiology. In 1837 the first physiology text appeared. Physiology became compulsory in 1850.¹¹

It has been well documented in literature that the curriculum prior to 1800 consisted of a program devoid of biology as we know it today. The following is an example of a high school program: (1) science of numbers, (2) elementary geography, (3) geometry, (4) hand surveying and navigation, (5) domestic literature, rudiments of grammar, oral recitation, (6) ancient literature--Grecian

¹⁰Paul Monroe, A Text-Book in the History of Education (New York: The Macmillan Company, 1905), p. 701.

¹¹Ibid.

The history of biology in the United States is a story of growth and change. In the early years, biology was often taught as a collection of facts, with little emphasis on understanding the underlying principles. However, as the century progressed, the study of biology became more scientific and more integrated with other disciplines.

One of the key figures in the development of biology in the United States was Louis Agassiz. He was a Swiss naturalist who came to the United States in 1829 and spent the rest of his life at Harvard University. Agassiz was a pioneer in the study of comparative anatomy and the history of life. He was also a strong advocate of the study of biology in schools.

In 1859, Charles Darwin published his book "On the Origin of Species," which revolutionized the way we think about life. Darwin's theory of evolution provided a framework for understanding the diversity of life on Earth. This theory was widely accepted in the scientific community and eventually found its way into school textbooks.

The history of biology in the United States is a story of growth and change. In the early years, biology was often taught as a collection of facts, with little emphasis on understanding the underlying principles. However, as the century progressed, the study of biology became more scientific and more integrated with other disciplines.

1. Louis Agassiz, A Two-Year in the History of Education (New York: The Macmillan Company, 1907), p. 101.

and Roman, (7) foreign literature--French. This information is from a letter written on July 15, 1816 by Dr. Samuel L. Mirchell of New York, to Governor Nicholas of Virginia and Directors of the Library Fund, State of Virginia, giving advice on a school system.¹²

Noble¹³ writes that Herbert Spencer, 1820-1903, one of England's greatest scholars, challenged the classical type of training in his essay on "What Knowledge Is of Most Worth?" He urged general instruction in science and that all might receive training and help for the daily duties of life. His ideas attracted attention in many lands. He concluded that of all subjects, a knowledge of science "was always most useful for preparation for life," and therefore the type of knowledge of most worth.

Noble continues that Louise Agassiz and Thomas Henry Huxley introduced the teaching laboratory in biology, about a century ago, with one primary purpose in mind. Their insight was a simple one: seeing is believing.¹⁴

Thomas H. Huxley, 1825-1895, an English scientist wrote on "A Liberal Education," in his Science and

¹²Edgar W. Knight, A Documentary History of Education in the South Before 1860 (University of North Carolina Press, 1953) p. 9.

¹³Stuart G. Noble, A History of American Education (New York: Rinehart and Company, Inc., 1954) p. 347.

¹⁴Ibid.

Education, as related by Noble:

That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order; ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of Nature and of the laws of her operations; one who, not stunted ascetic, is full of like and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of Nature or of art, to hate all vileness, and to respect others as himself.

Such an one and no other, I conceive, has had a liberal education; for he is, as completely as man can be, in harmony with Nature.¹⁵

John Dewey's conception of education involves not merely learning, but play, construction, use of tools, contact with nature, expression, and activity; and the school should be a place where children are working rather than listening, learning life by living life, and becoming acquainted with social institutions and industrial processes by studying them.¹⁶

A survey of the high schools in New York State for the period 1896-1900 showed that 82.5 per cent of the

¹⁵Ibid., pp. 340-341.

¹⁶Ibid., p. 486.

That man, I think, has a... education and has been... his body is one that... does with ease and... as a teacher, it is... in a city, said... part of what... order, leads... to any kind of work... will be large the... also is... and fundamental... lack of her... academic, is full of... persons who trained... vigorous will, she... omniscience; and... whether of nature... witness, and to...

Such an one and no other, I... a liberal education; for... man can be, in...

John Dewey's conception of... purely learning; but play, construction, one of... contact with nature, expression, and activity and... school should be a place where children are... than learning, learning life is... and industrial... processes by studying them.

A survey of the high schools in New York State for... the period 1880-1890 showed that 82.5 per cent of...

15
16

schools taught botany, 70 per cent physiology, 42.5 per cent zoology, and 10 per cent biology. During this period American secondary education underwent serious questioning relative to its proper function and purpose.¹⁷

In the decade from 1900-1910 the high school course in "biology" had its birth. It is sometimes difficult to realize that this course is so relatively young in the curriculum. In 1910, only 1.1 per cent of all high school students were enrolled in biology. The "new" biology then was established to present a unification of botany, human physiology, and zoology, which was actually three sub-courses combined in a one-year sequence.¹⁸

Along with the great industrial expansion in America, the period from 1910-1920 marked a changing emphasis upon science in the curriculum. Biology became increasingly popular with high school students because the emphasis was upon the teaching of biology for its importance to human welfare--vocations, health, sanitation, avocations, appreciations, understanding of the environment.¹⁹

During a period of curriculum refinement, 1920-1930, the movement to "humanize" the study of biology, which had

¹⁷Paul DeHart Hurd, Biological Education in American Secondary Schools 1890-1960, AIBS-BSCS Bulletin No. 1 (Baltimore: Waverly Press, Inc., 1961), p. 9.

¹⁸Ibid., p. 27.

¹⁹Ibid., pp. 30-39.

been gaining momentum during the previous two decades, was by now a generally accepted point of view for curriculum makers. The report of the American Association for the Advancement of Science in 1928 lent further support in this direction.²⁰

The economic or social crisis in America during 1930-1940, marking the depression years, also produced a period of questioning of educational practices. Attention of the curriculum developers was focused upon the individual student and his personal, social, and economic welfare. They were also more influenced by the growing importance of science and technology than the committees in previous decades. Their major emphasis was upon science for all young people--meeting their "needs" and "problems"--and set the curriculum in terms of its values for personal and social welfare. The strongest criticism was leveled at the nature of individual student laboratory work and its lack of educational returns for the time spent. The consequence was that double or two-hour laboratory periods in science teaching were dropped by the majority of high schools, which meant that biological experiments and investigations were reduced to a minimum.²¹

World War II and the birth of the "atomic age" marked

²⁰Ibid., p. 51.

²¹Ibid., pp. 70-73.

been gaining momentum during the past few decades, but
by now a generally accepted point of view has emerged
that the report of the National Commission on the
Organization of the Schools is the most important document in the
history of the field.

The commission's report is a landmark in the history of
education. It is a landmark because it is the first time
that a national commission has reported on the state of
the entire educational system. It is a landmark because it
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it is the first time that a national commission has
reported on the state of the entire educational system.

World War II and the birth of the "atomic age" marked
the beginning of a new era in the history of the
United States. It was a time of great change and
growth. It was a time when the United States emerged
as a world power. It was a time when the United States
became a superpower. It was a time when the United States
became a global leader. It was a time when the United States
became a world force. It was a time when the United States
became a world presence. It was a time when the United States
became a world influence. It was a time when the United States
became a world power.

the next decade. The question of "What the high schools ought to teach?" was still in the minds of the curriculum developers. There were many reports and even more opinions; it was a concensus that all young people should have some knowledge of science as a social force and that this would demand knowing something of the nature of the scientific enterprise.²²

The committees continued to speak of science and meeting the needs of individuals in various aspects of life, and as being "functional" in the lives of young people. For the first time "scientific attitudes" were referred to as being worthy goals for all students in science courses and at all levels.²³

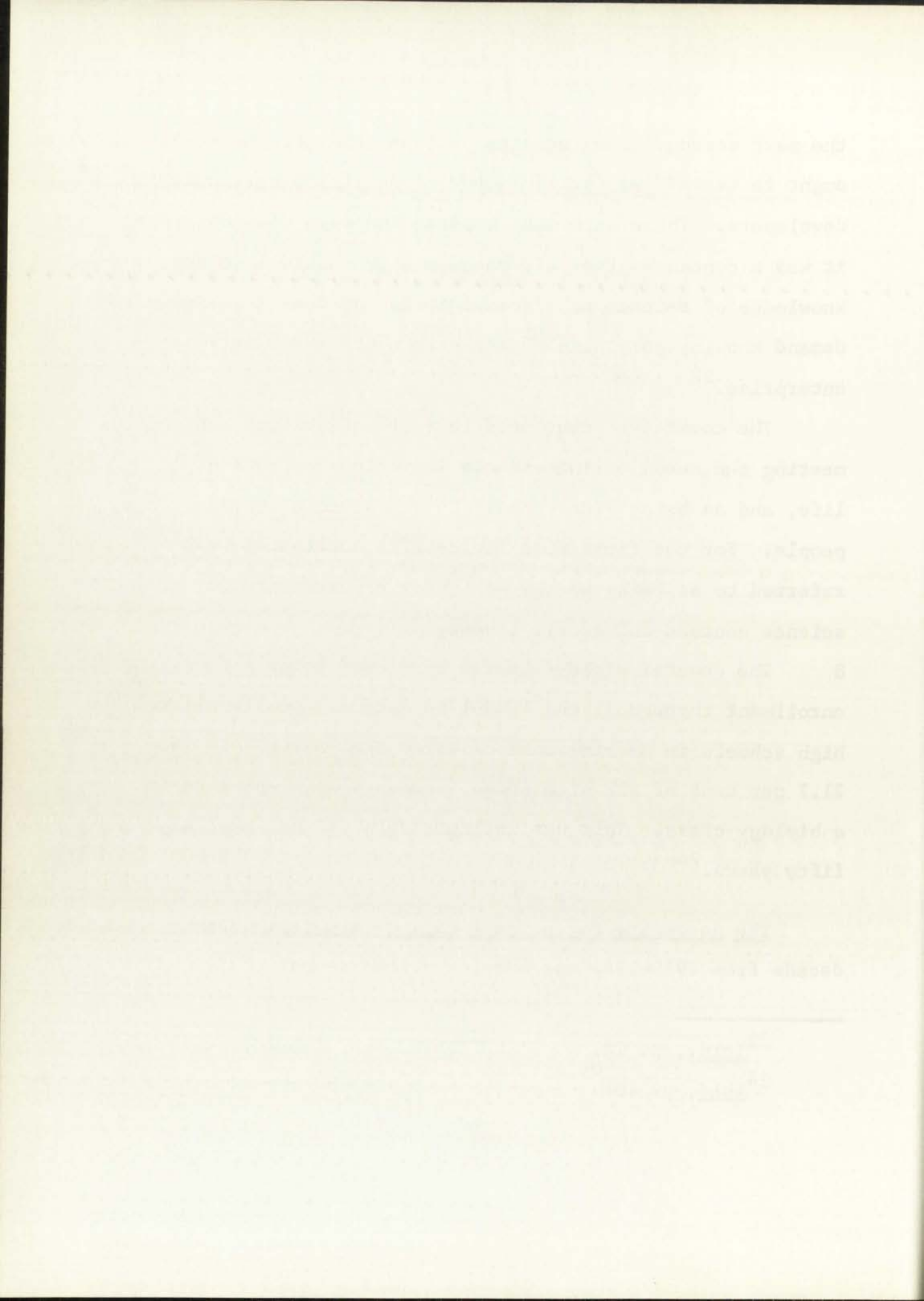
8 The general biology course continued to gain in enrollment throughout the 1940-1950 decade. Nearly all the high schools in America were offering the course. In 1950, 21.7 per cent of all high school students were enrolled in a biology class. This was an increase of 20 per cent in fifty years.²⁴

The necessity for a "new" biology program. The decade from 1950-1960 has been described as one of

²²Ibid., p. 74.

²³Ibid., pp. 105-107.

²⁴Ibid., p. 106.



"confusion and crisis" in science education.²⁵ The 1940's ushered in a period of biochemical expansion and inquiry that was unprecedented in the history of endocrinology. The period between 1951-1963 has marked the birth of "radiobiology," the newest and most infant development in biology. The use of isotopic tracer methods now relatively new is providing a great store of information that could not have been obtained in any other way. The unifying concepts in genetics, along with the research on DNA, have provided a foundation for the science of "biology." The development of the electron microscope has added new dimensions to biology on the cellular level.

The present decade was ushered in by the space era which will continue to progress in direct proportions to the capabilities of American scientists. Who are the American scientists? The students of today are the American scientists of tomorrow, therefore they must be given the best, up-to-date courses possible. This is the purpose of the Biological Sciences Curriculum Study.

Trends of current educational surveys. Accurate information regarding past trends may be helpful in making future improvements. Viall reported:

²⁵Ibid., pp. 108-109.

In American secondary schools 69 per cent of the science teachers and 63 per cent of the mathematics teachers are men. They earn salaries from below \$3,000 to over \$10,000, with a median range of \$5,000 to \$5,499. Half of the science teachers are under thirty-five years of age, and all but 1 per cent have bachelors' degrees. Although 75 per cent have had some post-baccalaureate courses, less than 40 per cent have taken such courses in their teaching areas. Twenty per cent have completed at least one National Science Foundation Summer Institute.

The survey sets 18 semester hours as "minimally adequate" preparation in a subject. Seventy-three per cent of biology teachers, 70 per cent of mathematics teachers of grades nine to twelve, 60 per cent of chemistry teachers, and 33 per cent of the physics teachers meet this standard.

A quarter of all physics classes in the country are taught by teachers with less than 9 hours in the subject. Thirty per cent of all the science and mathematics classes in American secondary schools are taught by teachers who spend some or most of their time teaching outside these fields.

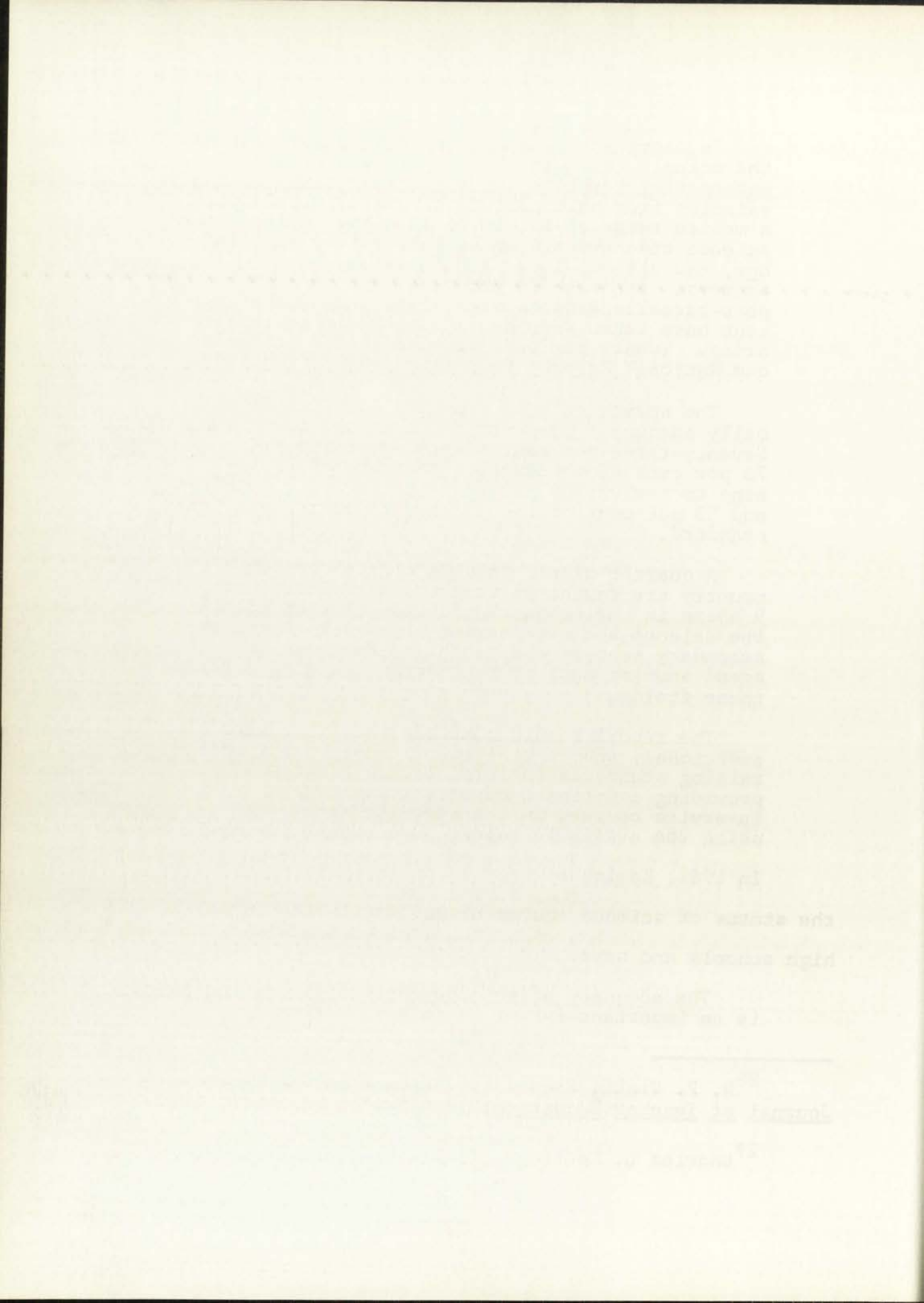
The report should convince many that much additional, substantial effort must be put into raising standards for preparation programs, providing additional opportunities for inservice courses in the academic areas, and using the available talent more intelligently.²⁶

In 1961, Koelsche reported an interesting study on the status of science equipment and facilities in public high schools and says:

The adequacy of science facilities and²⁷ equipment is an important factor in this situation.

²⁶W. P. Viall, "Secondary Science and Mathematics," Journal of Teacher Education, 13:475-476, December, 1962.

²⁷Charles L. Koelsche, "Facilities and Equipment



The following generalizations were made along with recommendations:

The proportion of high school students studying science is greater today than three years ago.

Classrooms and laboratories are inadequately equipped for effective instruction.

A definite relationship exists between the size of the school and status of the facilities and equipment for science instruction.

Time could be obtained for the teachers by eliminating all duties unrelated to science teaching from the assignment of science instructors.

A look at the high schools in which the basic items of equipment for teaching the various science subjects were missing discloses that a greater portion of items were absent in schools enrolling less than 200 students than in those with enrollments of 500 and above. Many investigators, including Dr. Conant, indicate that schools enrolling fewer than 500 students cannot offer the educational opportunities present in the larger schools. Every effort should be made, therefore, to bring about a consolidation of small high school districts thereby broadening the base for adequate financing of the total school program. Equal education opportunities for all American youth would thus move a step closer toward ultimate realization.²⁸

The work of the Biological Sciences Curriculum Study has made an effort to improve the science equipment available to the schools and encourage teachers to

Available for Teaching Science in Public High Schools 1958-1959," Science Education, 45:365, October, 1961.

²⁸Ibid., p. 372.

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participate in workshops and institutes.

Literature concerning BSCS, 1959-1964. The literature contributing to and commenting on the BSCS is limited because of the newness of the program. A few pertinent articles will be briefly discussed.

Grobman, in 1961, stated that our national survival may depend on our ability to make rapid changes in American education. Dr. Hulda Grobman is the BSCS Newsletter Editor and the wife of Arnold B. Grobman. She poses the following questions and comments:

Will BSCS be able to change American Education? Can we hasten the process of change? Can we determine what change is needed, and effect this change quickly? Once these now biology programs are generally available, will they influence the mainstream of biology teaching? Will the work of this "commission" have an effect?

To measure the effectiveness of the program, it will be necessary to examine the whole field of biology curriculum and determine what impact, if any, the BSCS materials have had on other biology writers and curriculum workers.²⁹

Unfortunately, some biology teachers equate national curriculum study materials with national curricula, and therefore, piously declare that they will have nothing to

²⁹Hulda Grobman, "Study in Educational Improvements," Clearing House, 36:163, November, 1961.

participate in workshops and institutes.

Illustrative examples are: 1955-1956, 1956-1957, 1957-1958.

contribution to the community in the field of science.

degrees of the members of the program's staff and students.

articles will be briefly discussed.

Program, in 1961, stated that our national program

may depend on our ability to raise rapid change in

American education. Dr. John G. Thompson is the 1961

National Science Foundation and the wife of Arnold S. G. Thompson.

poses the following questions and answers:

Will there be any in science education?
Education can be faster the process of
change. Can we determine what change is
needed, and affect this change rapidly?
Once these new biology programs are underway,
available, will they influence the education
of biology teachers? Will the work of these
"committees" have an effect?

To secure the effectiveness of the
program, it will be necessary to examine the
whole field of biology education and
determine what impact it has. The 1961
materials have had an effect on biology teachers
and curriculum workers.

Unfortunately, some biology teachers speak negatively

curriculum study materials with national curriculum, and

changes, usually feeling that they will have a negative

Dr. John G. Thompson, "Study in Biological Education",
Essential Issues, 1961, November, 1961.

do with them. This tragic semantic error, whether it be real or imagined, may be preventing the students under their care from receiving a superior education.³⁰

It was stated by J. Baker,³¹ in 1963, that the entire BSCS program was born out of necessity. High school biology was badly out of touch with the frontiers of the field. BSCS has created an enthusiasm for change in high school biology which should have started many years ago. BSCS has done a fairly good job in emphasizing that a teacher's use of BSCS materials does not mean that the course is necessarily excellent. However, with a few exceptions, the promotion writers of BSCS and speakers have not done a good job at all in dispelling the myth that if a teacher does not teach BSCS biology, then he or she must be teaching an old, out-dated, "traditional" course.

Novak³² stated that one of the significant features of the BSCS "approach" is the emphasis on scientific inquiry. He says that the laboratory experiences would be deliberately designed so that at the end of a year the student has reasonably clear ideas about the role of observations, measurement, experimental design, experimental

³⁰Arnold Grobman, "National Curricula," American Biology Teacher, 24:484, November, 1962.

