1962

A Study of the Training of Secondary Biology Teachers in Negros, Philippines

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A STUDY OF THE TRAINING OF SECONDARY BIOLOGY TEACHERS IN NEGROS, PHILIPPINES

A Thesis

Presented to

the Graduate Faculty

Central Washington State College

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

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by

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August, 1962

APPROVED FOR THE GRADUATE FACULTY

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ACKNOWLEDGEMENTS

The writer wishes to express sincere gratitude to Dr. John S. Shrader, Chairman of the Committee, for his inspiring and helpful comments and encouragement throughout the study.

Appreciation is also given to Dr. Donald Murphy and Dr. Dan Willson for serving on the committee.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

There has been a growing need for improvement of science education during the past decade. The key to this improvement is in the hands of science teachers at all levels. It is thought that by increasing the competence of secondary science teachers a corresponding improvement in instruction will result. Attempts, to date, to improve instruction have included a modification of collegiate training, introduction of new techniques, and the development of advanced and modern courses in secondary schools. Almost any suggestion for the improvement of science instruction, however, goes back to the problem of improving teacher education.

I. THE PROBLEM

Statement of the problem. If we believe in an educational system that keeps pace with a constantly evolving society, there is need for constant evaluation of the system. One aspect requiring evaluation is the preparation of biology teachers at the undergraduate and graduate level. The purposes of the present study were to determine:

1. present academic and professional preparation of secondary biology teachers in Negros, Philippines.

2. if improvements are needed in the undergraduate training for teaching biology.
3. the nature of teaching assignments of biology teachers.
4. factors which can contribute to the improvement of the fifth year of preparation of biology teachers.

Importance of the study. Science has never before been so significant in our society. Like other underdeveloped countries, the Philippines is in the midst of a "take-off period" of industrial development and technological advancement. There is a growing demand for highly qualified personnel who can pass on effectively the scientific knowledge and related cultural values mankind has accumulated. Students need every opportunity to understand the nature of scientific problems and their relationships to modern society.

The school is one agency which helps to provide students with an education suitable for modern living. Science teachers are essential to the total education program. These teachers require a type of preparation that will enable them to offer science courses, current in content and taught with skill and enthusiasm. In order to develop a science program of high quality, the teachers need quality college preparation appropriate to their teaching assignments.

Science is more than an inert body of knowledge, new machines, and productive techniques. It presupposes, above all, the existence of a group of men and women removed from the masses by their specialized skills and creative talents, yet also part of the masses in their desire to improve society.

The necessity for qualified teachers is emphasized in a report of the Harvard Conference on Science Teaching (35:41):

> For want of a few thousand competent new science teachers everywhere, science instruction may necessarily be radically reduced in the schools. Or the science offered may be such a caricature of science that promising students turn elsewhere through boredom or even develop a repugnance toward science.
>
> We need teachers who have an awareness of scientific problems, who grasp every opportunity to encourage an inquisitive pupil toward study and investigation, who know how to direct laboratory work and student projects, and who have a desire to make science classes a stimulating part of every high school curriculum.

A comment by Pella adds support (25:107):

> It has long been acknowledged that the high school teachers of science hold the key to the numerous and varied natural resources of the universe from which the needs of life and future scientists, doctors, engineers, nurses, and science teachers are fashioned. The teacher's influence stems from his knowledge of the subject taught, the facilities available for teaching and his method of teaching.

The prevailing differences in course requirements for the preparation of science teaching in the Philippines have resulted in a variety of professional and academic backgrounds among science teachers. The variations in preparation may have produced teachers with deficiences in one or several areas and/or overspecialization in other areas. It is also

probable that teachers with such training and preparation may be less able to fulfill their roles as science teachers. A Unesco survey team in the Philippines reported (2:96-97): "Fewer than half of the teachers of the nation are qualified in terms of present standards, which are relatively low. Greater emphasis must be placed on the provision for more and better teacher education."