³¹J. J. W. Baker, "Biology Bandwagon," Science Teacher, 30:74, October, 1963.

³²Alfred Novak, "Scientific Inquiry in the Laboratory," American Biology Teacher, 25:345, May, 1962.

error, hypothesis, cause and effect relationships, the exponential relationship, and a whole host of concepts which constitute the area of scientific inquiry.

Lee³³ explains and presents the laboratory block authors to give an understanding of how they expect to accomplish the following objectives: (1) to enable students not only to learn the science of biology, but (2) to also practice the science of biology.

Novak and Abraham have postulated certain basic principles to assure successful fulfillment of the objectives of the BSCS laboratories:

That investigative type laboratories will lead to better understanding of science.

That the objective of each laboratory exercise is valid.

That the biology teacher is adequately trained in the subject and methodology of laboratory experience.

That a properly equipped laboratory is available to carry out the investigations.

That needed apparatus and materials are readily available.

That sufficient laboratory preparation time or assistance to the teacher is available.³⁴

³³Addison Lee, "Experimental Approach in Teaching Biology: An Introduction to the BSCS Laboratory Block Program," American Biology Teacher, 23:409, November, 1961.

³⁴A. Novak and N. Abraham, "Excellence in Biology Facilities," Science Teacher, 29:14, March, 1962.

They recommended that serious consideration be given to the following points:

Reduction of assigned teaching duties.

Release from extracurriculum assignments such as lunchroom, hall duty, parking lot patrolling.

Facilitating the ordering of supplies.

Extensive use of non-certified personnel as laboratory assistants.³⁵

The importance of the competent teacher is spelled out by Klinckmann,³⁶ as being a final point in the new curriculum. She says that the teacher is the only model of an educated person with whom many students ever come in contact, therefore, if students are to become truly educated, the teacher must be a model of an educated person whom students can be encouraged and stimulated to emulate. Her description of the competent teacher as an educated person may seem grandiose and unattainable--and in one sense it is. It is an ideal. But it is necessary to remind oneself constantly of such ideals if one is more nearly to approach them.

Lisonbee³⁷ indicated that plans, during the summer

³⁵ Ibid.

³⁶ Evelyn Klinckmann, "New Curriculum Patterns for Biology Teachers," Yearbook of the American Association of Colleges for Teacher Education (AACTE), 1962, p. 102.

³⁷ L. Lisonbee, "Teaching Science to the Disadvantaged

They recommend that similar conditions be given to the following points:

Education of national teaching staff.

Salaries for national teaching staff should be fixed on a scale which is commensurate with the status of the profession.

Facilitating the selection of teachers.

Extensive use of the general and personal as diagnostic tests.

The importance of the corporate teacher is spelled out by Lindeman²⁶ as being a final point in the new curriculum. He says that the teacher is the only holder of an educated person which when with students that give in content, character, if students are to become truly educated, the teacher must be a model of an educated person whom students can be encouraged and stimulated to emulate. Her description of the corporate teacher in an individual person may seem grandiose and unrealistic--and in one sense it is. It is an ideal. But it is necessary to think oneself constantly of such ideals if one is ever nearly to approach them.

Lindeman²⁷ indicates that since, during the summer

²⁶ Lindeman

²⁷ Lindeman, "The Corporate Teacher," *Journal of Educational Psychology*, 1927, 18, 101.

²⁸ Lindeman, "The Corporate Teacher in the Disfranchisement

of 1964, are to provide material suitable for the disadvantaged pupil, in genetics, ecology, and cellular biology; to challenge, fascinate, and stimulate day to day interest of the students. The developing BSCS program is cognizant of the associated sociological problems--those that relate to the pupil and his cultural background and to the pupil and his teacher.

Lee³⁸ reported, in 1961, that although the BSCS laboratory block was too sophisticated for some of the groups, and the facilities were too cramped for success, students got something intangible out of the program, in spite of the handicaps--something not measurable by tests. The following is a typical response from a group whose I.Q. was over 130:

For the first time I have really had to think. I am just beginning to know what science is. The slow students showed the most improvement in study, preparation, attitude, and the test results following the block.

The use of team teaching in connection with the BSCS program is commented on by Johnson and Shutes:

The BSCS program came into the picture at the

Pupil," Science Teacher, 30:20, October, 1963.

³⁸Addison Lee, "Laboratory Instruction Innovation," Science Teacher, 28:47, October, 1961.

The following is a list of the names of the persons who were present at the meeting held on the 15th day of August, 1945, at the residence of the undersigned, in the City of New York, New York.

The names of the persons present are as follows:

Mr. J. Edgar Hoover, Director of the Federal Bureau of Investigation;
 Mr. Clegg, Chief of the Bureau of Investigation;
 Mr. Glavin, Chief of the Bureau of Investigation;
 Mr. Ladd, Chief of the Bureau of Investigation;
 Mr. Nichols, Chief of the Bureau of Investigation;
 Mr. Rosen, Chief of the Bureau of Investigation;
 Mr. Tracy, Chief of the Bureau of Investigation;
 Mr. Egan, Chief of the Bureau of Investigation;
 Mr. Gurnea, Chief of the Bureau of Investigation;
 Mr. Hendon, Chief of the Bureau of Investigation;
 Mr. Pennington, Chief of the Bureau of Investigation;
 Mr. Quinn, Chief of the Bureau of Investigation;
 Mr. Nease, Chief of the Bureau of Investigation;
 Mr. Gurnea, Chief of the Bureau of Investigation;
 Mr. Hendon, Chief of the Bureau of Investigation;
 Mr. Pennington, Chief of the Bureau of Investigation;
 Mr. Quinn, Chief of the Bureau of Investigation;
 Mr. Nease, Chief of the Bureau of Investigation;

Very truly yours,
 J. Edgar Hoover
 Director

appropriate time in that it provides a more consistent overall view of biology; and also provides more meaningful laboratory experiences for the students. The course will probably be somewhat different next year and the year after that, but this is a growing, evolving nature that certainly biology, if any course, should subscribe to. Occasionally a nonfunctional-nonessential bump or two will appear, but it is hoped that these will fade away in the evolutionary process, or at least promote a source of curiosity to some observant student. Biology is a becoming thing. What it becomes will depend mainly on the success that teachers of biology have in becoming real biology teachers. And they need time to do this. As I have pointed out, team teaching will go far to help provide this time.³⁹

The BSCS principles are praised by Sister Mary Ivo, in a 1962 report which says:

The BSCS with its emphasis on modern biology contributes to the development of attitudes and skills that are functional, that stimulate conceptual thinking, and that consequently lessen the students' dependence on the teacher.

And have not all students the right to become self-educable? Herein is the dynamic force of the BSCS program: it takes a subject that has been made trite by reliance on outmoded, weak, descriptive teaching techniques and catapults it to the level of a modern experimental science.⁴⁰

This article illustrates a complete acceptance of the BSCS program and agreement with the basic principles of the

³⁹R. H. Johnson and R. Shutes, "Biology and Team Teaching," American Biology Teacher, 24:254, April, 1962.

⁴⁰Sister Mary Ivo, "Catholic High School and the BSCS Program," American Biology Teacher, 24:362, May, 1962.

scientific attitudes, by a Catholic educator.

Klinge⁴¹ encourages teachers to join professional societies and bring in career pamphlets for their students. He describes reading materials such as Scientific American, American Biology Teacher, Science Teacher, and other curriculum aids. He suggests the BSCS texts, laboratory guides, and films. He urges teachers to improve their training by the fifth year program or the National Science Foundation in-serving training.

Frankel quotes Hiden T. Cox, executive director of the American Institute of Biological Sciences:

The seeds which are now being planted in our school system will be bearing fruit for years to come. No comparable effort in reworking the contents of a curriculum has been made by so many experts in any field.⁴²

Frankel goes on to say that it is difficult to estimate the impact of BSCS efforts on biology teaching on the secondary school level nationally.⁴³

Weaver suggests that some of the BSCS material can be introduced earlier in the junior high school and upper

⁴¹P. Klinge, "Resources for Improving Instruction in Biology," School Life, 45:13, October, 1962.

⁴²E. Frankel, "BSCS--Where New Horizons Begin," Science Teacher, 29:47, May, 1962.

⁴³Ibid.

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elementary grades. He says:

BSCS became so voluminous, maybe the solution will lie in the direction of a reorganization of the K-12 science program, in identifying and weaving into the earlier years as much of the life-science information as possible, and in offering some degree of selectivity at the upper levels in the type of materials used for the various types and interests of students.⁴⁴

Brett gives the following facts about the high schools of today. Eight out of ten students take biology in tenth grade. One-half of the eight never take another science course, and do not want to go to college. Brett adds:

At the present time it is fair to say that teachers, administrators and parents need further preparation for BSCS courses in biology; the courses need further revision; methods of evaluating the results of these courses need refining; in fact the only ingredient ready for BSCS brand biology is the high school student himself.⁴⁵

An editorial in the London Times Educational Supplement implies that classroom testing has shown that 70 to 80 per cent of grade ten pupils are able to utilize the BSCS materials in a satisfactory manner. The necessity of developing materials for the other 20 to 30 per cent of the students was realized.⁴⁶ It is interesting to note that BSCS

⁴⁴R. L. Weaver, "BSCS--Plus," American Biology Teacher, 25:404, October, 1963.

⁴⁵William J. Brett, "BSCS Biology," Teachers College Journal, 33:139, March, 1962.

⁴⁶Editorial in the London Times Educational Supplement,

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materials are being used in at least four foreign countries.

According to Van Deventer,⁴⁷ it would be difficult to say which of the three BSCS versions is "best." He claims that all are good, all have the same basic "themes" or cross-cutting ideas. The strongest feature of all in the BSCS material is the introduction of modern approaches in the laboratory. He thinks that the Blue Version gives the best presentation of the methodology of science; the Yellow Version has the best section on microbial life; the Blue Version also gives an excellent treatment of biotic communities and succession. Van Deventer claims the following outstanding features for the three versions:

Green Version = the most thorough treatment of taxonomy.

Blue Version = the clearest treatment of the origin of life.

Yellow Version = the strongest presentation of evolution.

These are the unifying threads that run through all three BSCS versions, according to Van Deventer:

1. Change of living things through time--evolution.

"BSCS Biology Course--Blue, Green and Yellow Versions," 2502:922, May 3, 1963.

⁴⁷W. C. Van Deventer, "BSCS Biology," School Science and Mathematics, 63:89, February, 1963.

material is being prepared for the purpose of being used in the construction of a new building.

any other of the same kind, and it is to be used in the construction of a new building.

that all the other material is to be used in the construction of a new building.

cross-cutting beams, and it is to be used in the construction of a new building.

8128 material is the best material for the purpose of being used in the construction of a new building.

the Laboratory, and it is to be used in the construction of a new building.

best presentation of the material, and it is to be used in the construction of a new building.

version has the same material, and it is to be used in the construction of a new building.

version also has the same material, and it is to be used in the construction of a new building.

committee and subcommittee, and it is to be used in the construction of a new building.

Following are the names of the members of the committee and subcommittee, and it is to be used in the construction of a new building.

Green Version, and it is to be used in the construction of a new building.

Blue Version, and it is to be used in the construction of a new building.

Yellow Version, and it is to be used in the construction of a new building.

These are the names of the members of the committee and subcommittee, and it is to be used in the construction of a new building.

2. Diversity of type and unity of pattern of living things.
3. Genetic continuity of life.
4. Complementarity of organism and environment.
5. The biological roots of behavior.
6. Complementarity of structures and function.
7. Regulation and homeostatis: the maintenance of life in the face of change.
8. Science as inquiry.
9. The intellectual history of biological concepts.⁴⁸

It has been found that 70 per cent of the content of the three biology curricula is identical. All three represent a completely new start based on the most up-to-date thinking. None of the three courses was written for advanced or slow students; all can be taught with equal facility at the tenth grade level to the average youngster. The difference between versions is essentially in the approach to biology.⁴⁹

Inferences from the literature. It appears that the setting and the timing are both right for the development and success of any "new" curriculum in biology. It seems

⁴⁸Ibid., pp. 93-94.

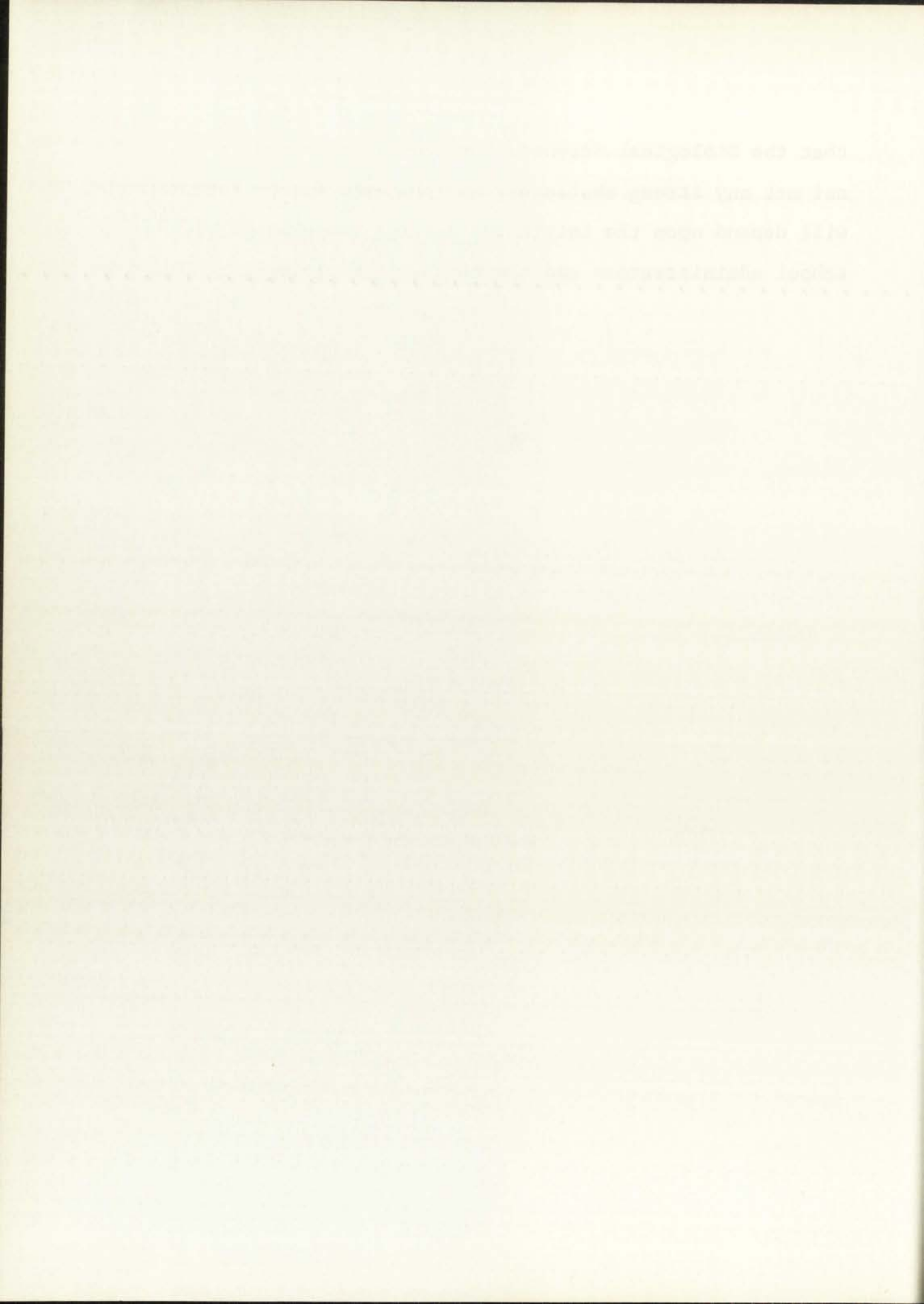
⁴⁹Editorial, "New Science Curriculums: Biology," School Management, 7:63, June, 1963.

1. The historical roots of biology
2. The scientific method
3. The cell theory
4. The discovery of DNA
5. The structure of DNA
6. The central dogma of molecular biology
7. The genetic code
8. The flow of genetic information
9. The role of proteins
10. The role of enzymes
11. The role of hormones
12. The role of the immune system
13. The role of the nervous system
14. The role of the endocrine system
15. The role of the reproductive system
16. The role of the circulatory system
17. The role of the respiratory system
18. The role of the digestive system
19. The role of the excretory system
20. The role of the integumentary system

1954, pp. 1-100

1954, pp. 1-100
1954, pp. 1-100
1954, pp. 1-100

that the Biological Sciences Curriculum Study program has not met any strong obstacles, and that its future success will depend upon the initiative and the cooperation of the school administrators and the teachers of biology.



CHAPTER III

METHODS OF CONDUCTING THE SURVEY

Survey material was mailed to 107 of the public high schools in the state of New Mexico. These schools represented all of the public high schools in the state of New Mexico listed in the Directory of Secondary Schools - 1963-1964, supplied by the State Board of Education in Santa Fe, New Mexico. A letter of introduction, endorsed by Dr. Bonner M. Crawford, Professor of Education, University of New Mexico; Questionnaires Forms A and B for participants and non-participants, respectively; and a stamped self-addressed envelope were sent to the principal for distribution in each school. Each letter had a suspense date of approximately ten days thereon, to expedite the responses.

The subjects were all basically teachers affiliated with the biology department of their particular high school; however, in some instances, where the schools were small, some had various other duties within the school. Their teaching preparation is discussed and categorized in Chapter IV. Their membership in professional, technical, or scientific organizations was requested in the survey questionnaires. Also requested was information concerning

SETTING OF CONDITIONS FOR STUDY

Survey research was carried out in 1973-1974 in the state of Michigan. These schools represented all of the public schools in the state of Michigan. The survey was carried out in the winter of 1973-1974, and the data were analyzed in the summer of 1974. A letter of introduction, accompanied by Dr. Robert M. Gage, Professor of Education, University of Michigan, was sent to each school. The letter explained the purpose of the study and the participation of the schools. Each school had a representative of the school who was interviewed for the study. The data were analyzed and the results were reported in the summer of 1974.

The subjects were all secondary schools affiliated with the Michigan Department of Education. The schools were selected on the basis of their location within the state. Their existing programs in physical education were described and categorized in Chapter IV. Their membership in professional organizations was also noted. The data were analyzed and the results were reported in the summer of 1974.

any special training in workshops, the military service, or receipt of any governmental or educational subsidies designed to increase their training.

Because it was not known how many biology teachers would respond, no minimum size of the sample was predetermined. Some of the schools returned only one completed questionnaire; others returned more than one. The actual number of questionnaires received from each of the schools is shown in the Appendix. As the questionnaires were returned, they were posted to the proper chart, graph (see Figure 3-1 and 3-2 in the Appendix), and individual control sheets.

The first dispatch of survey materials was mailed on April 1, 1964. It was hoped that all replies would be complete by May 31, 1964, the end of the 1963-1964 school year. The objective of a 100 per cent response did not materialize, but the investigator discontinued follow-up requests after 82.2 per cent of the 107 schools replied.

The 82.2 per cent response received after four follow-up requests was strongly sought to provide adequacy of sample. Records were kept of all dispatch and receiving dates for all types of communicative contacts with the 107 high schools in the original list of schools. The final receipt of 82.2 per cent returns is considered highly satisfactory.

any special training in mathematics, but the results of the study or results of the psychological or educational research conducted in the field to determine their extent.

Because it was not known how many students would respond, no estimate of the number of students at the schools was made. Since the schools were selected on the basis of their location, it was not possible to determine the number of questionnaires received from each school. It is shown in the Appendix, as the Appendix is intended to be returned, they were posted to the schools in the Appendix. Figures 1-1 and 1-2 in the Appendix show the number of questionnaires returned.

The first mailing of questionnaires was made on April 1, 1964. It was noted that the first mailing was completed by May 31, 1964, the end of the first year. The objective of a 100 per cent response rate was not achieved, but the investigator estimated that the response rate after 60 days was 50 per cent of the total number of questionnaires.

The 50 per cent response rate was achieved after a follow-up response was strongly encouraged. Results were kept of the response rate of each school. Results were kept of the response rate of each school for all types of questionnaires. Results in the original list of questionnaires of 50.1 per cent return is shown in the Appendix.

I. DESCRIPTION OF THE SURVEY QUESTIONNAIRE

FORMS A AND B

Forms A and B differed in that:

Form A--For teachers of biology who are using the BSCS.
For participating teachers.

Form B--For teachers of biology who are not using the
BSCS materials. For non-participating
teachers.

The first twelve questions of both forms were identical and were designed to obtain basic background information about the teacher, the student body, and the school.

Questions numbered thirteen through twenty-eight, on Form A, were designed to obtain the opinions and attitudes of teachers concerning the Biological Sciences Curriculum Study. These questions were of the ordinal scale of measurement and open-ended. Form A included a table for evaluating the effectiveness of BSCS on students participating in the program and to ascertain whether the objectives of BSCS were being accomplished.

Questions thirteen through twenty-eight, on Form B, were designed for the teacher who was not participating in the BSCS or who was not familiar with the BSCS effort to up-grade the high school biology course. The last item on both forms requested the teachers to indicate "yes" or "no," if they desired a copy of the findings of the survey. This

1. CHARACTERISTICS OF THE CURRENT QUESTIONNAIRES

Form A and B

Form A and B differed in that Form A included questions about the teacher's background and the school, while Form B included questions about the teacher's background only.

Form B included questions about the teacher's background and the school, while Form A included questions about the teacher's background only.

The first twelve questions of both forms were identical

and were designed to obtain basic background information about the teacher, the teacher's body, and the school.

Questions numbered thirteen through twenty-eight on Form A were designed to obtain the teacher's and students

of teachers concerning the pedagogical beliefs questionnaire study. These questions were of the highest order of

importance and were included in Form A to provide for evaluating the effectiveness of the questionnaire in

being in the program and to determine whether the objectives of the study were being accomplished.

Questions numbered twenty-nine through thirty-eight on Form B were designed for the teacher and were not included in

the 1950 or 1951 survey but included with the 1952 survey to update the high school biology course. The last item on

both forms requested the teacher to indicate "yes" or "no" if they needed a copy of the findings of the survey. The

item permitted the investigator to acquire the names of the subjects participating in the study and made possible future correspondence about developments in this field.

The instrument was reconstructed several times, removing items which could be answered from library sources or which did not contribute to its opinion seeking capacity. When trial tested for reliability it was found that the questions were interpreted in the same manner by many people.

II. METHODS OF ANALYZING THE DATA

The numbers of Form A and Form B questionnaires were tallied, and the per cent of each calculated to determine the total percentage participating in the BSCS in the state of New Mexico.

The names of those participating were listed by school along with the number of years participated in the BSCS. Responses of those who were not participating in the BSCS were analyzed and tallied to indicate the probability of future participation.

All answers to the questions on each form were analyzed, compared, and tallied according to the frequency of the item of measurement. The data were tabulated and illustrated. All frequencies were converted to percentages to facilitate comparison. Where the questions were

also provided the investigation with a series of questions
subjected participants in the experiment to a series of questions
forum correspondence about the study. The last part of the
The instrument was designed to measure the degree of
removing items which could be interpreted as being
reasons or which had not been mentioned in the
capacity. When final tested items were
that the questions were interpreted as being
any people.

II. METHOD

The subjects of Part A and Part B were
called, and the cost of the study was
the total percentage participation in the study
of New Mexico.

The names of those participants who
acted along with the number of items
ESDE, responses of those who were
ESDE were analyzed and called in
of future participation.

All answers to the questions
analyzed, compared, and called in
of the form of measurement. The
illustrated. All responses were
to facilitate comparison. The

open-ended the information was tabulated and placed in categories to show the trend of the opinions and attitudes of the biology teachers.

The opinions and evaluation of the three versions of BSCS materials were sought by direct and open-ended questions. The relationship of preferred versions to the most used versions of BSCS text materials was ascertained.

Suggestions offered by the teachers to improve the BSCS were tabulated and grouped according to subject matter content frequency.

It can readily be seen that the magnitude of numbers used in an ordinal scale of measurement has no absolute, but only relative, meanings.¹ The statistical analysis of the data obtained in this survey were to reject or accept the hypotheses set forth in Chapter I of this study. The statistical evidence was presented in tables, and on bar and linear graphs presented in the Appendix on page 97-98.

The frequency distribution tables comprise groupings which illustrate the opinions and attitudes of biology teachers. These groupings are listed below:

For Participants Only.

1. Student achievement in the BSCS.

¹William A. Scott and Michael Wertheimer, Introduction to Psychological Research (New York: John Wiley and Sons, Inc., 1962), p. 110.

... included the information was recorded and placed in
 categories to show the form of the material and whether
 of the study material.
 The results of the study of the study material are
 1952 materials were found by direct and open-ended
 questions. The relationship of the material was to the
 most recent version of 1952 was material was determined.
 suggestions offered by the response to improve the
 1952 were analyzed and general comments on subject matter
 content included.
 It can readily be seen that the material of number
 used in an ordinal scale of measurement has no meaning,
 but only relative, meaning. The statistical analysis of
 the data obtained in this survey were in terms of degree
 the hypothesis set forth in Chapter I of this study. The
 statistical evidence was presented in tables, and on the
 and their graphs presented in the appendix on page 77-93.
 The frequency distribution of the material groups
 which illustrate the relation and analysis of study
 material. These groups are listed below.

The Factorial Study

1. Factorial relationship to the text.

William A. Gantt and Richard W. Gantt, *Psychology*
 in Psychological Research (New York: John Wiley and Sons,
 Inc., 1951), p. 110.

2. Versions of BSCS materials in use.
3. Versions of BSCS liked best.
4. Versions of BSCS liked least.
5. Suggestions to improve BSCS.
6. Effects of BSCS on the teacher.
7. Government funds for BSCS.
8. Value of BSCS.
9. Benefits obtained from BSCS.
10. Reasons for deciding to use BSCS.
11. General opinion of BSCS.
12. Evaluation of the students using BSCS.

For Non-Participants Only.

1. Current text books used.
2. Attitude toward future use of BSCS materials.
3. Effect of BSCS on the teacher.
4. Opinion of their present biology curriculum.
5. Government funds for BSCS.
6. Value of BSCS.
7. BSCS text most familiar to teachers.
8. Version of BSCS liked best.
9. Version of BSCS liked least.
10. Version of BSCS referred to on the job.
11. Suggestions for improving BSCS.
12. Unfamiliar with the program, therefore no opinion.

1. Introduction
2. Objectives of the study
3. Methodology
4. Results and Discussion
5. Conclusion
6. References
7. Appendix
8. Acknowledgements
9. Author's Bio
10. Contact Information
11. Declaration
12. Certificate
13. Acknowledgements
14. Author's Bio
15. Contact Information
16. Declaration
17. Certificate

The cumulative data of the participating and non-participating teachers in BSCS were then compared and the results indicated.

The data obtained in questions number one, two, four, five and thirteen of the survey forms A and B were analyzed by tabulating the range and calculating the arithmetic mean and the variance. The following formulas were used:²

The Means:
$$\bar{X} = \frac{\sum f_1 X_1}{\sum f_1}$$

The Variance:
$$s^2 = \frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}$$

Since the mean does not in itself give a clear picture of a distribution, measures of dispersion, spread or variability were expressed by the variance.

The complete findings, based upon the analysis and evaluation of the data obtained from the survey questionnaires are presented in Chapter IV. The conclusions comprise the fifth and final chapter of this study.

²Wilfred J. Dixon and Frank J. Massey, Jr., Introduction to Statistical Analysis (New York: McGraw-Hill Book Company, Inc., 1957), pp. 18-19.

The descriptive data of the population and the
tabulated figures in 1902 were used to compute the
variance ratios.

The data obtained in question number 17, 18, 19, 20,
21 and 22 of the survey form A and B were analyzed
by calculating the mean and variance for each item
and the variance. The following formulae were used:

$$\bar{x} = \frac{\sum x_i}{n}$$

The mean:

$$s^2 = \frac{\sum x_i^2}{n} - \bar{x}^2$$

The Variance:

Since the year 1902 is itself also a class below
of a distribution, variance of dispersion, based on
data were expressed by the variance.
The complete variance, based on the data and
evaluation of the data obtained from the survey question
naires are presented in Chapter IV. The complete variance
the 17th and 18th items of this study.

CHAPTER IV

ANALYSIS OF THE DATA

INTRODUCTION

The sample represents 100 teachers of biology (see map), from 88 (82.2 per cent) of the 107 public high schools in the state of New Mexico. The returns of the 100 questionnaires revealed that 10(10 per cent) of the teachers of biology are participating in the BSCS program, and 90(90 per cent) of the teachers of biology are not participating in this program. Form A contains responses of the participating teachers and Form B gives the responses of the non-participating teachers.

This chapter is presented in three general parts. The first part is concerned with the background of the participating and non-participating teachers, the size of the high schools, the average number of students involved and the population of the various school areas. The consolidation in Table I compares the data of the participants and non-participants where questions were common on questionnaires Form A and B, and a word picture was not necessary. Part two is a complete analysis of each question on Form A which was not included in Table I, indicating the attitudes and other data concerning biology teachers participating in BSCS. Part three examines the data obtained in Form B concerning non-participants in a similar manner.

The sample consisted of 100 teachers from 50 schools in the state of New Jersey. The schools were selected from a list of schools in the state of New Jersey which were participating in the 1977-78 school year.

Teachers of Divided and Non-Divided Schools Form A contains a questionnaire which was given to the teachers. Form B gives the results of the questionnaire.

This chapter is divided into two parts. The first part is devoted to a description of the sample and non-participating schools. The average number of students in the various school areas, the date of the first year of the study, and the number of questions which were common to questions which were not necessary.

Form A and Form B were given to the teachers and other interested parties. The results of the questionnaire are given in Form B. The results of the questionnaire are given in Form B.

The results of the questionnaire are given in Form B. The results of the questionnaire are given in Form B. The results of the questionnaire are given in Form B.

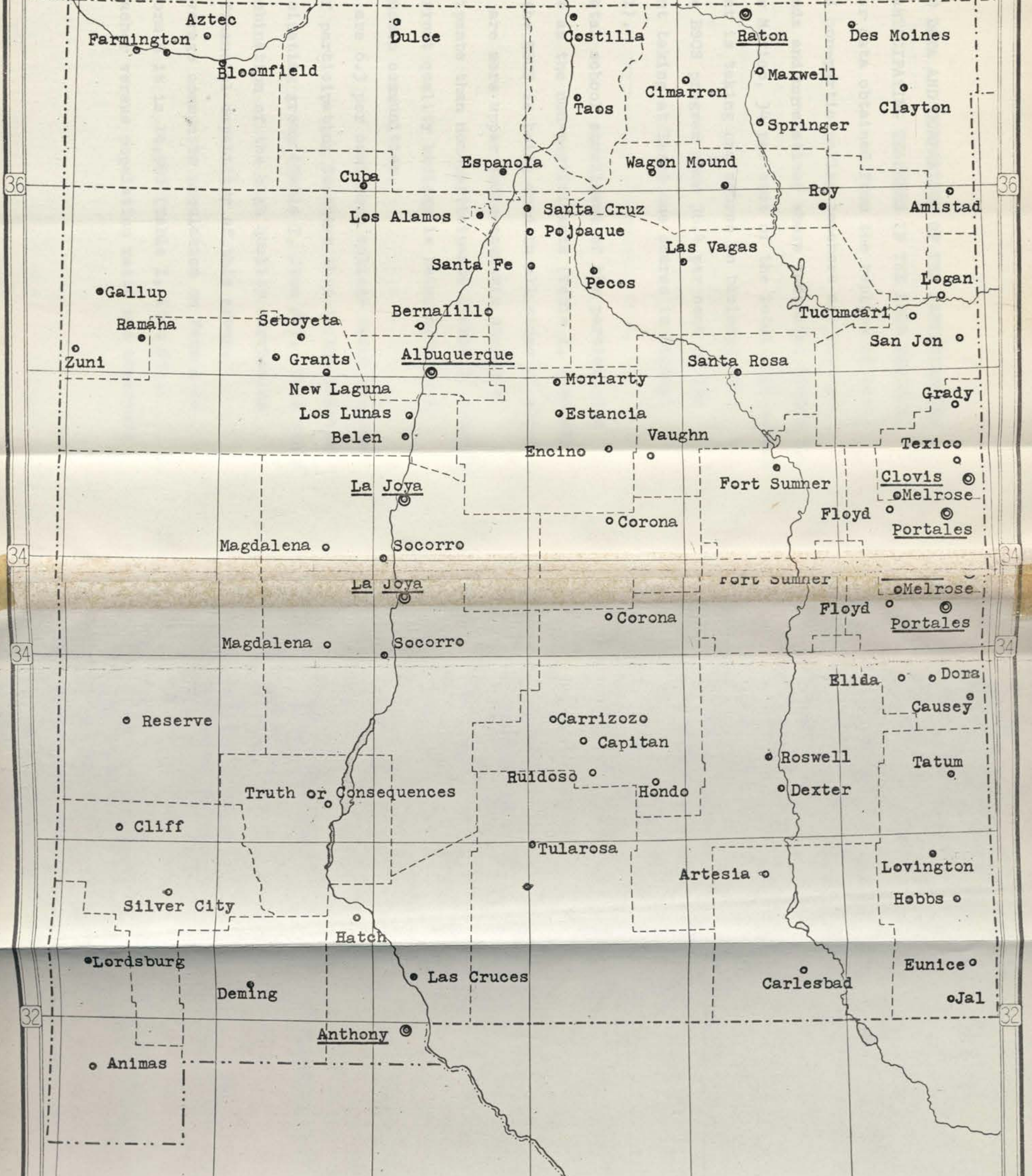
The results of the questionnaire are given in Form B. The results of the questionnaire are given in Form B. The results of the questionnaire are given in Form B.

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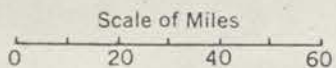
MAP OF NEW MEXICO INDICATING LOCATIONS OF SCHOOLS AND TEACHERS IN THE SAMPLE

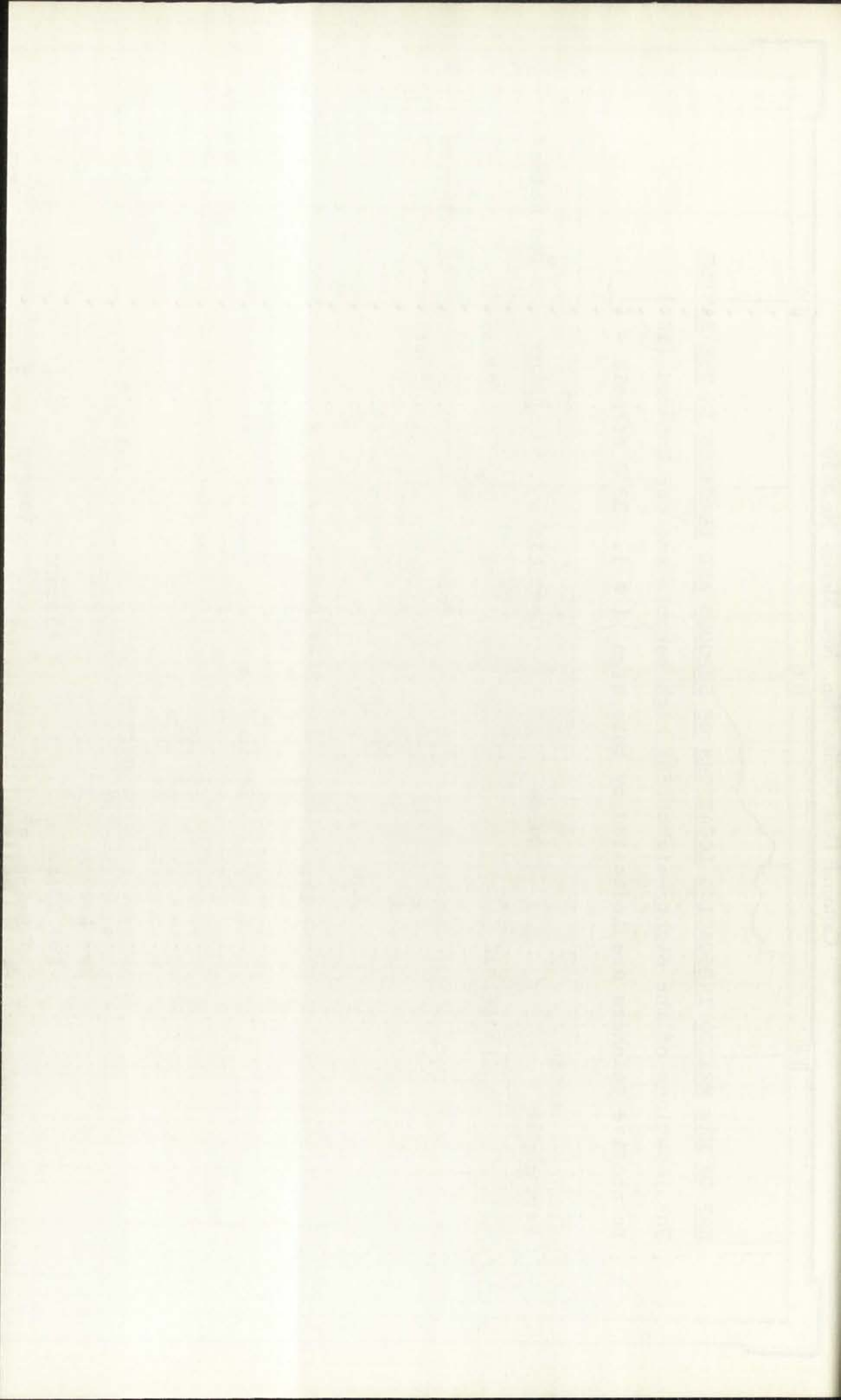
The locations of the eighty-eight (88) high schools and one hundred (100) respective teachers are indicated by this sign (o). BSCS schools = (_).



MAP OF NEW MEXICO SHOWING LOCATIONS OF SCHOOLS AND TEACHERS IN THE SAMPLE

The locations of the eighty-eight (88) high schools and one hundred (100) respective teachers are indicated by this sign (o). BSCS schools = (_)





I. BACKGROUND DATA AND COMPARISON OF THE PARTICIPATING AND NON-PARTICIPATING TEACHERS IN THE BSCS PROGRAM

All similar data obtained from the replies of the participating and non-participating teachers are compared to point out trends and correlations where indicated (Table I).

1. In New Mexico, 34 per cent of the total high school student enrollment is taking one course in biology. The schools using the BSCS program show 36.4 per cent of the student enrollment taking at least one course in biology (Table I, Item #1).

2. The total school enrollment of the participants is twice as large as the non-participants (Table I, Item #2) indicating that the BSCS is being used in all sizes of schools.

3. There are more upper socio-economic students among the participants than non-participants (Table I, Item #3) implying that current quality biology is being offered in higher socio-economic communities.

4. There are 6.3 per cent more college bound students in the schools of participating teachers than in the schools of the non-participating group (Table I, Item #4). This could be due to the combination of the high quality curriculum offered and the financial capability of this group.

5. The average community population on Form A is 154,650 and on Form B it is 26,982 (Table I, Item #5).

The following teacher versus population ratio was observed:

1. The purpose of this report is to provide a comprehensive overview of the current state of the project and to identify the key challenges and opportunities that lie ahead.

The following information is based on the data provided in the attached reports and is intended to provide a clear and concise summary of the findings.

All data has been verified and is accurate as of the date of the report.

During the course of the project, several key findings have emerged that have significant implications for the overall success of the initiative.

It is important to note that the data presented here is preliminary and subject to change as more information becomes available.

In the next section, we will discuss the specific findings and their implications for the project's future direction.

It is our hope that this report will provide a clear and concise overview of the current state of the project and will serve as a valuable resource for all stakeholders.

Thank you for your attention and support. We look forward to continuing our work together to achieve our shared goals.

Student name: [Name] Date: [Date]

The total number of students enrolled in the program is 1,200.

A total of 150 students are currently enrolled in the program.

The following table provides a breakdown of the enrollment data by semester.

Enrollment in the program has increased significantly over the past year.

This increase is due to a combination of factors, including improved marketing efforts and a growing interest in the program.

As a result of this growth, we are currently facing several challenges, including a shortage of faculty and limited classroom space.

To address these challenges, we are currently exploring several options, including hiring additional faculty and expanding our classroom facilities.

We are confident that these efforts will enable us to continue to provide a high-quality education to our students.

The following table provides a breakdown of the enrollment data by semester.

In the process of reviewing the data, we identified several areas for improvement.

One of the key areas of concern is the high level of student attrition during the first semester.

We are currently working to identify the reasons for this attrition and to implement strategies to reduce it.

Another area of concern is the limited number of students who are completing the program.

We are currently working to identify the reasons for this and to implement strategies to increase the number of students who complete the program.

The following table provides a breakdown of the enrollment data by semester.

The following table provides a breakdown of the enrollment data by semester.

Participating teacher	Non-participating teacher	Population of school community
297,000	5	8
30,000	1	9
9 to 12,000	3	29
500	1	44
	<u>10</u> teachers	<u>90</u> teachers

The following figures represent the 100 subjects versus population of their school communities:

All of the teachers	Range of population
53%	100 to 5,000 people
34%	5,001 to 100,000 People
13%	100,001 to 300,000 people

It was found that 50 per cent of the schools using BSCS are in the top 13 per cent group of teachers, ranging from 100,001 to 300,000 persons; 40 per cent of the schools using BSCS are in the 5,000 to 50,000 population range, and only 10 per cent of the BSCS schools are in the 500 to 1,000 population range. Based on this data no trend can be established relating BSCS teachers to population.

6. The average number of years taught by the participants is 11 years and only 6.7 years by the non-participants (Table I, Item #6). Fifty per cent of the participants and 59 percent of the non-participants are novices with less than 5 years of teaching experience. There are more teachers with less than two years of teaching experience in the non-participating group of teachers than in the participating group. More teacher quality is indicated in the participating group.

Participating Teacher	Non-participating Teacher	Specialist or Generalist
277,000	1	1
30,000	1	1
9 to 12,000	1	1
500	1	1

The following tables represent the 100 subjects versus population of their school communities.

All of the teachers	Range of population
238	100 to 2,000 people
348	2,001 to 100,000 people
174	100,001 to 500,000 people

It was found that 50 per cent of the schools using ECCE are in the top 13 per cent group of teachers, ranging from 100,001 to 500,000 persons; 40 per cent of the schools using ECCE are in the 2,000 to 50,000 population range, and only 10 per cent of the ECCE schools are in the 500 to 1,000 population range. Based on this data we think can be established regarding ECCE teachers to population.

6. The average number of years' length of the parties made in 11 years was only 4.9 years for the non-participants (Table 1, Line 5). Fifty per cent of the participants and 59 percent of the non-participants were married with less than 5 years of teaching experience. There are some teachers with less than the rate of teaching experience in the non-participating group of teachers than in the participating group. More teacher quality is indicated in the participating group.

7. More participants can apply all of their time to the teaching of biology and chairmanship (Table I, Item #7) indicating that they have more time to concentrate on offering a well prepared presentation of biology.