Hurd expressed this view of the type of preparation for biology teachers (14:329):

> A good teacher is competent in his knowledge of biology, and he is educated far beyond the level he is expected to teach. The depth of training for a biology teacher must be sufficient for him to understand the nature of the discipline, its substance and methods. He must have some insights into the problems of the frontier of biology and possess an understanding of the events that caused these problems to emerge. His training must be such that he is qualified to do graduate work in biology and to participate in curriculum improvement in biology.

That some science teachers in the Philippines are keenly aware of the limitations of their undergraduate training is illustrated by their attendance at college and university summer school programs. Others participate in seminars, workshops, and in-service training programs. Apparently, however, a fair proportion of teachers do not realize the need for a thorough knowledge of the subject they teach. Neither are they aware that adequate preparation will probably make them enthusiastic, stimulating, and informative teachers.

Educational leaders in the Philippines are cognizant

of the important need for improving science education. Attempts were made by the Secretary of Education with the financial assistance of the National Science Development Board, International Cooperative Administration-National Economic Council, and Unesco to upgrade the quality of science teachers by holding a series of summer institutes and in-service training for both science teachers and administrators. Memoranda, circulars, bulletins, and letters from central and district offices have conveyed a concern for the problem. However, no specific recommendations for the improvement of the science program have been made. Furthermore, suggestions for enriching the science curriculum have been general in nature. Research investigations regarding the nature of science education have been limited. For example, no formal survey has been conducted pertaining to secondary biology teachers in Negros, Philippines. It seemed logical that, by gaining specific data regarding the biology teachers in this area, specific recommendations could be made to aid in improving science education in the schools.

II. LIMITATIONS OF THE STUDY

The study was limited to:

1. Public and private secondary schools in Negros, Philippines.

2. Teachers (regular, provisional, and substitute) who were teaching biology as all or part of their teaching assignments.
3. The determination of specific factors regarding the biology teachers:
   a. undergraduate training
   b. graduate training
   c. teaching assignments
   d. opinions regarding the fifth year of preparation.

III. DEFINITION OF TERMS USED

For the purposes of the study the following terms were used:

1. Secondary school: a four year high school.
2. Negros: provinces (equivalent to a state) of Negros Occidental and Negros Oriental.
3. Public schools: government-supported schools.
4. Private schools: schools owned or run either by religious groups or private corporations.
5. Civil service examination: government examination administered once in every four years to classify teachers into:
   a. regular: status gained after passing an appropriate Civil Service Examination.

b. provisional: status subject to removal from a high school teaching job for failure to pass or take the Civil Service Examination.

c. substitute: either regular or provisional serving temporarily in the place of another teacher.

6. Biology teachers: teachers who are teaching biology as all or part of their teaching assignments.

7. Unesco: United Nations Educational, Scientific, and Cultural Organization.

IV. METHODS OF RESEARCH

To gain information pertinent to the study, the survey method was used.

A questionnaire (see Appendix F) was constructed with the aid of the suggestions from the staff and students at Central Washington State College and high school biology teachers.

A letter was sent to the Division Superintendent of Negros Occidental (see Appendix A) requesting him to submit the names of biology teachers in his division. The names of the biology teachers in Negros Oriental were compiled by Mrs. Virginia Agustin Flores, and no formal letter was sent to the superintendent of that division. A letter (see Appendix B) and a questionnaire were sent to the principals/directors of

the schools informing them about the nature of the study.

A draft of the questionnaire, mailing list, and a letter of instruction (see Appendix E) were sent to Miss Henrietta Agustin in Bacolod City, Philippines, who assumed full responsibility for mimeographing, mailing, and collecting the questionnaires.

Of the 100 questionnaires mailed, 71 were returned, which represented a 71 per cent return.

V. OVERVIEW OF THE THESIS

The thesis is organized into five chapters, a bibliography, and appendices. A brief account of the remaining chapters is given below.

Chapter II will present information derived from literature pertinent to the study.

The findings regarding status, teaching experience, and pre-service training of biology teachers will be summarized in Chapter III.

Chapter IV will report the rankings of undergraduate and fifth year courses and opinions regarding fifth year of training of biology teachers.