8. Participants belong to more professional organizations (Table I, Item #8).

9. More teacher preparation is indicated in the participating group than in the non-participating group based on college and university training (Table I, Item #9). The last statement of the aforementioned item indicates that 4 or 3.7 per cent of the teachers have for example : Master's degree with additional forty hours in biology or Bachelor's degree in Pharmacy. These figures indicate that 70 per cent of the participating teachers and 53 per cent of the non-participating teachers majored in biology on the Bachelor's or Master's level. If 18 semester hours is considered as "minimally adequate" preparation in a subject, about 83.1 per cent of the teachers of biology in this sample would meet this standard. This is better than the national findings of W. P. Viall¹ who found that 73 per cent of biology teachers meet this standard.

10. Only 20 per cent of the participants and 44.4 per cent of the non-participants have not had National Science

¹W. P. Viall, "Secondary Science and Mathematics" Journal of Teacher Education, 13:475-6, December, 1962.

Foundation Institute training. Again, more quality is implied among the participating teachers (Table I, Item #10).

11. The statistics for total number of BSCS students divided by the combined high school enrollment indicated that only 1.2 per cent of all New Mexico high school students are involved in the BSCS program. In schools where the BSCS program is being used only 6 per cent of the student enrollment is involved in the BSCS biology.

The significance of these comparisons is to show evidence and facts which tend to support hypotheses 1 and 2 of this study. The biology teacher's knowledge about the BSCS is proportional to his scientific background and professional qualifications. The participation in BSCS of the teachers is directly proportional to the amount of teaching experience. It is found that better qualified, trained, prepared and experienced teachers tend to want to use the "new" biology or the BSCS program.

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TABLE I

COMPARISON OF PARTICIPATING TEACHERS AND NON-PARTICIPATING TEACHERS IN BSCS

No. * Factors	Form A Participants			Non-Participants			Combined Form A and B		
	Mean	Per cent	Range	Mean	Per cent	Range	Mean	Per cent	Range
BACKGROUND DATA									
1.a No. of students enrolled in biology in respective schools	504	36.4	16-825	206	33.0	0 to 1,000	236	34	0 to 1,000
b No. of students in these teachers' classes	128		16-164	74		0 to 167	80		0 to 167
c. % of students in BSCS classes		6.0			0.0			1.2	
2. Total high school enrollment	1,381		80-2,400	623		23-2,400	700		35-3,000
3. Socio-economic status of students--									
Lower		30.0			27.0			28.7	
Middle		54.0			69.0			65.7	
Upper		16.0			4.0			5.6	
4. Percentage of college bound students		39.8 ± 6.2			33.5			34.2	5%-80%
5. Population of community	154,650		500-297,000	26,982		100-297,000	38,108		100-297,000
6. No. of years teaching biology	11		2-26	6.7		1-33	7.2		1-33

* Questionnaire questions

STATIONED OVER	DATE	TIME	DRY	WET	WIND	TEMP	HEAVY	WIND	WIND
1000	10-10	10-10	10-10	10-10	10-10	10-10	10-10	10-10	10-10

COMMISSION OF METEOROLOGICAL SERVICES AND NON-METEOROLOGICAL SERVICES IN 1954

TABLE I (Cont.)

COMPARISON OF FORM A AND B

No.* Factors BACKGROUND DATA	Form A (Participants)		Form B (Non- Participants)		Form A and B Combined	
	Mean Cent	Range Cent	Mean Cent	Range Cent	Mean Cent	Range Cent
7. School responsi- bilities:						
Chm. of Bio.Dept.	13.3	33.3	18.2	21.0		
None	20.0		2.8			
Other subj. taught	26.7		31.8			
Other than academic (clubs)	20.0		27.3			
Other duties (athletics)	20.0		19.9			
8. Membership in profes- sional organizations		0-8	2.3	0-7		
9. Teacher preparation:						
a Bach.'s D.--major in Biology	40.0		34.0		33.3	
b Bach.'s D.--minor in Biology	--	70.0	22.0	61.0	19.5	54.3
c Bach.'s D.--no major nor minor in Biology	--		5.0		4.6	
d Master's D.--major in Biology	30.0		19.0		21.3	38.9
e Master's D.--minor in Biology	20.0	60.0	8.0	35.0	9.3	
f Master's D.--no major nor minor in Biology	10.0		8.0		8.3	
g Another category	--		4.0		3.7	

* Questionnaire questions

TABLE I (Cont.)

COMPARISON OF FORM A AND B

No.* Factors BACKGROUND DATA	Form A (Participants)		Form B (Non- Participants)		Comments	
	Mean	Per Cent	Range	Per Cent		
+ ATTITUDES						
10. Special Training:						
a. None		20.0		44.4	Again, more quality is implied among the participating teachers.	
b. Nat'l Science Fdn.		80.0		33.3		
c. Other training		--		22.3		
11. Time familiar with BSCS--(years)	3.7		1-7	2.6	0-7	Participants have been acquainted with BSCS for longer time than non-participants.
12.a No. Biology classes taught	2.9		1-5	3.1	0-5	
b No. students/class	27.9		16-32	24.8	0-35	
c Total no. Biology students/BSCS classes						
+ 15A Version of BSCS used and or referred to:			822 students, 16-150 per teacher			
26B Blue		20.0		27.8		The Yellow version is most used by participants, and the Blue version is most referred to by the non-participants.
Green		10.0		16.7		
Yellow		70.0		23.3		
None		--		14.4		
Unfamiliar		--		17.8		

*Questionnaire questions

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TABLE I (Cont.)

COMPARISON OF FORM A AND B

No.* Factors	Form A (Participants)		Form B (Non- Participants)		Comments	
	Mean	Per Cent	Range	Per Cent		
BACKGROUND DATA						
+ ATTITUDES						
10. Special Training:						
a. None	20.0			44.4	Again, more quality is implied among the participating teachers.	
b. Nat'l Science Fdn.	80.0			33.3		
c. Other training	--			22.3		
11. Time familiar with BCS--(years)	3.7		1-7	2.6	0-7	Participants have been acquainted with BCS for longer time than non-participants.
12.a No. Biology classes taught	2.9		1-5	3.1	0-5	
b No. students/class	27.9		16-32	24.8	0-35	
c Total no. Biology students/BSCS classes						
15A Version of BCS used and or referred to:			822 students, 16-150 per teacher			
26B Blue	20.0			27.8		The Yellow version is most used by participants, and the Blue version is most referred to by the non-participants.
Green	10.0			16.7		
Yellow	70.0			23.3		
None	--			14.4		
Unfamiliar	--			17.8		

*Questionnaire questions

TABLE I (Cont.)

COMPARISON OF FORM A AND B

No.* Factors	Form A (Participants)		Form B (Non- Participants)		Comments
	Mean	Per Cent	Mean	Per Cent	
ATTITUDES					
16A and 24B	Version of BSCS liked best:				
	Blue	18.2		25.0	The Yellow version is preferred.
	Green	18.2		25.0	
	Yellow	63.6		22.0	
	None	--		1.0	
Unfamiliar	--		27.0		
17A and 25B	Version of BSCS liked least:				The Blue version is least liked.
	Blue	40.0		16.7	
	Green	20.0		13.3	
	Yellow	20.0		15.6	
	No preference	10.0		--	
	All are good	10.0		1.1	
18A and 27B	Unfamiliar	--		48.9	Indications are that the majority of the participants are satisfied with present 3 volumes and 3 versions of BSCS materials. The major- ity of non-participants were too unfamiliar to offer comment.
	Undecided	--		4.4	
	Should the three versions be revised, rewritten, or integrated				
	Yes	30.0		10.0	
	No	60.0		26.7	
Question unimportant	10.0		--		
Unfamiliar	--		63.3		

*Questionnaire questions

TABLE I (Cont.)

COMPARISON OF FORM A AND B

No.*	Factors	Form A (Participants)		Form B (Non- Participants)		Comments
		Mean	Per Cent	Mean	Per Cent	
23A and 19B	Is Government wasting money supporting BSCS					
	Yes	--	--	2.2	2.2	Majority of respondents favored government support to BSCS
	No	100.0	100.0	73.3	73.3	
	Undecided	--	--	18.9	18.9	
	Unfamiliar	--	--	5.6	5.6	
25A and 22B	Value of BSCS to Biology teacher:					One hundred per cent of the participants and 40% of non-participants were in the moderate to marked category on value of BSCS.
	None	--	--	11.1	11.1	
	Slight	--	--	15.6	15.6	
	Moderate	10.0	10.0	24.4	24.4	
	Marked--great	90.0	90.0	15.6	15.6	
	Undecided	--	--	4.4	4.4	
	Unfamiliar	--	--	28.9	28.9	
21A and 16B	Is current biology curriculum mtg. student needs by offering: College preparation Terminal education Knowledge of Human Body No answer	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>	Majority of teachers felt their current biology curriculum is meeting needs of students.
	90.0	10.0	69.0	31.0		
	70.0	30.0	69.0	31.0		
	100.0	--	64.0	36.0		
	--	--	14.7	--		
24A and 18B	Is current biology curriculum satisfactory in terms of these teacher needs: Teaching materials Presentation Cultivating scientific thinkers Professional stimulation Unanswered	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>	Majority of participants are satisfied; majority of non-participants are dissatisfied with their current biology
	70.0	30.0	22.2	77.8		
	80.0	20.0	40.0	60.0		
	80.0	20.0	32.2	67.8		
	80.0	20.0	25.5	74.5		
	--	--	32.2	--		

*Questionnaire questions

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II. ANALYSIS OF DATA PERTAINING TO TEACHERS PARTICIPATING IN BSCS TEACHING

Analysis of Form A. Form A is the survey questionnaire completed by those teachers using or participating in the BSCS program. There are twenty-eight questions involved in this form, the analyses of which will be presented in the sequence of the original questionnaire with the exception of items included in Table I. Since there were only 10 respondents from nine high schools participating in BSCS, the replies were convenient to analyze. These teachers are 10 per cent of the total number of teachers in the sample of this study, as previously indicated.

Question Eleven

From what source did you learn about BSCS? When did you first develop a desire to become more familiar with the BSCS program?

Dr. A. Grobman, Director of BSCS informed 10 per cent of the teachers; 30 per cent found out from institute courses; 30 per cent were informed at the University of New Mexico; 30 per cent were advised by administrators and one of the writers. These teachers were familiar with the program for a mean of 3.7 years with a range from 1 to 7 years.

Question Thirteen

How long have you used or participated in the BSCS project?

Sixty per cent of the teachers have used this program for only 1 year; 10 per cent have participated for two years; 20 per cent of the teachers have used it for three years and

II. RESULTS OF THE INVESTIGATION

1. Description of the Study

The study was conducted in two phases.

Phase I was a pilot study to determine the feasibility of the study.

Phase II was the main study which was conducted in two parts.

The first part of the study was a survey of the opinions of the

officials of the schools in the study.

The second part of the study was a survey of the opinions of the

teachers in the schools in the study.

The results of the survey of the officials are presented in

Table I. The results of the survey of the teachers are presented in

Table II. The results of the survey of the principals are presented in

Table III. The results of the survey of the parents are presented in

Table IV. The results of the survey of the students are presented in

Table V. The results of the survey of the community are presented in

Table VI. The results of the survey of the business community are presented in

Table VII. The results of the survey of the labor community are presented in

Table VIII. The results of the survey of the religious community are presented in

Table IX. The results of the survey of the cultural community are presented in

Table X. The results of the survey of the political community are presented in

Table XI. The results of the survey of the social community are presented in

Table XII. The results of the survey of the economic community are presented in

Table XIII. The results of the survey of the educational community are presented in

Table XIV. The results of the survey of the health community are presented in

Table XV. The results of the survey of the recreation community are presented in

Table XVI. The results of the survey of the transportation community are presented in

Table XVII. The results of the survey of the communication community are presented in

Table XVIII. The results of the survey of the energy community are presented in

Table XIX. The results of the survey of the environmental community are presented in

Table XX. The results of the survey of the international community are presented in

only 10 per cent have used BSCS for four years.

Question Fourteen

How does the student achievement in the BSCS program compare with the traditional or your program of previous years?

a. Lower	0%
b. Higher	50%
c. No change	30%
d. No way of knowing now	20%

In the opinion of these teachers BSCS did no harm to the student achievement. Five of the teachers thought student achievement was higher.

Question Sixteen

Which version of BSCS do you like best? Why?

a. Blue	18.2%
b. Green	18.2%
c. Yellow	63.6%

The following reasons were given to support the above choices:

"Yellow is a happy medium, better fits needs of students, not too hard, not too easy, like the approach, like the labs, good in today's major area Biochemistry or chemistry of the cell."

"Yellow. Better adapted for our area-- evolution approach considered more important in present day biology."

"Yellow. Not familiar with others, in the sense of using them."

"Blue. This is the one I was taught, the chemistry is deep, but I like it. When the students apply themselves, they do all right." (sp.)

Question Seventeen

Which version do you like least? Why?

- | | |
|--------------------------|-----|
| a. Blue | 40% |
| b. Green | 20% |
| c. Yellow | 20% |
| d. No preference | 10% |
| e. All versions are good | 10% |

"Blue. Too hard; reading level too high; do not like the molecule approach; a little heavy on chemistry."

"Blue. Chemical approach."

"Green. Probably green would be less adaptable in our environment."

"Yellow. No reason other than personal opinion."

Question Eighteen

Do you think the three versions should be revised, rewritten or combined into two volumes which could then be used as a high school biology text?

- | | |
|--------|-----|
| a. Yes | 30% |
| b. No | 70% |

"No. Why ruin three good books; you have too much material now and 70% is common to all three versions."

"No. Teachers can combine and use from all using one basic better than an editor can combine into one."

"Yes. I think all three could be combined into one textbook taking the best from each."

Question Nineteen

What suggestions can you offer to improve BSCS, or to integrate the current three versions for use as a class text?

It was found that 50 per cent of the participating BSCS teachers have no suggestions nor opinions concerning this aspect. Here are a few suggestions by the other teachers:

- a. All teachers are good
- b. All teachers are bad
- c. All teachers are average
- d. All teachers are excellent

Q. Now, if you were to ask a teacher to rate himself, would he rate himself as good, bad, average, or excellent?

A. He would rate himself as good.

Q. Now, if you were to ask a teacher to rate himself as good, bad, average, or excellent, would he rate himself as good, bad, average, or excellent?

A. He would rate himself as good.

Question 10

Q. Now, if you were to ask a teacher to rate himself as good, bad, average, or excellent, would he rate himself as good, bad, average, or excellent?

- a. Yes
- b. No

Q. Now, if you were to ask a teacher to rate himself as good, bad, average, or excellent, would he rate himself as good, bad, average, or excellent?

A. He would rate himself as good.

Q. Now, if you were to ask a teacher to rate himself as good, bad, average, or excellent, would he rate himself as good, bad, average, or excellent?

Question 11

Q. Now, if you were to ask a teacher to rate himself as good, bad, average, or excellent, would he rate himself as good, bad, average, or excellent?

A. He would rate himself as good.

Q. Now, if you were to ask a teacher to rate himself as good, bad, average, or excellent, would he rate himself as good, bad, average, or excellent?

A. He would rate himself as good.

"None; use the three texts; let the individual teachers make the choice."

"Train teachers! 'As the teacher, so is the school--of course.' May sound 'trite'--but it is true."

"At present, I am highly satisfied with the results I am getting."

Question Twenty

Do you believe the BSCS program has stimulated your interests and aspirations as a biology

- | | |
|---------------|-----|
| a. Not at all | 0% |
| b. Slightly | 0% |
| c. Moderately | 20% |
| d. Markedly | 80% |

"Moderately! It requires more study because it is very up-to-date much of the material, I did not have during my B. S. in Education days."

"Markedly! New materials, new approach, more interest from students, better fits today's needs."

"Markedly! Have had 30 college hours in 5 years to bring 1935 work up-to-date. Have been center leader for yellow version experiment."

Question Twenty-two

Are there any basic differences between your traditional or previous curriculum and BSCS? Please explain your interpretation of the term "basic difference".

- | | |
|--------------|-----|
| a. Yes | 90% |
| b. No | 0% |
| c. Undecided | 10% |

These teachers indicated their meaning related to item a. as follows:

"Sex education, body functions presented much more realistically."

There was the first time for the first time
I remember the first time.

There was the first time for the first time
I remember the first time.

There was the first time for the first time
I remember the first time.

Question Two

There was the first time for the first time
I remember the first time.

- a. Not at all
- b. Slightly
- c. Moderately
- d. Very much

There was the first time for the first time
I remember the first time.

There was the first time for the first time
I remember the first time.

There was the first time for the first time
I remember the first time.

Question Three

There was the first time for the first time
I remember the first time.

- a. Not at all
- b. Slightly
- c. Moderately
- d. Very much

There was the first time for the first time
I remember the first time.

There was the first time for the first time
I remember the first time.

There was the first time for the first time
I remember the first time.

"A basic difference is a change from memorizing details and skimming too much material to better sampling of important materials and testing principles rather than details."

"Traditional curriculum stresses memorization of parts and names; the BSCS places emphasis on understanding and principles."

"Key = more lab., more techniques are acquired by students. Students do more observing and actual simple research instead of compiling notebooks."

Question Twenty-five

All in all, what value is the BSCS program to you as a biology teacher? Please give your interpretation of the term "value" as you applied it.

- | | |
|--------------------|-----|
| a. None | 0% |
| b. Slight | 0% |
| c. Moderate | 10% |
| d. Marked or great | 90% |

It is clear that most teachers believe the BSCS program has marked or great value. These are some of their opinions concerning value:

"New--Different presentation--Better for students."

"Importance to general development of student and increased morale of teacher."

"The value to me is a tool for teaching principles which I consider most important."

"I think it stimulates more thinking by both students and me."

Question Twenty-six

How does BSCS help you on the job?

These are some typical responses reflecting the attitudes of the teachers in the state of New Mexico:

"A basic difference between the two systems is that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed."

"Traditional systems are based on a fixed set of rules, while modern systems are based on a set of rules that can be modified or added to as needed."

"The main difference between the two systems is that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed."

All in all, the
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- a. None
- b. 1/2
- c. 1/4
- d. 1/8

It is clear that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed.

"New-0-1" system of...
"The main difference between the two systems is that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed."

"The main difference between the two systems is that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed."

"The main difference between the two systems is that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed."

"The main difference between the two systems is that the first system is based on a fixed set of rules, while the second system is based on a set of rules that can be modified or added to as needed."

"Experiments are done, not for definite expected results, but for accurate observation and presentation of data."

"By including up-to-date materials that would have to be brought in."

"Keeps me supplied with latest developments in the field."

"Since it is some of the latest materials, it keeps me active keeping up present day ideas in biology."

Question Twenty-seven

Why did you or your Biology Department decide to use the BSCS program? Please explain.

These are representative of the quotations of the teachers:

"New program! Set up a center, with one teacher in each high school. Tried the new program to see--."

"As Department Head, I introduced it. Two teachers used it. Six will use it in 1965."

"We were with the experiment in 1961-62 and 1962-63, and decided it better met our needs."

"Best method of presenting subject matter."

"We haven't decided."

There were no indications that outside pressure caused these teachers to use the BSCS program. The teachers thought the program was worth at least a trial. Some schools are still using the BSCS materials only on an experimental basis to evaluate it relative to the needs of their society, more specifically the socio-economic needs, student needs and teacher needs.

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Question Twenty-eight

What is your general opinion of the Biological Science Curriculum Study? Please explain.

A definitely positive opinion of the BSCS is reflected by the following teacher statements:

"It is a fine organization, and should continue working on various areas. The slow learner is one area now being considered. Over all I believe they have done a good job."

"Good--Up-to-date material--a method of teaching for future study and knowledge in biology that will double in the next 10 years."

"It is not the only acceptable program, or the only one, but it is a decided improvement over traditional courses offered."

"I think the BSCS stimulates interest in students. It makes them aware of the processes of science. For those who do not attend college this appreciation would never come about. Also they would not have any knowledge of basic biological principles otherwise. For college bound students the background and understanding is, of course, even more important."

"Most important change in the teaching of biology in my lifetime."

The questions and responses listed above and elsewhere are an effort to synthesize answers sought in this study. An attempt was also made to answer the following question concerning two basic principal objectives of the Biological Sciences Curriculum Study.

Are the original objectives of BSCS being accomplished by the average students involved in this program?

These two objectives are: (1) to help the student to understand various processes in biological research; (2) to

A comparison of the effects of a self-concept therapy and a self-concept questionnaire

by the following: a self-concept questionnaire and a self-concept therapy

It is a long time since the self-concept questionnaire was first used in the study of self-concept. The self-concept questionnaire was first used in the study of self-concept by Allport and O'Connell (1942).

The self-concept questionnaire is a self-concept questionnaire. The self-concept questionnaire is a self-concept questionnaire. The self-concept questionnaire is a self-concept questionnaire.

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develop within the student an understanding and appreciation of the scientific enterprise (Table II).

The teachers were asked to evaluate fourteen more specific objectives pertaining to the two general objectives by comparing their average pupils in the BSCS program during the 1963-1964 school year, with average pupils in the previous program or traditional programs from past or present experiences. The students were rated on their degree of improvement in these fourteen sub-objectives. The results were as follows for the two basic principal objectives:

<u>IMPROVEMENT</u>	<u>TEACHERS' EVALUATION OF STUDENT ACHIEVEMENT</u>
None	00.0%
Slight	15.5%
Some	15.5%
Notable	37.0%
Great	32.0%

The fourteen sub-objectives used to obtain this student achievement rating are listed in Form A of the Appendix on page 93. The statistics obtained indicate that the objectives are actually being accomplished by the students and teachers to a marked extent (Table II). The data indicates that these participating teachers of biology have a positive opinion toward the Biological Sciences Curriculum Study.

TABLE II STUDENT ACHIEVEMENT

Form A (Continued)

The two basic principal objectives of the Biological Science Curriculum Study are:

- To help the student to understand various processes in biological research.
- To develop within the student an understanding and appreciation of the scientific enterprise.

The following statements should help to evaluate these two objectives stated by the BSCS. Please compare your average pupils in the BSCS program this year, with average pupils in the previous program or traditional program from past or present experience, by checking (✓) your opinion in the appropriate column to the right.

	I M P R O V E M E N T					Obj.#1
	NO	SLIGHT	SOME	NOTABLE	GREAT	
The average student in the BSCS compared to the average pupil in traditional biology:	00%	16%	16%	40%	28%	
1. defines a problem in researchable terms.	00%	10%	40%	40%	10%	
2. recognizes a reasonable hypothesis which can be tested by experiment or observation, concerning a problem.		20%	20%	40%	20%	
3. recognizes the importance of appropriate controls in an experimental design.		20%	10%	30%	40%	
4. distinguishes among different kinds of data. Data, as used here and elsewhere in these objectives, includes observations as well as other kinds of data.		10%	00%	70%	20%	
5. recognizes the importance of accuracy in obtaining data.		20%	10%	30%	40%	
6. selects a suitable procedure for the analysis of data.		20%	20%	40%	20%	
7. realizes that being a scientist involves much study and routine work.		10%	10%	30%	50%	
8. realizes that both teamwork and individual work are important in research.		10%	00%	40%	50%	
9. recognizes that his participation in a scientific investigation contributes to his learning.		20%	10%	40%	30%	
10. recognizes that scientists do not base judgments on authority.		10%	30%	30%	30%	
11. recognizes the value of creative thinking and ingenuity in science.		00%	30%	30%	40%	
12. recognizes that scientists share ideas with others.		10%	20%	20%	50%	
13. realizes the value of a broad background in areas other than the sciences.		40%	00%	30%	30%	
14. sees the unity and relationships among the sciences (botany, zoology, chemistry, physics, mathematics, etc.).		10%	10%	30%	50%	
TOTAL		15.5%	15.5%	37%	32%	Obj.#2 = 100%

I (do) (do not) desire a copy of the summary of the findings of this opinion survey.

NAME: _____

ADDRESS: _____

SCHOOL: _____

LOCATION: _____

THANK YOU FOR COMPLETING THIS SURVEY QUESTIONNAIRE!

The first part of the report deals with the general situation in the country. It is noted that the economy is showing signs of recovery, but that inflation remains a serious problem. The government has implemented various measures to control inflation, but these have had limited success. The report also discusses the political situation, noting that the government is working to improve its relations with the opposition and to hold free and fair elections.

The second part of the report provides a detailed analysis of the economic situation. It examines the impact of the government's policies on the different sectors of the economy. It is found that the manufacturing sector has been particularly hard hit, with many factories closed and unemployment high. The agricultural sector has also suffered, with a significant decline in output. However, the services sector has shown some resilience, with a slight increase in activity. The report also discusses the role of the private sector and the need for further reforms to attract investment and stimulate growth.

The third part of the report discusses the social and political situation. It notes that there is a growing sense of dissatisfaction among the population, particularly in the urban areas. This is due to a combination of factors, including high unemployment, inflation, and corruption. The government has taken steps to address these issues, but more needs to be done. The report also discusses the role of the media and the importance of transparency and accountability in government. It concludes that the country is at a critical juncture and that the government must take decisive action to reform itself and the economy.

I am, Sir, your obedient servant,
John Doe
Secretary

III. ANALYSIS OF DATA PERTAINING TO NON-PARTICIPATING TEACHERS IN BSCS PROGRAMS

Analysis of Form B. Form B is the survey questionnaire completed by those teachers not using the BSCS and are teachers referred to as non-participants. There are ninety (90) respondents from seventy-nine (79) public high schools included in this sample. These teachers represent the non-participants in the BSCS program and are 90 percent of the total number of respondents. There are twenty-eight questions on this form also. However, the answers discussed in Table I of this chapter will not be recapitulated.

Question Seven

Please indicate your additional school responsibilities.

a. Chairman of the Biology Department	18.2%
b. Others subjects taught	31.8%
c. Other than academic (clubs, etc.)	27.3%
d. Other duties (athletics)	19.9%
e. None	2.8%

These figures indicate that only 21 per cent of the teachers can devote all of their time to the field of biology, without additional school responsibilities. This is below the national average of 25 per cent and 12.3 per cent below the participants or BSCS teachers in this study.

Question Eleven

From what source did you learn about BSCS? How long have you known about the work of the American Institute of Biological Science on the Biological Sciences Curriculum Study project?

The teachers indicated that they were informed by pamphlets, educational literature, education meetings, college

RESEARCH IN THE SOUTH

Analysis of the data in Table 1 of the survey questionnaire
 detailed by these authors indicates that the 1930s and 1940s
 related to an increasing number of non-participants. There are almost 1000
 respondents from every state (999) within the study area included
 in this analysis. These figures represent the non-participants
 in the 1930s program and are 30 percent of the total number of
 respondents. There are approximately 1000 respondents on this form
 also. However, the authors disagree in Table 1 of this
 chapter will not be resubmitted.

Questionnaire

10000 respondents from 1930s and 1940s

- a. Chairman of the National Board of Geographic Names
- b. Chairman of the National Board of Geographic Names
- c. Chairman of the National Board of Geographic Names
- d. Chairman of the National Board of Geographic Names
- e. Chairman of the National Board of Geographic Names

These figures indicate that only 10 percent of the
 respondents can be said to be active in the field of history
 without additional contact. This is based on
 national average of 25 percent and 10 percent for the
 participants in 1930s and 1940s.

Questionnaire

From your survey and your own knowledge, how many
 you know about the field of the historical society
 of historical society in the historical society
 historical society

The research indicates that the field of history
 research, especially in the field of history, is

seminars, National Science Foundation, the school principal, American Institute of Biological Science Bulletins, Albuquerque Public Schools, fellow teachers, BSCS Bulletins, summer institutes, New Mexico Educational Association meetings student teaching, conventions, Biology Teachers Association Journal, college professors and their high school department chairman. There appeared to be no pressure applied by any group to force adoption of BSCS upon the non-participating teachers.

Question Thirteen

What biology curriculum program are you participating in other than BSCS? Please list your text or texts being used.

The majority of the teachers described their biology curriculum as being "None" or "Traditional" however, a few others used the following terminology: "My own development," "Modern Biology," "General Biology," "Advanced Biology," "My personal program," "Only classroom work," "Standard college prep. course," "Own Curriculum," "Team teaching with Moon, Mann and Otto," "Conventional," "E.B.F. (Encyclopedia Britannica Films)," "Regular text book curriculum" and "Based on the text."

This aforementioned description of the current biology program indicated a definite lack of standardization in the high schools of this state. However, a lack of quality is not implied.

The following text books are being used by 83 of the non-participating teachers:

Titles According to Popularity	Per Cent Respondents
1. Modern Biology: Moon, Mann and Otto. Henry Holt & Co., N. Y., 1956	49.4%
2. Elements of Biology: Dodge, 1959. Allyn & Bacon	15.7%
3. Exploring Biology: the science of living things; Ella Thea Smith, 5th ed. Harcourt, Brace & Co., 1959.	15.7%
4. New Dynamic Biology: Baker, et al. Rand McNally Co., 1959.	8.4%
5. Biology: Kroeber, Wolf and Weaver D. C. Heath & Co., 1957.	4.8%
6. Biology For You: Vance & Miller J. B. Lippincott, 1958.	1.2%
7. Biology and Human Progress: L. Eisman & C. Tanzer; 2nd ed., 1958. Prentice-Hall, Inc.	1.2%
8. Textbook of Anatomy & Physiology: Kimber, et al. 13th ed. (accelerated) MacMillan Co., 1955.	1.2%
9. Your Biology: Ella Thea Smith & Lorenzo Lisonbee; Harcourt, Brace & Co., 1958.	1.2%
10. Living Things: Fitzpatrick, et al. Henry Holt & Co., 1958.	1.2%
11. Biology: A Basic Science; Heiss, et al. D. Van Nostrand, 1958.	1.2%
*12. Biology: C. Villee, 4th ed. Saunders, 1962.	1.2%
*13. Adv. with Plants and Animals: Heath & Co.	1.2%
*14. Today's Biology: Fried & Co.	1.2%
*15. Biology and Daily Life: Ginn & Co.	3.6%

Index

1. Modern Biology: Man and His World
Henry Holt & Co., N. Y., 1932
2. Elements of Biology
Allyn & Bacon, 1937
3. Exploring Biology: The Science of Living Things
Lila Tress Smith, Ed. Wm. McCourt, Bruce & Co., 1939
4. New Synthesis Biology
Rand McNally Co., 1939
5. Biology: Knicker, Wolf and Weaver
D. C. Heath & Co., 1937
6. Biology for You: Vance & Miller
J. B. Lippincott, 1938
7. Biology and Human Progress
D. Van Nostrand, 1937
8. Textbook of Anatomy & Physiology
Macmillan Co., 1937
9. Your Biology: Lila Tress Smith & Lillian Libenstein
McCurt, Bruce & Co., 1938
10. Living Things: Fitzpatrick, et al.
Henry Holt & Co., 1938
11. Biology: A Basic Science
D. Van Nostrand, 1938
12. Biology: Principles and Problems
McCurt, Bruce & Co., 1938
13. Adv. with Plants and Animals
Heath & Co.
14. Today's Biology
Rand McNally Co.
15. Biology and Daily Life
Rand McNally Co.

The last four (*) books are not listed in "State Adopted Textbooks," State of New Mexico, Department of Education, Free Textbook Division.

Question Fourteen

Although you are not presently participating in, or using BSCS, do you think you will?

- | | |
|-----------------------------------|-------|
| a. Never | 2.2% |
| b. Undecided | 20.0% |
| c. Maybe in the future (2-3 yrs.) | 50.0% |
| d. Next year | 26.7% |
| e. No answer | 1.1% |

These figures seem reasonable and would approximate a normal curve. The prognosis that BSCS will be used more extensively in the future is indicated by these percentages.

Question Fifteen

Do you believe the BSCS program has stimulated your interests and aspirations as a biology teacher? Please explain.

- | | |
|----------------------|---------------|
| a. Not at all | 6.6% Teachers |
| b. Slightly | 16.8% |
| c. Moderately | 34.4% |
| d. Markedly or great | 27.8% |
| e. Unfamiliar | 2.2% |
| f. Unanswered | 12.2% |

The following statements of the respondents support the percentages listed above.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It is essential to ensure that all entries are supported by appropriate evidence and are clearly documented.

3. The second part of the document outlines the various methods used to collect and analyze data.

4. These methods include both qualitative and quantitative approaches, each with its own strengths and limitations.

5. The third part of the document provides a detailed overview of the theoretical framework underlying the research.

6. This framework is based on a combination of established theories and new insights into the subject matter.

7. The fourth part of the document describes the specific procedures used to conduct the study.

8. These procedures were designed to ensure the reliability and validity of the data collected.

9. The fifth part of the document presents the results of the study and discusses their implications.

10. The findings suggest that there are significant differences between the two groups being compared.

- (a) "I have not investigated this study in more detail as yet. Perhaps it is OK, but as yet I have not been stimulated by what it has to offer."
- (b) "I am not completely sold on the idea. Perhaps more information is essential."
- (c) "I need to become more familiar with the BSCS program. I feel that it adds greatly to teaching biology and that it is worth while."
- (d) "Have been interested in Biological Education for many years. It's not the curriculum, but the teacher that makes a good biology program."
- (d) "It seems to meet the needs of our present day better than any other. We must present science as concepts rather than facts."
- (d) "I have been using quite a bit of the laboratory work of BSCS with my students."
- (d) "Its laboratory block approach resembled and supported what we were already doing in Biology II. The text books contain basic material contained in Moon, Mann and Otto, plus supplementary material which we either were already adding or would have if adequate reading background had been available to students."
- (d) "I am interested in the approach of inquiry and concepts."
- (d) "Biology can be experienced by the student rather than being the textbook subject of traditional biology sources."

Question Sixteen

Is your current biology curriculum meeting the needs of your students by:

<u>No</u>	<u>Yes</u>	
31%	69%	a. Offering college preparation
31%	69%	b. Offering a good background for terminal education.
36%	64%	c. Providing an understanding of the Human Body, to satisfy the biological inquiry of young adults.

It appears that further improvement in their current curriculum is necessary in Items a., b., and c., and that this group is less content than the group of teachers using BSCS to help meet the needs of the students. It should be added that 14.7% of the teachers did not answer this question. It is not possible to assume an answer for them, however, if it were assumed that all 14.7% would have answered "yes," the cumulative results would be less than the results on Form A.

Question Seventeen

Is there any difference between your present curriculum and BSCS? Please explain your interpretation of the term "basic difference."

a. Yes	51	56.6%
b. No	2	2.3%
c. Undecided	24	26.7%
d. Unfamiliar	13	14.4%

The statements below support the above data:

- Y
- (a) "BSCS forces students to think on their own and lets them use what they learn."
- E
- (a) "We do not have three separate programs as does BSCS. We do not have as complete a lab program as BSCS."
- S
- (a) "Our program does not have the laboratory time that is spent in BSCS."
- (a) "The BSCS lab work (blue) is more complex and advanced than mine."
- (a) "The curriculum I now teach is out of date and is based solely upon what is in the book, the student does not think for himself."

Form A

LA BUREAU DE LA
SÉCURITÉ NATIONALE
INVESTIGATION

- a. Yes
- b. No
- c. Undecided
- d. Unavailable

The statements of the following persons are being furnished to you for your information:

(a) [Name] [Address] [City] [State] [Zip]

(b) [Name] [Address] [City] [State] [Zip]

(c) [Name] [Address] [City] [State] [Zip]

(d) [Name] [Address] [City] [State] [Zip]

(e) [Name] [Address] [City] [State] [Zip]

(f) [Name] [Address] [City] [State] [Zip]

(g) [Name] [Address] [City] [State] [Zip]

(h) [Name] [Address] [City] [State] [Zip]

(i) [Name] [Address] [City] [State] [Zip]

(j) [Name] [Address] [City] [State] [Zip]

(a) "BSCS is lab oriented; mine is not. BSCS stresses inquiry; mine is traditional."

(b) "Cellular and ecological approaches are pretty much the same as BSCS."

(c) "Fairly similar, considering different text. We approach BSCS through supplementation. As applied here it probably means scientific method versus scientific facts; doing versus pure book learning; problems versus answers."

(c) "Basic curriculum is probably the same."

(c) "Our program is adequate."

These figures and statements indicate that 51 teachers think the BSCS is better than their biology curriculum. Twenty-four teachers seem to be content with their curriculum and believe it is as good as BSCS and adequate.

Question Eighteen

Is your current biology curriculum satisfactory to you in terms of teacher needs by:

No

<u>Answer</u>	<u>No</u>	<u>Yes</u>	
32%	46%	22%	a. Supplying better teaching materials.
32%	28%	40%	b. Helping you to give students a better presentation of biology.
32%	36%	32%	c. Helping to cultivate young scientific thinkers.
32%	42%	26%	d. Stimulating you professionally.

There seems to be evidence of the current biology curriculum failing to satisfy the teachers' needs listed above. It must be pointed out however, that twenty nine

1. The first part of the report...

2. The second part of the report...

3. The third part of the report...

4. The fourth part of the report...

5. The fifth part of the report...

6. The sixth part of the report...

7. The seventh part of the report...

8. The eighth part of the report...

9. The ninth part of the report...

10. The tenth part of the report...

Appendix

1. The first part of the appendix...

No.	Description	Amount
1
2
3
4
5
6
7
8
9
10

There shall be no objection to the amount of the account...

or 32 percent of these non-participating teachers did not answer this question. It can not be assumed whether their answers would have been "yes", "no" or otherwise. If it were assumed that all 32 per cent of the answers were "yes", the total cumulative results would still indicate less teacher satisfaction than the same question in Part II of this Chapter, answered by the teachers participating in BSCS. Since assumptions can not be made and the sample of this study is limited only to 100 biology teachers, the analysis must be limited only to their responses.

The analysis given in this study is based entirely upon the opinions and attitudes of teachers answering the questions on the survey. No attempt has been made to assume any answers, opinions or attitudes not given by the respondents.

Based on the answers to this question some of the non-participants are not being supplied better teaching materials and are not being stimulated professionally by their present biology curriculum.

Question Twenty

As a non-participant, what is your general opinion of the BSCS project? Please explain.

The majority or 62.3 per cent of the teachers reflected a positive general opinion toward BSCS; 33.3 per cent showed a lack of familiarity with the program, and 4.4 per cent were negative to the project. The negative non-participants gave

the following reasons: (1) funding difficulty; (2) material too specialized for the heterogeneous group of this school system; (3) lack of teachers qualified to teach BSCS; and (4) too difficult for our average high school students. The following quotations will support the above generalizations:

- (1) "I believe it would be very effective to those schools who could adopt it. This school needs more funds for better texts and materials, therefore unlikely to be adopted here. I would like to see it here."
- "It is not revolutionary, however, it is a good effort to up-date our instruction. I believe the program will be excellent for larger systems but will suffer in the smaller schools where money for laboratories and facilities is lacking."
- (2) "I think the BSCS material can be used successfully with better than average students."
- "Splendid work but it is only a facet of constant study needed; there is no cure-all for teaching heterogeneous groups."
- "Teacher loads in smaller schools very nearly obviate the possibility of a teacher being able to present adequately the BSCS program."
- (3) "I think it is very worthwhile and would like to use it if I had the time and the training. I feel I should have a summer institute in it before using the material."
- "Let it stabilize and cool off and get teachers trained."
- (4) "Too advanced. Students should learn basic principles first."
- "Not applicable on the high school level, too complex for students (alright for reference for myself), an excellent book or books for freshmen college students."
- "I would like to try it with the upper 50% of my students, but not with the lower 50%."
- "I feel the BSCS project is very good for biological study, but needs some modification for the students such as I teach because they need more terminal teaching."

Question Twenty-one

Why did you or your Biology Department
decide not to use BSCS?

All of the responses can be classified into seven types of answers reflecting the opinions of the teachers:

- | | |
|--|-------|
| (1) Unfamiliar with BSCS; never considered it. | 41.1% |
| (2) Lack of Finance; inadequate time and laboratories, lack of prepared teachers. | 20.0% |
| (3) We have not decided for or against BSCS, as yet. | 15.6% |
| (4) Preparation to use it is in progress. | 7.8% |
| (5) Negative to BSCS:
"Not sufficiently convinced BSCS is perfect."

"Why should we, if we have something better, and more applicable." | 7.8% |
| (6) Some teachers in the Biology Department are using BSCS. | 4.4% |
| (7) I do not know! | 3.3% |

Here, again, it is found that very few teachers have a negative attitude toward the BSCS program. However, the high percentage of this unfamiliarity fails to confirm a positive opinion toward this project. The most outstanding factor is the very high percentage of teachers who are unfamiliar with current curriculum developments. Forty-one per cent (41.1%) of the teachers reflect unfamiliarity with the Biological Sciences Curriculum Study.

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Question Twenty-two

All in all, what value is the BSCS program to you as a biology teacher? Please give your interpretation of the term value as you applied it.

a. None	10	11.1%
b. Slight	14	15.6%
c. Moderate	22	24.4%
d. Marked or great	14	15.6%
e. Undecided	4	4.4%
f. Unfamiliar	26	28.9%

The following statements show their interpretation of value as they used it:

- (a) "I know little about BSCS."
"My own program is as good."
- (b) "I use some of the material to supplement the regular course."
"It has made me aware of a fine program."
- (c) "Source of ideas for improvement of my own program."
"Even if text is not adopted, it is excellent reference material."
- (d) "Better, more detailed preparation in cultivating scientific thinking."
"I think it stimulates a teacher as well as his students."
- (e) "I do not know until I see the full scale program."

The respondents to Items (a) and (f) indicate unfamiliarity and ignorance or complete lack of opinion concerning the program. Again, 40% of the teachers are unfamiliar with the materials of the BSCS or did not answer. therefore, an

All of the data listed in the table above is for the
1980-81 school year. The data for the 1979-80 school year
is also available at the same location.

Category	1979-80	1980-81
1. Instruction	10	10
2. Guidance	10	10
3. Health and Safety	10	10
4. Physical Education	10	10
5. Administration	10	10

The following statements show their interpretation of

the data as they use it in their program.

(a) "I use this data as follows:
"The program is as good."

(b) "I use some of the material to supplement the regular
"course."

(c) "I use some of the material as a time saver."
"Some of them are improved by my program."

(d) "I use it as a guide, but I do not use it as a
"checklist."

(e) "I use it as a checklist, but I do not use it as a
"checklist."

(f) "I think it is a checklist, but I do not use it as a
"checklist."

(g) "I do not know what I am doing with this data program."
The respondents to items (a) and (f) indicate that

they are not using the data as a checklist, but they are
using it as a guide. The data are used in the
program, but the teachers are not using it as a
checklist of the data or as a checklist of the data.

interpretation of value in the positive or negative sense cannot be assessed. The remaining majority or 55.6% of the teachers state the values in a positive sense.

Question Twenty-three

Are you familiar with the BSCS texts?

a. Yes	55	61.1%	
b. No	29	32.2%	} 38.9%
c. Slightly	2	2.2%	
d. No answer	4	4.5%	

These statistics, with a slight variation, further support the aforementioned questions and give a better view of the following questions.

Question Twenty-four

Which version of BSCS do you like best? Why?