The summary, conclusions, and recommendations of the study will appear in Chapter V.

Only selected items directly related to the study are

included in the bibliography. The appendices comprise all instruments used in completing the research.

CHAPTER II

REVIEW OF LITERATURE

Research is almost non-existent in the area of undergraduate and graduate training for secondary school biology teachers in the Philippines. Articles have been written about the need for improvement of science teachers, but practically no formal research has been conducted which bore directly upon the nature of the study. Therefore, it was necessary to review publications from various educational resources in the United States to gain sufficient background regarding the problem.

The areas which seemed most pertinent to the problem were preparation of science teachers, preparation of biology teachers, recommendations regarding preparation for teaching biology, and recommendations for a fifth year of training for biology teachers.

I. PREPARATION OF SCIENCE TEACHERS

Studies of teacher training in science education showed that a considerable number of teachers were inadequately prepared. Reiner (26:637-642) indicated that most undergraduate programs required that teachers be prepared in more than one science, yet many institutions were not certain

as to what preparation science teachers should have. Finkel (9:119) found a large number of teachers teaching a science outside their fields of specialization, often without an undergraduate minor. Zeimer (36:931-942), Koelsche (15:134-139), Warren (35:164), and Brooks and Baker (5:277-280) noted similar conditions.

Shrader (29:154-155) discovered that one-half of the beginning science teachers in the Pacific Northwest had not attained the science preparation standards suggested by the National Society for the Study of Education. Gardner and Richardson (12:65-71) disclosed that the majority of Ohio teachers who had graduated credits in science had significant deficiencies when their academic preparations were compared with recommended undergraduate standards for science teaching majors. Both studies pointed out the need for teachers to acquire broad science backgrounds because many teachers teach two or more sciences.

Ming (20:607-613) reported concern shown by school administrators regarding the preparation of high school science teachers. The administrators recommended an extensive training in the whole field of science rather than an intensive training in any particular branch of science.

II. PREPARATION OF BIOLOGY TEACHERS

Results of surveys of teacher preparation in biology indicated variations in teaching backgrounds. In a survey of 2,931 high school biology teachers, the Union of American Committee on the Teaching of Biology (31:28) found that 1,533 or 53 per cent teaching biology were majors in this field, while the remaining 47 per cent were not prepared to teach biology at all.

Hurd (14:328), in a report based on numerous studies on the training of biology teachers, indicated that the average biology teacher had twenty semester credits in biology and nearly all fell short of the minimum of the fifty-sixty units suggested by various national committees. Five per cent of the high school biology teachers have never had any college course in biology, 50 per cent of those teaching biology were biology teachers by an administrative decision and no college or university had recommended these persons as biology teachers.

Pella (23:106-137) found that out of 367 biology teachers in Wisconsin, only 2.8 per cent had no preparation in biology, 40.6 per cent had no physics, 20.2 per cent had no chemistry, 39.2 per cent had no earth science, and 24.6 per cent had no mathematics. The median number of semester hours in science for biology teachers was 41.

Gardner and Richardson (11:65-71) discovered that biology teachers in Ohio were generally inadequately prepared. Less than 50 per cent had thirty semester credits or more in biology. Gerring (13:31-32) reported that 59 per cent of high school biology teachers had a college major in biological science. A survey by Gentry (12:208-211) indicated a definite lack of sufficient undergraduate training in field biology.

A study by Brooks and Baker (5:277-280) of high school teachers in Kansas showed that of the 539 biology teachers, 53 per cent had no credits in general biology, 42 per cent had no botany, 34 per cent had no zoology, 87 per cent had no field biology, 32 per cent had no chemistry, and 42 per cent had no physics.

In a survey of curriculum aspects of the preparation of high school biology teachers, Myers and Crall (18:147-152) found wide variations in the curricula of 57 colleges and universities. More than one-third did not require chemistry, over one-half did not require physics, and nearly one-half did not require geology. Few colleges required mathematics, 10 had no definite requirements in botany and zoology, and 8 did not have specified zoology courses. A survey conducted by Ferguson (8:332) showed variations in required courses in biology for prospective biology teachers among teacher colleges in the Midwest.