25%	a. Blue	"Biological Science: Molecules to Man"
25%	b. Green	"High School Biology"
22%	c. Yellow	"Biological Science: An Inquiry into Life"
1%	d. None	
27%	e. Unfamiliar	

There seems to be but slight difference in preference of the version used. The reasons given indicate a lack of familiarity which necessitates that valid opinions be based upon more knowledge. The following are typical statements:

(a) "More vital and dynamic in its approach."



- (a) "I have only been fortunate enough to read the blue version."
- (b) "Basic approach; Language more understandable."
"I find ecology interesting--personal preference."
- (c) "I am most familiar with it."
"I only have read one version."
- (d) "None. Don't care for any of them."
- (e) "I do not know."

Question Twenty-five

Which version do you like least? Why?

a. Blue	15	16.7%
b. Green	12	13.3%
c. Yellow	14	15.6%
d. All	1	1.1%
e. Unfamiliar	44	48.9%
f. Undecided	4	4.4%

Again, there seems to be but slight difference between the percentages for teachers who indicated the version least preferred. About one-half of the teachers were not able to make a choice because they lack familiarity with the three texts. The following quotations support the above preferences:

- (a) "Overemphasis on biochemistry."
"Because of the background of chemistry it pre-supposes."
- (b) "Limited flora and fauna in semi-desert region."
"Green doesn't impress me a great deal."
- (c) "Not as good as the blue."

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(8)

(9)

(10)

(11)

(12)

(13)

(14)

(15)

(16)

(17)

(18)

(19)

(20)

"It has a tendency to select the students."

- (d) "I do not have enough information on BSCS to make an objective statement."

"Each is good; The use depends upon the group."

Question Twenty-six

Which of these BSCS versions do you refer to on the job?

a. Blue	25	27.8%	
b. Green	15	16.7%	
c. Yellow	21	23.3%	
d. None	13	14.4%	} 32.2%
e. Unfamiliar = No Answer	16	17.8%	

The Blue version "Biological Science: Molecules to Man" is most popular as a reference book used by the teachers. The Yellow version is next in popularity and the Green version is least referred to on the job. Again, there is the same percentage (32.2%) of teachers unfamiliar with the versions as was found in the replies to Question Twenty-three. The trend of the statistics indicates that one third of the Biology teachers in New Mexico are not familiar with current curriculum development in Biology.

17.75	11	11
18.75	11	11
19.75	11	11
20.75	11	11

The following table shows the results of the experiment. The first column shows the number of trials, the second column shows the number of correct responses, and the third column shows the percentage of correct responses. The data shows that the percentage of correct responses increases as the number of trials increases, indicating that the subjects are learning the task.

Question Twenty-seven

Do you think the three versions should be revised or integrated for use as a class text? Explain.

After analyzing many statements, three categories became clear and the following percentages were apparent: 10% of the teachers said "Yes;" 26.7% replied "No," and the majority or 63.3% were so unfamiliar with the program that they were either unable to answer the question or felt not qualified to answer. These are a few quotations supporting these findings:

(Yes) "I think more consideration should be given to the 'time factor'."

"It certainly needs revision or be discarded."

"A version is needed for the lower 50% of the students."

(No) "No. I think each teacher should be free to make their choice depending on their background and interests."

"I like the three different approaches."

"No; there are only 180 days in a school year."

"No. They should be adopted as is for the present. later editions within the next few years will be improved even more."

"No, I think the three versions will meet the needs of different classes better than one integrated one."

"No; differences of opinion are healthy--we do not all agree."

"No. I think as separate books, a teacher can pick the one which fits the situation best."

It is not clear how the results of this study are to be interpreted.

After comparing the two groups, it was found that the experimental group performed significantly better than the control group on the majority of the 15 items. This was an unexpected result.

They were either unable to answer the question or they were confused by the question. There are a few possible reasons for this.

One possibility is that the questions were too difficult for the subjects.

It certainly needs revision or re-organization.

A revision is needed for the latter part of the questionnaire.

I think the three different approaches.

There were only 150 days in a school year.

It is not clear how the results of this study are to be interpreted.

After comparing the two groups, it was found that the experimental group performed significantly better than the control group on the majority of the 15 items.

They were either unable to answer the question or they were confused by the question. There are a few possible reasons for this.

Question Twenty-eight

Please give your suggestions for improvement of BSCS.

Only 18.9% of the teachers were willing to give suggestions: 11.1% are satisfied and have no further recommendations for improvement; 2.2% were not sure or undecided; and, 67.8% were unfamiliar or not qualified to answer.

These are some suggestions from some of the teachers participating in this study:

1. "More participation by more teachers using the materials in the revision of the present programs."
2. "Find a way of providing all the lab equipment needed. Work for smaller biology classes. Eliminate certain lab studies that tend to be heavy for slower and disinterested students because these lab studies protract relatively unimportant readings for too long a time."
3. "More practical labs; learn basic biology first."
4. "Get rid of the idea that the approach is entirely new and novel--teachers have been doing this kind of teaching long before BSCS."
5. "Anything for the improvement of presenting facts, principles and attitudes is worthwhile, BSCS is therefore worthwhile. Without teaching BSCS, I hesitate to offer suggestions for improvement. More comprehension material for first year students would be one suggestion."
6. "Simplify material and vocabulary; it would be fine for second year selected biology students."
7. "Somehow make it available to more schools."
8. "Evolve practical presentation for terminal students who need to use more materials they will know through experience."
9. "Add a glossary."

10. "Give it time to catch on. Rome was not built in a year. People change slowly."
11. "Teacher preparation should be offered either at the universities, or as weekly workshops. Some class periods should be extended for laboratory periods."
12. "Less students per class."
13. "Re-due it for students without a science background like some Indians."
14. "Some of the materials required do not fit the budget of some school systems."
15. "Development of version less difficult to read."
16. "None, except that you need a book for the non-academic student."
17. "I have none at this time, except I feel there should be a better program for acquainting teachers with BSCS."

In essence, these teachers seem to be asking three basic things. The uninformed or unfamiliar teachers are asking for (1) help and leadership in becoming prepared and informed about BSCS. The better informed teachers are asking for (2) materials less difficult to read and more suitable for their students who are not necessarily college bound, and for (3) a way to solve the problem of finance involved in the transition to BSCS.

1. The first part of the report deals with the general situation of the country and the progress of the work done during the year.

2. The second part of the report deals with the results of the work done during the year and the progress of the work done during the year.

3. The third part of the report deals with the results of the work done during the year and the progress of the work done during the year.

4. The fourth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

5. The fifth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

6. The sixth part of the report deals with the results of the work done during the year and the progress of the work done during the year.

CHAPTER V

CONCLUSIONS

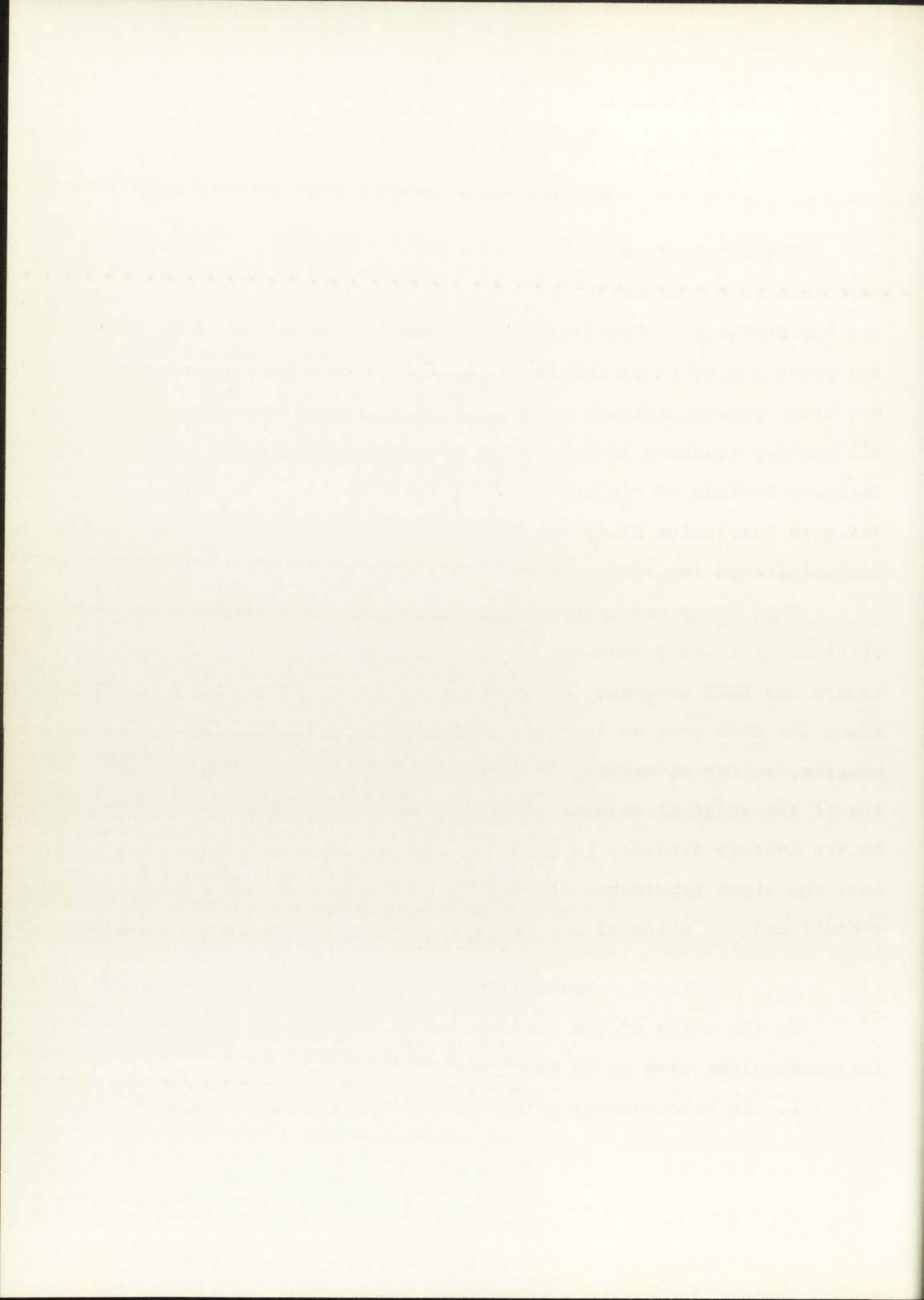
The conclusions are based on the results of the survey questionnaires indicating the opinions and attitudes of 100 biology teachers in New Mexico. The conclusions are based on the responses of these 100 teachers only. The conclusions are not broad generalizations concerning opinions and attitudes of all biology teachers in New Mexico toward BSCS. The 100 teachers include 10 biology teachers who used the Biological Sciences Curriculum Study and 90 biology teachers who did not participate in the BSCS program.

This study was undertaken in order (1) to survey the opinions of biology teachers in the state of New Mexico toward the BSCS program; (2) to discover the answers sought about the BSCS program in this state; (3) to evaluate the program, so far as meeting teacher and student needs; (4) to see if the original objectives of BSCS are being accomplished by the average students involved in this program; and (5) to test the eight hypotheses concerning teachers, students, BSCS, schools and the state of New Mexico.

CONCLUSIONS

On the basis of the findings of this study the following conclusions seem to be warranted:

1. In high schools using the BSCS program the following



characteristics seem to exist; (1) usually the participant was only one of six to eight biology staff members; (2) the population of the school community was over 10,000 people; (3) there was a high percentage of college bound students; and (4) the teachers were better qualified in their discipline and general educational background.

2. BSCS has been used for only one year by six of the ten participating teachers.

3. BSCS, on the basis of responses of the 10 participating teachers, seems to have stimulated their interests to a marked degree. These same teachers believe BSCS has improved students' processes in biological research and understanding of the scientific enterprise.

4. Most of the participating teachers have a positive attitude toward the Biological Sciences Curriculum Study program, according to their responses. The Yellow Version was most used by the participants however, the Blue Version was most referred to by the non-participants.

5. Advantages. The ten participating biology teachers liked the BSCS program because in their opinion (1) it offers up-to-date information; (2) it prepared an enormous amount of teaching materials to aid them in getting the information and concepts over to the students; (3) the emphasis has changed from memorizing details to understanding and testing principles; and (4) students do more observing and actual simple

research instead of compiling notebooks. All three versions have 70 per cent of common subject material with 30 per cent devoted to the special interest of the teachers and students in areas of ecology, evolution or biochemistry. This variation allows for the individual's special interests without sacrificing essential basic biological concepts.

6. Disadvantages. The majority of the non-participating biology teachers disliked the BSCS program because in their opinion (1) the materials were too specialized for the heterogenous group of the school system; (2) it was difficult for the average high school students; and (3) many schools in New Mexico did not have money for the equipment and facilities recommended by the BSCS program.

7. The participating teachers felt that the objectives of BSCS were being accomplished by their average students.

Concerning the original hypotheses (subject to the limitations of the small number of participating teachers (10) and non-participating teachers (90) in the BSCS):

Hypothesis 1. The biology teacher's knowledge about the BSCS is proportional to his scientific background and professional qualifications. This was indicated by teachers' college or university preparation, association in professional organizations, memberships, participation in workshops or National Science Foundation Institutes, and their amount of teaching experience. The best qualified teachers seemed to be the most

informed and most active in accepting and using BSCS or rejecting it and giving a good reason for doing so. The 10 participants had more university training than the 90 non-participating biology teachers.

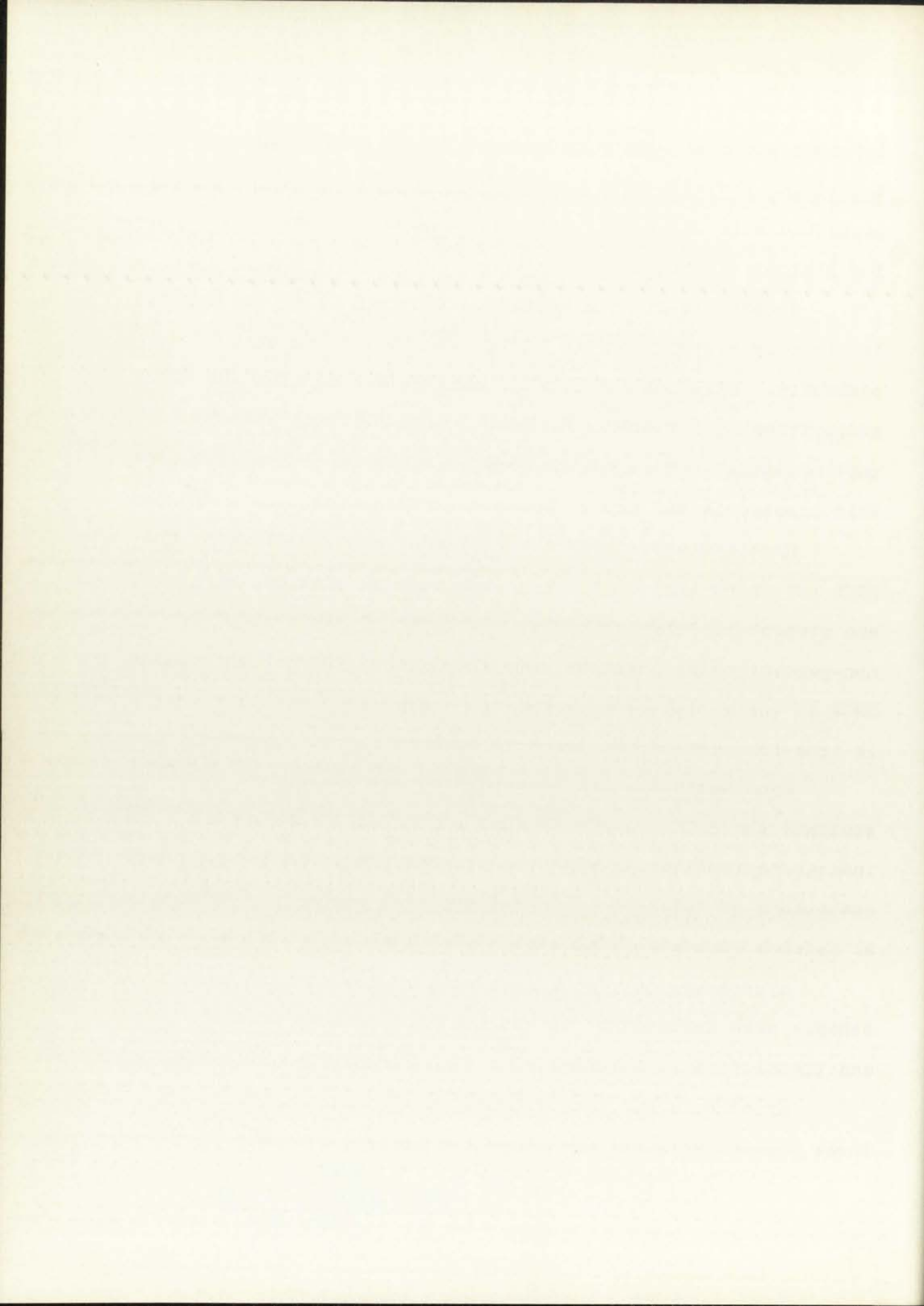
Hypothesis 2. The participation in BSCS of the schools is directly proportional to the population of the school community. Based on the data of this survey no trend or proportional relation can be established relating schools participating in BSCS to the population of the school community. This hypothesis can not be accepted or rejected.

Hypothesis 3. Many teachers are in favor of using the BSCS but think they do not have adequate facilities, equipment and student ability available. At least 20 per cent of the non-participating teachers gave this reason for not using the BSCS in their biology departments, therefore this statement is true for some of the teachers qualifying the word "many".

Hypothesis 4. Many teachers do not qualify to give the students the BSCS program because of lack of training and inadequate familiarity with the program, as indicated by the quotations of teachers and the statistics concerning National Science Foundation Institute participation.

Hypothesis 5. The respondents indicated that many schools have decided not to use the BSCS because of the additional finance involved.

Hypothesis 6. Many teachers feel that BSCS in its three present versions are above the ability of their high



school students. Non-participating teachers asked for more simplicity to meet the needs of the terminal education of students, and the reading ability of their average student, not an imaginative "average" student.

Hypothesis 7. Many teachers are resistant to change and are satisfied with their present program and methods. "Many" can not be accepted without qualifications. Although there are implications that a minority of teachers are satisfied with their present programs because they are not convinced that BSCS is any better, or can better satisfy the teacher and student needs, they are not resistant to change. It appears that they would change to something better if given the opportunity or possibly better informed by their school administrators.

Hypothesis 8. Most teachers in New Mexico are not informed about BSCS and therefore are not using the program, or have no opinion or attitude concerning this program. One qualification to this is "most biology teachers or most teachers of biology".

It is concluded that biology teachers using the BSCS in New Mexico have a positive attitude toward the Biological Sciences Curriculum Study however, due to the high percentage of uninformed teachers in the non-participating group a similar conclusion can not be drawn.