III. RECOMMENDATIONS REGARDING ADEQUATE PREPARATION FOR TEACHING BIOLOGY

The National Association of State Directors of Teacher Education and Certification in cooperation with the American Association for the Advancement of Science made the following recommendations for the preparation of high school biology teachers (21:7-8).

1. The program should include a thorough college level study of the aspects of the subject that are included in the high school curriculum.

2. The program should take into account the sequential nature of certain areas, and in particular should provide the prospective teacher with an understanding of the aspects of the subject which his students will meet in subsequent courses.

3. The program should include preparation in the subject to be taught, with courses chosen for their relevance to the high school curriculum.

4. The program should include sufficient preparation for the later pursuit of graduate work in biology.

5. A fifth-year program should emphasize courses in the subject to be taught.

6. The program should include preparation in areas related to the subject to be taught.

7. The program should include preparation in the methods especially appropriate to the subject to be taught.

8. The program should take into account the recommendations for curriculum improvement currently being made by various national groups.

The American Association for the Advancement of Science Cooperative Committee on Science Teaching recommend-

ed for Biology teachers (1:107-118):

1. Thirty-one to 33 semester hours of survey and advanced courses in biological science.
2. Ten to 12 semester hours in chemistry.
3. Eight semester hours in physics.
4. Three to 6 semester hours in earth science.
5. Six semester hours in mathematics.

A total of 59 to 63 semester hours is regarded as the minimum. It further recommended that one-half of the four-year college curriculum should be devoted to science courses. Brueckleman, et al (4:42-45) and Ferguson (7:339) made similar recommendations. Myer and Crall (19:147-152) had the same recommendations, but both also provided for a curriculum permitting the teacher to earn an advanced degree in biological science in education.

Fuller (10:14-21) and Baker and Brooks (5:277-280) pointed out the importance of preparation in basic courses in botany, zoology, and field biology. A summary of the North Central Conference on Biology Teaching (16:45-47) was concerned with the relation of fundamental biology to applied biology in the training of high school teachers. Courses in varied areas of biological sciences, physical sciences, education, humanities, and social studies should be taken. These suggestions were similar to the ones made by Weaver (34:257-263) at a Florida conference of science

teachers.

A survey sponsored by the Committee on the Teaching of Biology (28:33) showed that teachers were aware of the need for more special methods of a practical nature and included a plea for better training in laboratory and demonstration techniques. The National Committee on the Teaching of Science (22:61-62), Gentry (13:208-211), and Richardson (30:251) offered similar recommendations but stressed further the importance of training in the selection and proper utilization of projection and instructional aids.

Brett (3:116) and Lee (17:521-523) suggested the need for original research to develop an understanding and appreciation of the scientific method. Experience in research should be an essential part of any biology teacher's training, incorporated in the undergraduate or master's program.

IV. RECOMMENDATIONS FOR A FIFTH YEAR OF TRAINING FOR BIOLOGY TEACHERS

A number of studies dealt with recommendations for a fifth year of training for biology teachers. Only selected findings will be presented in this section.

A recognition of the need for studying the problems presented by the fifth year of training for teachers was shown by the Committee on Teacher Education and Professional Standards of Indiana State Teacher's Association in cooper-

ation with the four state institutions of higher education in Indiana. Conferences were held in 1952, 1953, 1954, and 1955 to study the problem. The discussion group of science and mathematics at the 1953 conference arrived at the following conclusions (25:30-31)

1. The fifth year should not follow the fourth year until the teacher has had a period of experience, and subject matter should be adapted to secondary school level.

2. The teacher should be given the opportunity for experience in research in science and mathematics so that he can guide projects and investigations on the secondary level.

3. The teacher should be given the opportunity to see how subject matter of science and mathematics can be adapted to the maturity level of the secondary school student.

4. In recognition of the fact that few teachers work in a single subject area, the program of study for the fifth year should be flexible enough to provide for study in related sciences, including mathematics.