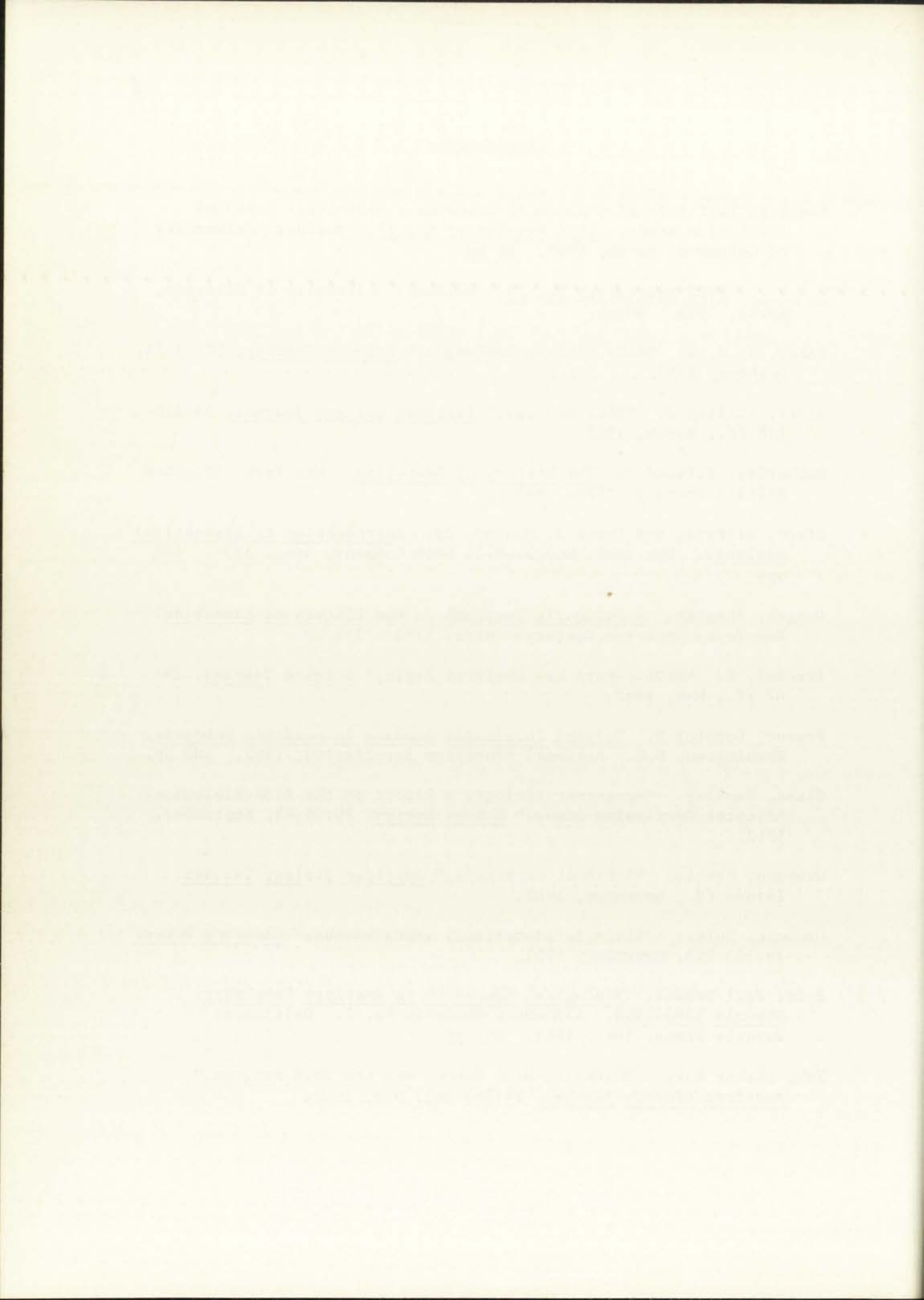
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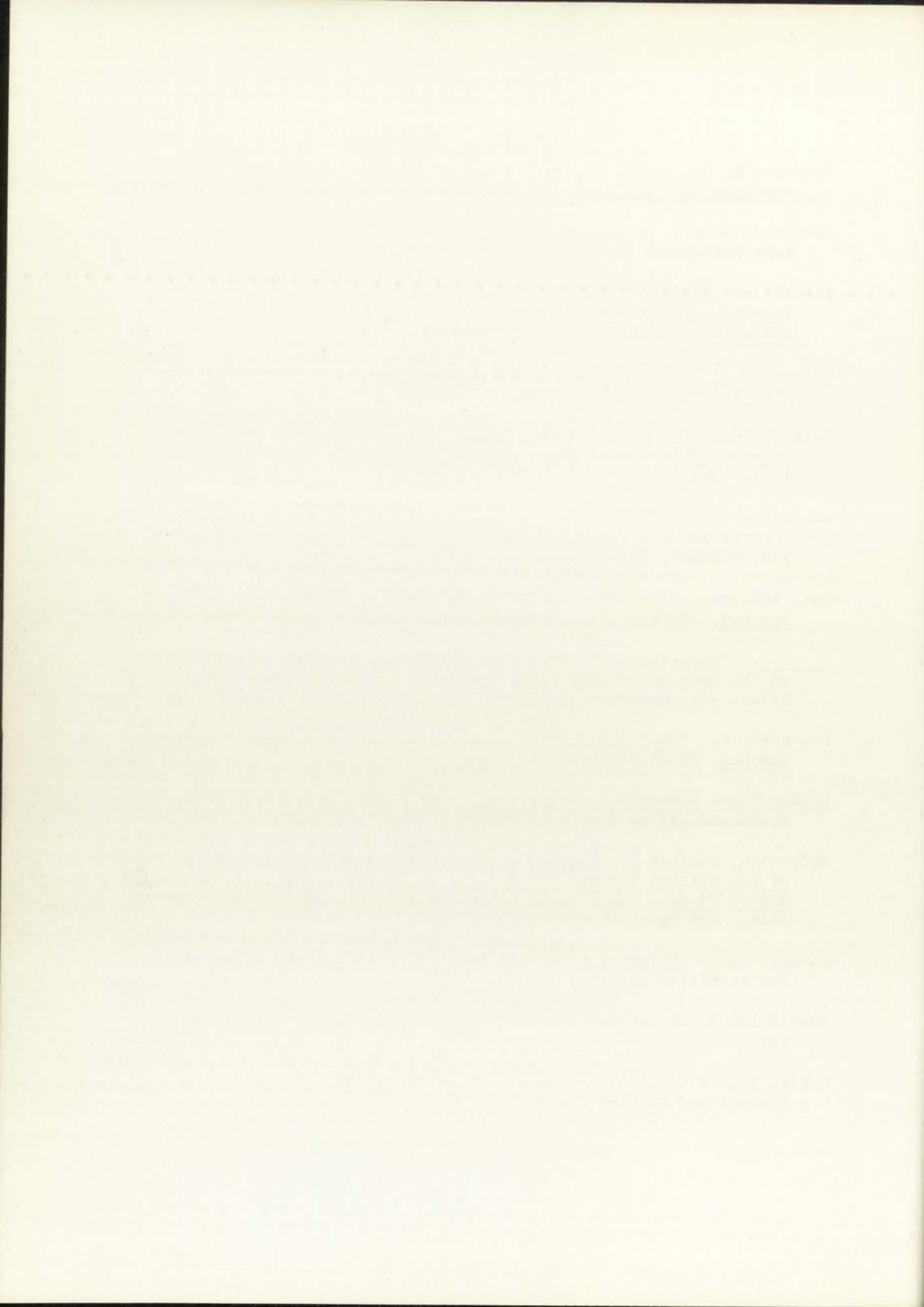


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APPENDIX





THE UNIVERSITY OF NEW MEXICO | ALBUQUERQUE

889-1964
TH ANNIVERSARY~~XXXXXXXXXXXXXXXXXXXX~~
DEPARTMENT OF SECONDARY EDUCATION
COLLEGE OF EDUCATION

Dear

A survey of the opinions of Biology teachers in New Mexico toward the Biological Science Curriculum Study is being conducted. The information sought in the attached questionnaire will be analyzed in a thesis study at the College of Education, University of New Mexico.

Will you please have your teachers of Biology complete either the attached questionnaire Form A or B, as appropriate, and return it in the enclosed self-addressed envelope as soon as possible. This information is urgently needed on or before

It is expected that a summary of the results of this survey will be mailed to you.

Please understand that this study is in no way concerned with promoting the BSCS nor, is it trying to influence teachers' opinions. However, it is highly important to ascertain teachers' attitudes at this time in the absence of more empirical data.

Your cooperation will be sincerely appreciated.

Yours truly,

Frizelle L. Aguilar, Grad. Student
Secondary Education Department
University of New Mexico

FLA:hlr
Encl.
end:

Endorsement

This study has the endorsement of Dr. Bonner M. Crawford, Professor of Secondary Education and Instructor of Materials and Methods in teaching for Science and Mathematics teachers at the University of New Mexico.

Your completion of the appropriate questionnaire is requested.

Bonner M. Crawford
Bonner M. Crawford
Professor of Education
University of New Mexico

The first part of the report deals with the general situation in the country and the progress of the work during the year. It is followed by a detailed account of the various projects and the results obtained.

The second part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

The third part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

The fourth part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

The fifth part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

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The eighth part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

The ninth part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

The tenth part of the report is devoted to a detailed description of the various projects and the results obtained. It is followed by a detailed account of the various projects and the results obtained.

FORM A

S U R V E Y
QUESTIONNAIRE

If you are a teacher of Biology and using the Biological Science Curriculum Study, please complete this Form A. If you are not using BSCS, please complete Form B. After selecting the appropriate form, either mark the letter which reflects your answer, complete the blank, or explain where indicated.

1. How many students are enrolled in biology courses of all teachers in your school at the present time? _____
How many of these students are in your classes? _____
2. What is your total high school enrollment for 1963-1964? _____
3. Compared to the entire state of New Mexico, what is the socio-economic status of your students in their out-of-school environment?
a. Lower class b. Middle class c. Upper class
4. What percentage of your total student population usually will enter college? _____
5. What is the approximate population of your community? _____
6. How many years have you taught biology? _____
7. Please indicate your additional school responsibilities.
a. Chairman of the Biology Department.
b. Other subjects taught: _____
c. Other than academic (clubs, etc): _____
d. Other duties (athletics): _____
8. Please list your membership in professional, technical or scientific organizations or societies. _____
9. Which category best describes your teaching preparation?
a. Bachelor's degree with major in biology.
b. Bachelor's degree with minor in biology.
c. Bachelor's degree with neither major or minor in biology.
d. Master's degree with major in biology.
e. Master's degree with minor in biology.
f. Master's degree with neither major or minor in biology.
g. None of the above are applicable.
10. Please indicate special training not included in the above which may have been in workshops, the military service, under some government agency grant (A.E.C.) or educational organization (N.S.F., or N.A.S.A., ect.) _____
11. From what source did you learn about BSCS? _____
When did you first develop a desire to become more familiar with the BSCS program? _____
12. How many classes of BSCS biology are you teaching? _____
How many students are in each class? _____
13. How long have you used or participated in the BSCS project?
a. 1 year b. 2 years c. 3 years d. 4 years
14. How does the student achievement in the BSCS program compare with the traditional program of previous years?
a. Lower b. Higher c. No change
15. What version of BSCS materials are you using?
a. Blue - "Biological Science: Molecules to Man"
b. Green - "High School Biology"
c. Yellow - "Biological Science: An Inquiry Into Life"
16. Which version of BSCS do you like best? Why?
a. Blue b. Green c. Yellow _____

APPENDIX
QUESTIONS

If you are a teacher of history and used the Historical Skills
Inventory, please circle the items that you use and indicate
how often you use them. After selecting the appropriate item,
then circle the letter which indicates your answer, according to the blank
in the space provided.

1. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
2. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
3. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
4. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
5. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
6. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
7. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
8. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
9. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
10. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
11. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
12. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
13. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
14. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
15. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
16. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
17. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
18. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
19. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always
20. How often do you use the Historical Skills Inventory in your classroom?
a. Never b. Rarely c. Sometimes d. Often e. Always

Form A (Continued)

17. Which version do you like least? Why?
 a. Blue b. Green c. Yellow
-
18. Do you think the three versions should be revised, rewritten or combined into two volumes which could then be used as a high school biology text? a. Yes b. No
 Why? _____
-
19. What suggestions can you offer to improve BSCS, or to integrate the current three versions for use as a class text? _____
-
20. Do you believe the BSCS program has stimulated your interests and aspirations as a biology teacher? Please explain.
 a. Not at all b. Slightly c. Moderately d. Markedly
-
21. Is your current biology curriculum meeting the needs of your students by:
 a. Offering college preparation.
 b. Offering a good background for terminal education.
 c. Providing an understanding of the HUMAN BODY, to satisfy the biological inquiry of young adults.
22. Are there any basic differences between your traditional or previous curriculum and BSCS? a. Yes b. No c. Undecided
 Please explain your interpretation of the term "basic difference".
-
23. Do you think the government is wasting money by supporting BSCS?
 a. Yes b. No c. Undecided
24. Is your current biology curriculum satisfactory to you in terms of teacher needs by:
 a. Supplying better teaching materials.
 b. Helping you to give students a better presentation of biology
 c. Helping you to cultivate young scientific thinkers.
 d. Stimulating you professionally.
25. All in all, what value is the BSCS program to you as a biology teacher? a. None b. Slight c. Moderate d. Marked or great
 Please give your interpretation of the term "value" as you applied it.
-
26. How does BSCS help you on the job? _____
-
27. Why did you or your Biology Department decide to use the BSCS program? Please explain. _____
-
28. What is your general opinion of the Biological Science Curriculum Study? Please explain. _____
-
-
-
-

1. Which version do you like better? Why?
a. Blue b. Green c. Yellow

2. Do you think the three versions should be revised, rewritten or
replaced into two versions which could then be used as a high school
biology text? a. Yes b. No

3. What suggestions can you offer to improve BGC, or to integrate it
into your version for use as a class text?

4. Do you believe the BGC program has stimulated your interest and
enthusiasm as a Biology teacher? Please explain.
a. Not at all b. Slightly c. Moderately d. Very

5. In your current biology curriculum listing the needs of your
students are:
a. Giving solid exercises
b. Giving a good background for logical education
c. Providing an understanding of the HUMAN BODY, so easily the
biological inquiry of your students.

6. Are there any basic differences between your traditional or
previous curriculum and BGC? a. Yes b. No c. Unchanged
Please explain your interpretation of the term "basic differences".

7. Do you think the government is wasting money by supporting BGC?
a. Yes b. No c. Unchanged

8. In your current biology curriculum relationship to you in terms
of teacher needs are:
a. Supplying better teaching materials.
b. Helping you to give students a better understanding of biology
c. Helping you to motivate your scientific interest.
d. Encouraging you professionally.

9. All in all, what value is the BGC program to you as a biology
teacher? a. None b. Slight c. Moderate d. Great or great
Please give your interpretation of the term "value" as you applied it.

10. How does BGC help you in the job?

11. Why did you or your biology department decide to use the BGC
program? Please explain.

12. What is your general opinion of the Student Science Curriculum
Project? Please explain.

13. _____

14. _____

15. _____

Form A (Continued)

The two basic principal objectives of the Biological Science Curriculum Study are:

1. To help the student to understand various processes in biological research.
2. To develop within the student an understanding and appreciation of the scientific enterprise.

The following statements should help to evaluate these two objectives stated by the BSCS. Please compare your average pupils in the BSCS program this year, with average pupils in the previous program or traditional program from past or present experience, by checking (✓) your opinion in the appropriate column to the right.

	I M P R O V E M E N T			
	NO	SLIGHT	SOME	NOTABLE GREAT
The average student in the BSCS compared to the average pupil in traditional biology:				
1. defines a problem in researchable terms.				
2. recognizes a reasonable hypothesis which can be tested by experiment or observation, concerning a problem.				
3. recognizes the importance of appropriate controls in an experimental design.				
4. distinguishes among different kinds of data. Data, as used here and elsewhere in these objectives, includes observations as well as other kinds of data.				
5. recognizes the importance of accuracy in obtaining data.				
6. selects a suitable procedure for the analysis of data.				
7. realizes that being a scientist involves much study and routine work.				
8. realizes that both teamwork and individual work are important in research.				
9. recognizes that his participation in a scientific investigation contributes to his learning.				
10. recognizes that scientists do not base judgments on authority.				
11. recognizes the value of creative thinking and ingenuity in science.				
12. recognizes that scientists share ideas with others.				
13. realizes the value of a broad background in areas other than the sciences.				
14. sees the unity and relationships among the sciences (botany, zoology, chemistry, physics, mathematics, etc.).				

I (do) (do not) desire a copy of the summary of the findings of this opinion survey.

NAME: _____
 ADDRESS: _____
 SCHOOL: _____
 LOCATION: _____

THANK YOU FOR COMPLETING THIS SURVEY QUESTIONNAIRE!

FORM B

S U R V E Y
Q U E S T I O N N A I R E

If you are a teacher of Biology and not using the Biological Science Curriculum Study program, please complete this Form B, by marking the letter which reflects your answer, completing the blank or explaining where indicated.

1. How many students are enrolled in biology courses of all teachers in your school at the present time? _____
How many of these students are in your classes? _____
2. What is your total high school enrollment for 1963-1964? _____
3. Compared to the entire state of New Mexico, what is the socio-economic status of your students in their out-of-school environment?
a. Lower class b. Middle class c. Upper class
4. What percentage of your total student population usually will enter college? _____
5. What is the approximate population of your community? _____
6. How many years have you taught biology? _____
7. Please indicate your additional school responsibilities.
a. Chairman of the Biology Department.
b. Other subjects taught: _____
c. Other than academic (clubs, etc.): _____
d. Other duties (athletics): _____
8. Please list your membership in professional, technical or scientific organizations or societies. _____
9. Which category best describes your teaching preparation?
a. Bachelor's degree with major in biology.
b. Bachelor's degree with minor in biology.
c. Bachelor's degree with neither major or minor in biology.
d. Master's degree with major in biology.
e. Master's degree with minor in biology.
f. Master's degree with neither major or minor in biology.
g. None of the above are applicable.
10. Please indicate special training not included in the above which may have been in workshops, the military service, under some government agency grant (A.E.C.) or educational organization (N.S.F., or N.A.S.A., etc.) _____
11. From what source did you learn about BSCS? _____
How long have you known about the work of the American Institute of Biological Science on the Biological Science Curriculum Study project? _____
12. How many classes of biology are you teaching? _____
How many students are in each class? _____
13. What biology curriculum program are you participating in other than BSCS? _____
Please list your text or texts being used. _____
14. Although you are not presently participating in, or using BSCS, do you think you will?
a. Never; b. Undecided; c. Maybe in the future(2-3yrs); d. Next yr
15. Do you believe the BSCS program has stimulated your interests and aspirations as a biology teacher? Please explain.
a. Not at all; b. Slightly; c. Moderately; d. Markedly or greatly

14. In your opinion, what are the most important factors in the development of your organization?

15. How do you estimate the future of your organization?

16. How do you estimate the future of the industry?

17. How do you estimate the future of the economy?

18. How do you estimate the future of the world?

19. How do you estimate the future of the United States?

20. How do you estimate the future of the world economy?

21. How do you estimate the future of the world population?

22. How do you estimate the future of the world's resources?

23. How do you estimate the future of the world's environment?

24. How do you estimate the future of the world's energy?

25. How do you estimate the future of the world's technology?

26. How do you estimate the future of the world's science?

27. How do you estimate the future of the world's art?

28. How do you estimate the future of the world's literature?

29. How do you estimate the future of the world's music?

30. How do you estimate the future of the world's dance?

31. How do you estimate the future of the world's theater?

32. How do you estimate the future of the world's film?

33. How do you estimate the future of the world's television?

34. How do you estimate the future of the world's radio?

35. How do you estimate the future of the world's press?

36. How do you estimate the future of the world's publishing?

37. How do you estimate the future of the world's education?

38. How do you estimate the future of the world's health?

39. How do you estimate the future of the world's sports?

40. How do you estimate the future of the world's recreation?

41. How do you estimate the future of the world's leisure?

42. How do you estimate the future of the world's entertainment?

43. How do you estimate the future of the world's culture?

44. How do you estimate the future of the world's heritage?

45. How do you estimate the future of the world's history?

46. How do you estimate the future of the world's geography?

47. How do you estimate the future of the world's politics?

48. How do you estimate the future of the world's law?

49. How do you estimate the future of the world's religion?

50. How do you estimate the future of the world's philosophy?

NEW MEXICO SCHOOLSNUMBER OF PUBLIC AND NONPUBLIC:

<u>LEVEL</u>	<u>PUBLIC</u>	<u>NONPUBLIC</u>
ELEMENTARY	492	102
JUNIOR HIGH	84	4
SENIOR HIGH	107	28
SPECIAL	8	

INDEPENDENT ADMINISTRATIVE UNITS	86
COUNTY ADMINISTRATIVE UNITS	<u>3</u>
TOTAL	89

ADMINISTRATION:

NEW MEXICO HAS 89 SCHOOL ADMINISTRATIVE UNITS, 86 OF WHICH ARE INDEPENDENT OR MUNICIPAL SYSTEMS. REMAINING THREE ARE COUNTY UNITS WHICH COMPRISE 17 COUNTY SCHOOL DISTRICTS. IN THE PAST 20 YEARS NEW MEXICO HAS REDUCED THE NUMBER OF SCHOOL DISTRICTS FROM 769 TO 106.

THE STATE HAS 107 HIGH SCHOOLS ACCREDITED BY THE STATE DEPARTMENT OF EDUCATION. THERE ARE 84 COUNTY JUNIOR HIGH SCHOOLS AND 492 ELEMENTARY SCHOOLS. NEW MEXICO HAS 28 NONPUBLIC HIGH SCHOOLS, 4 NONPUBLIC JUNIOR HIGH SCHOOLS AND 102 NONPUBLIC ELEMENTARY SCHOOLS WITH A TOTAL ENROLLMENT OF 25,329 STUDENTS DURING THE FIRST MONTH OF 1963-64.

PERSONNEL:

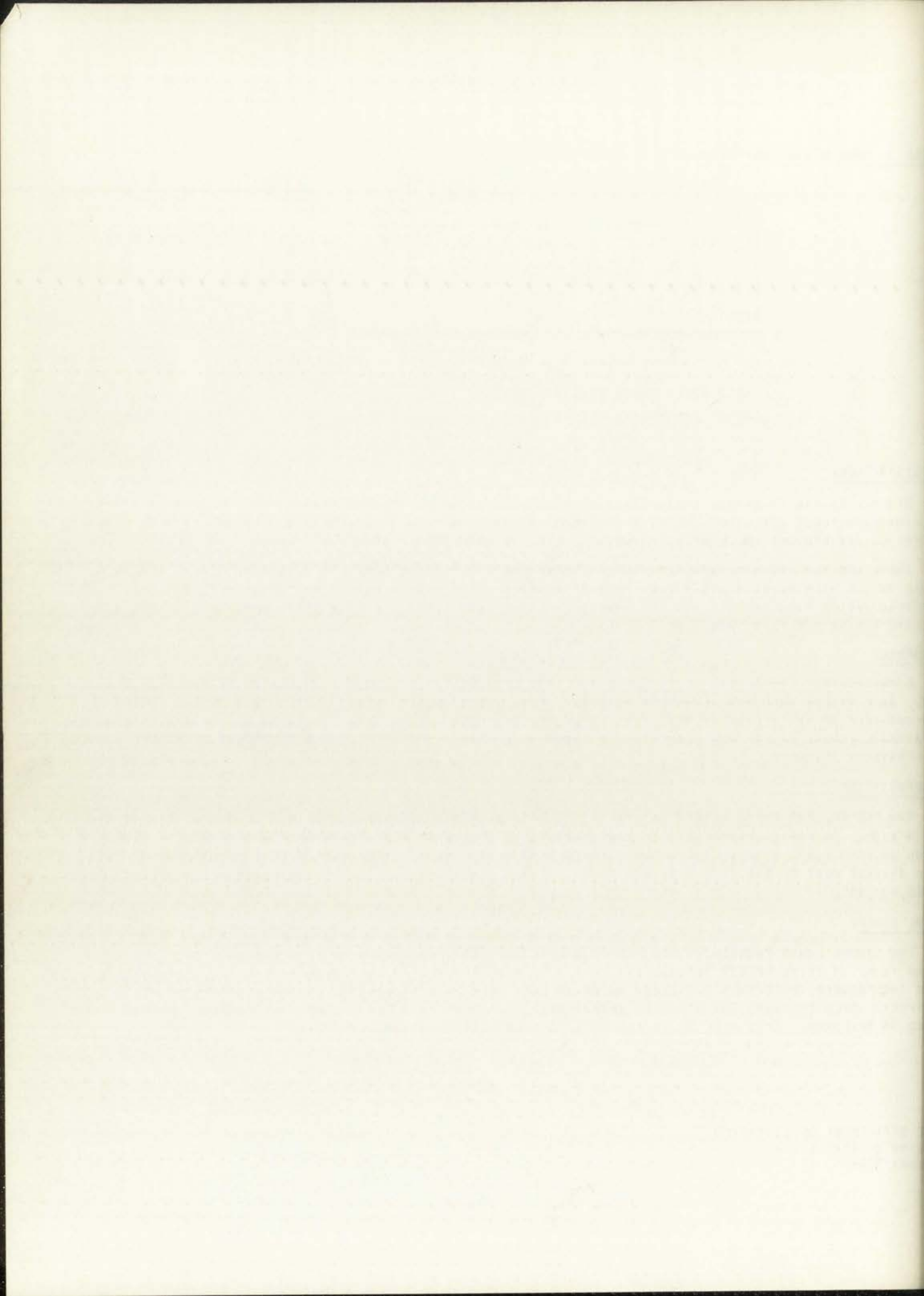
APPROXIMATELY 11,150 PEOPLE IN NEW MEXICO ARE ENGAGED IN WORK DIRECTLY RELATED TO PUBLIC EDUCATION. THIS FIGURE INCLUDES CLASSROOM TEACHERS, PRINCIPALS, SUPERVISORS, AND ADMINISTRATORS. MORE THAN ONE-HALF OF THE SECONDARY TEACHERS AND ONE-FOURTH OF THE ELEMENTARY TEACHERS HOLD ADVANCED DEGREES. THE AVERAGE ANNUAL SALARY FOR ELEMENTARY CLASSROOM TEACHERS IN NEW MEXICO IS \$5971 AND \$5965 FOR SECONDARY CLASSROOM TEACHERS.

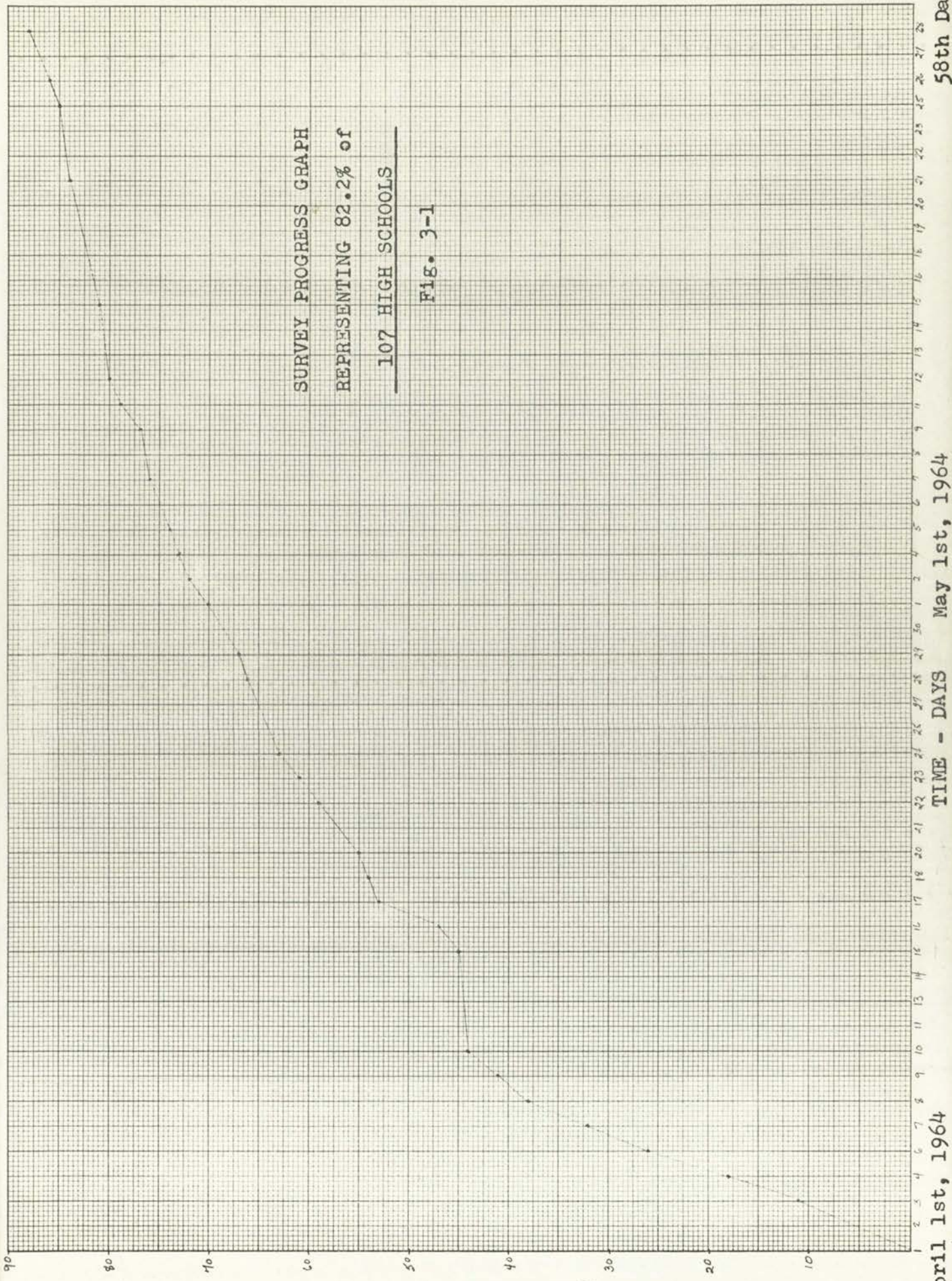
TRANSPORTATION:

NEW MEXICO, THE FIFTH LARGEST STATE IN THE NATION, MUST MAINTAIN A SUBSTANTIAL PUPIL TRANSPORTATION SYSTEM. IN SCHOOL YEAR 1962-63, MORE THAN 82,000 CHILDREN WERE TRANSPORTED DAILY TO AND FROM SCHOOLS ON SOME 1,355 BUSES. THESE BUSES TRAVELED A TOTAL ANNUAL MILEAGE OF NEARLY 12 MILLION MILES AT AN AVERAGE COST OF \$66.14 A YEAR PER PUPIL. TOTAL ANNUAL COST OF SCHOOL TRANSPORTATION IN 1962-63 WAS \$5,435,385.

SCHOOL LUNCH:

THE SCHOOL LUNCH PROGRAM IN NEW MEXICO DURING 1962-63 INCREASED ALMOST 12 PER CENT OVER THE PREVIOUS YEAR. A TOTAL OF 522 SCHOOLS PARTICIPATED; OVER 16 MILLION LUNCHESES WERE SERVED TO CHILDREN THROUGH THE PROGRAM; MORE THAN 2 MILLION OF WHICH WERE FREE TO THE CHILDREN WHO WERE SERVED THEM. IN THE SPECIAL MILK PROGRAM, 527 SCHOOLS PARTICIPATED, AND MORE THAN 14 MILLION HALF-PINTS OF MILK WERE SERVED TO CHILDREN. THIS MILK IS IN ADDITION TO MILK USED IN SCHOOL LUNCHESES.



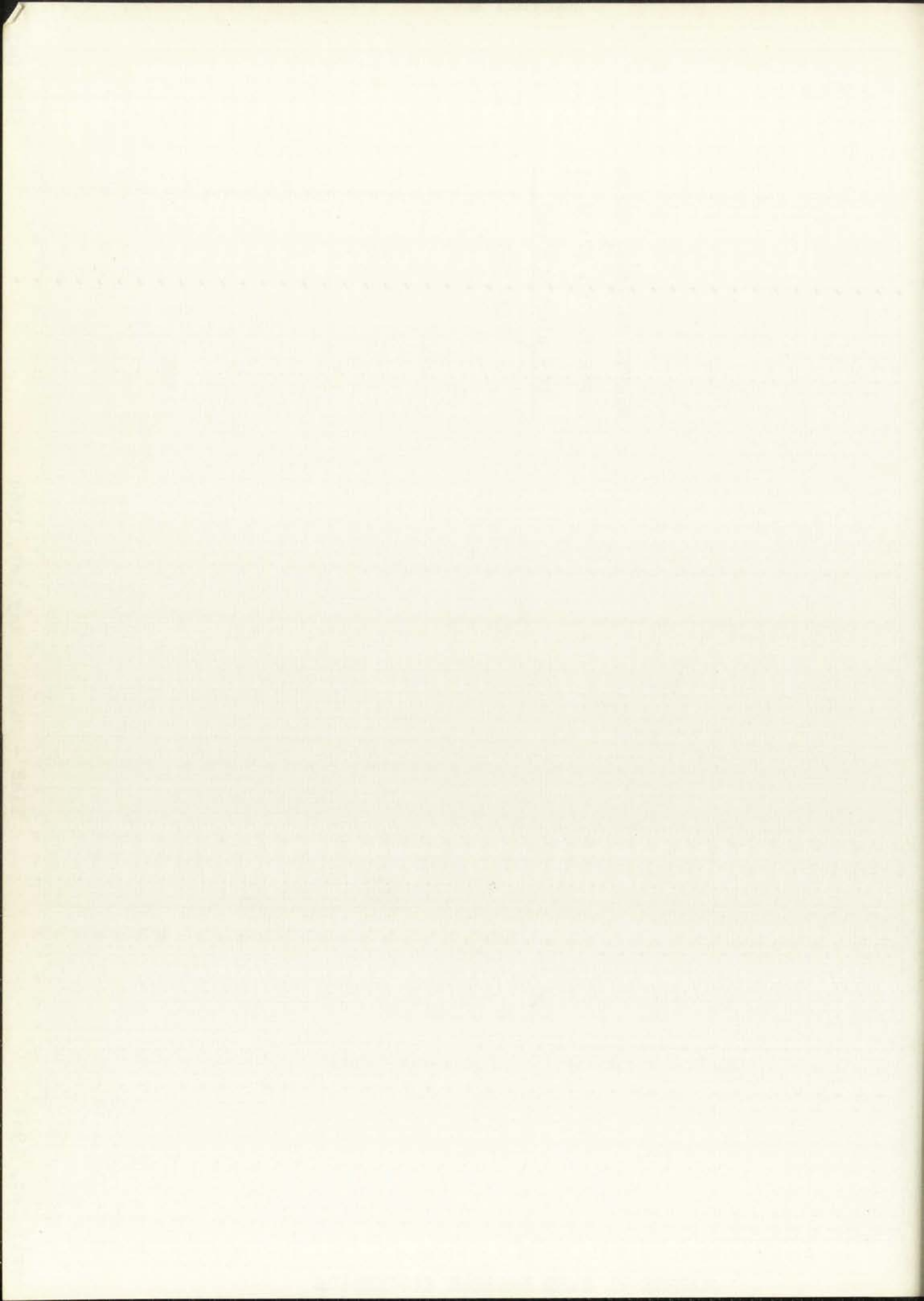


SURVEY PROGRESS GRAPH
 REPRESENTING 82.2% of
107 HIGH SCHOOLS

FIG. 3-1

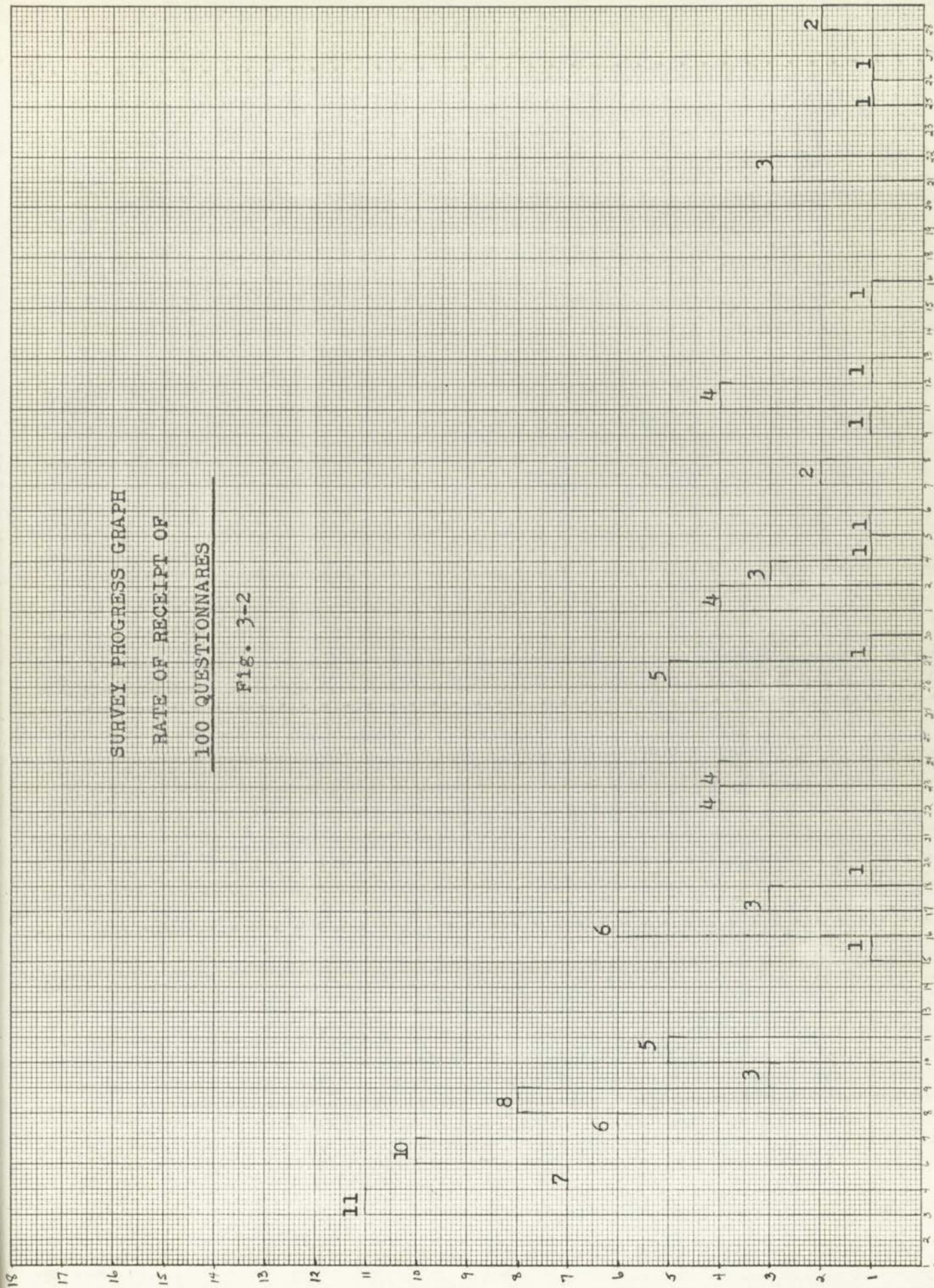
Number of high schools responding

April 1st, 1964
 TIME - DAYS
 May 1st, 1964
 58th Day



SURVEY PROGRESS GRAPH
 RATE OF RECEIPT OF
 100 QUESTIONNAIRES

Fig. 3-2

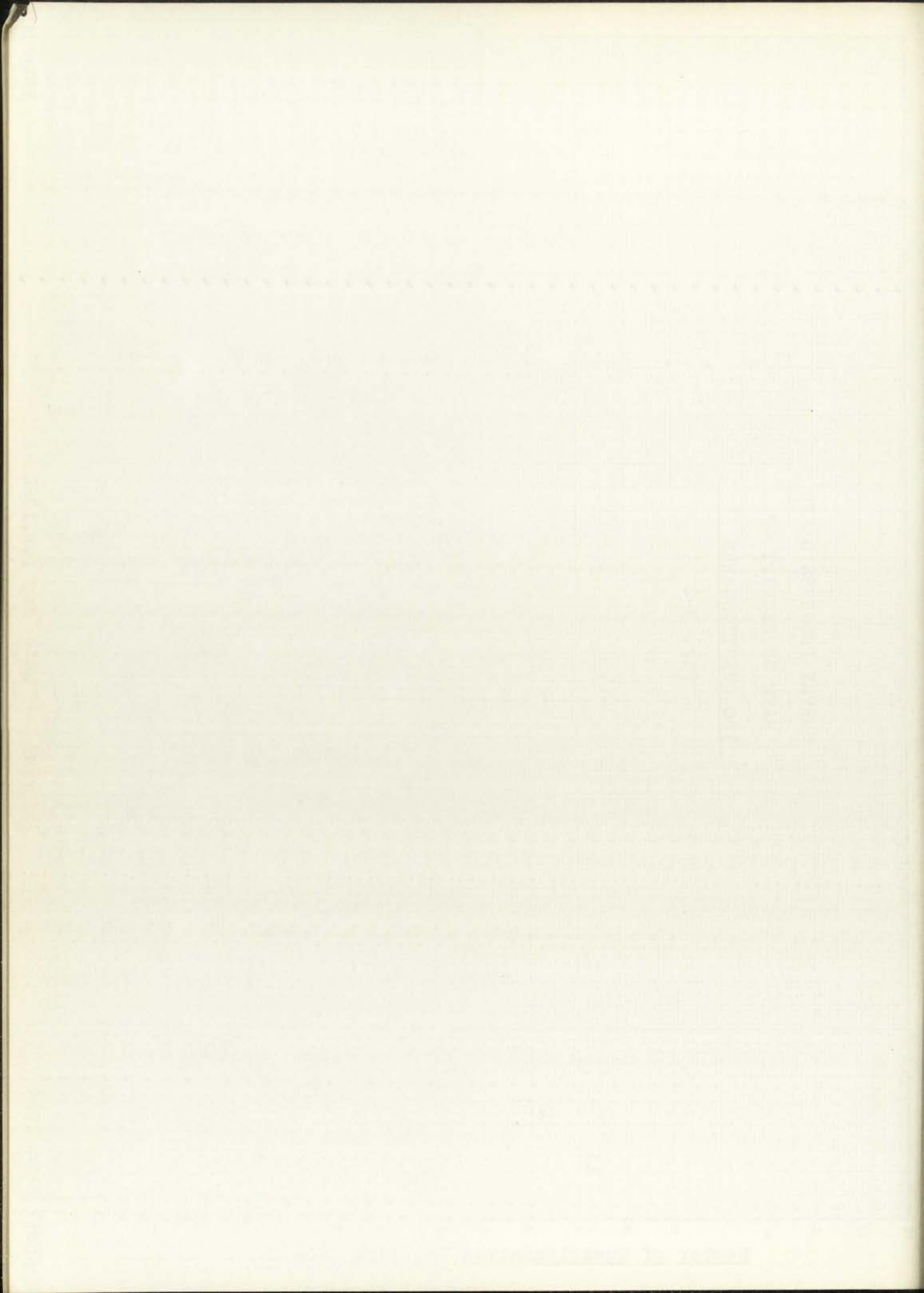


Number of Questionnaires Received Each Day

April 1st, 1964

TIME - DAYS May 1st, 1964

58th Day



BSCS AREA MEETING

The New Mexico Area Consultant for BSCS Marshall S. Floyd conducted an Area Meeting on March 20, 1965 at Highland High School, Albuquerque, New Mexico. Seventy-six biology teachers, administrators and educators were present. Fifteen of these people were teachers using the BSCS materials.

Dewitt Ivey of Sandia High School asked which versions were being used and the following results were obtained:

(1964-65)		(Statistics of this survey)	
Blue Version	5 Teachers	(1963-64)	2 Teachers
Yellow "	4 "		7 Teachers
Green "	<u>6</u> "		<u>1</u> Teachers
Total # teachers	15		10 Teachers

These figures can not be compared because of the nature of the sample. However, there is an increase in the number of participating teachers within the two year period.

This meeting was not very informative for the person on the BSCS mailing list who has perused the BSCS literature. Imogene Russell, Dewitt Ivy, Harry Bishop and John House reviewed the outline of the Blue, Green, Yellow Versions and Special Materials, respectively. There was no new information or statistics regarding teachers and their opinions toward the BSCS. The meeting was informative for the uninformed. However, it appeared that only the informed were interested enough to be present.

ANNEX 1
STATISTICAL DATA
FOR THE YEAR 1965

The following table shows the number of persons employed in the various occupations in the year 1965. The figures are in thousands and are rounded to the nearest thousand.

Occupation	Number of persons (thousands)
Professional, technical and related occupations	1,200
Administrative, clerical and sales occupations	2,500
Service occupations	3,000
Operative occupations	4,000
Construction occupations	1,000
Agriculture, stock raising and fishing	1,000
Unemployed	1,300
Total	14,000

The above figures are based on the 1965 Census of the Population and Housing. The figures are in thousands and are rounded to the nearest thousand. The figures are based on the 1965 Census of the Population and Housing.

The above figures are based on the 1965 Census of the Population and Housing. The figures are in thousands and are rounded to the nearest thousand. The figures are based on the 1965 Census of the Population and Housing.

NOTICE

It must be observed and remembered that this study is in no way concerned with promoting the Biological Sciences Curriculum Study. This is the first such study to be done in the nation, to survey the attitudes of biology teachers in the state of New Mexico or any other state, toward the Biological Sciences Curriculum Study.



REVOLUCION

ESTADOS UNIDOS MEXICANOS