5. The program should be based on a cooperative study by the subject matter people, school personnel, and professional educators to determine the type and nature of the courses to be included in the fifth year program.

6. The teacher should be given the opportunity to complete the usual program of study for the research degree in the area of his special interest.

7. The teacher should be given the opportunity to enroll in professional education courses included in the program of study for the fifth year for the science teachers. These courses should not exceed one-third of the total program.

8. The science and mathematics courses included in the program should be planned by a committee of

representatives of the subject matter and education departments of the college and of master teachers of the subject area.

This conference further stated that research into the problems of this area should be conducted (25:59). Several specific problems were outlined (25:60):

1. What are the most important needs of teachers to be met by the fifth year program?

2. What proportionate amount of time should be given to the strengthening of (a) teaching area, (b)related teaching fields, (c) professional education?

3. Should the program for the fifth year provide opportunities for the student to apply and extend his professional competence through directed experience with young people? If so, to what extent?

4. Shall breadth and preparation receive priority over specialization in the fifth year program?

5. Shall the several disciplines design introductory courses of graduate caliber for teachers with no previous preparation in the area? If so, what courses would be most helpful?

6. Shall a common core of subject matter be required of all teachers?

7. Shall a master's degree be awarded to all completing the fifth year of training?

The discussion group in science at the 1955 conference arrived at a number of conclusions, of which the following are most pertinent to the present study (27:12-13):

1. Flexibility for an individual's program is strongly recommended but in general at least one-half of the fifth year should be in the field of specialization-- in science.

2. Three areas of science training or experience should be adequately covered before completion

of fifth year:

a. an integrated (not survey) course in modern and basic concepts, cutting across traditional scientific boundaries.

b. advanced training in laboratory work for demonstrations, illustrations, and experiments. This would be the teaching methods through subject matter.

c. advanced work in one science of special interest to the fifth year teacher.

3. During the "fifth year" the students should have opportunity to develop further his understanding of the social and psychological aspects of education, through advanced work not duplicating his previous training.

4. The balance of the "fifth year" program should be entirely flexible. It should provide opportunity for the student to broaden his cultural backgrounds through general education courses and to meet many requirements of the institution.

In relation to the specific problems in the fifth year of training for science teachers, Whitehead (35:351) recommended that graduate training of teachers include both academic and professional work in equal amounts. Respondents to a survey conducted by Warren (32:165) indicated that college science courses for teachers should be organized around problems of everyday living and that education courses should be more practical with more time given to demonstration of good teaching. In a nation wide survey by Walsh (31:353), 80 per cent of 261 teacher training institutions arrived at the consensus that close cooperation between science and education departments should be sought in all efforts allied with the fifth year program.

The Master of Arts in Teaching program at Brown University (24:75-76) is based on the concept that successful teaching is dependent upon thorough familiarity with the subject matter taught. Hence, emphasis is more on course work in the subject matter field than in teacher training courses in the education department.

The National Association of State Directors of Teacher Education and Certification in cooperation with the American Association for the Advancement of Science (23:8-9) recommended that not less than one-half of the advanced study beyond the baccalaureate degree be devoted to biology courses. Broadening courses in the history and philosophy of science, development of experiments and demonstration techniques, and research participation would be valuable components of the program.

On the basis of a survey of the requirements for the Master's degree for biology teachers, Crall and Myers (19: 506-511) recommended that the curricula for biology teachers should be different from that of an administrator, the graduate curriculum should be aimed toward the preparation of a "master teacher," and that it would help the teacher to learn what to teach in addition to learning how to teach.

The Committee on the Place of Science in Education (30:640-664) and the Mideast Regional State College Conference on Science and Mathematics Teacher Education (6:509-

528) recommended a reactivation of interest in and respect for the master's degree in the subject matter field for science teaching. Both emphasized a five-year teacher training program.

V. SUMMARY

The review of literature included four areas pertinent to the study. A brief summary was made relating to undergraduate preparation of science and biology teachers and recommendations for undergraduate and fifth year of preparation of biology teachers.

The literature pertaining to teacher preparation in science and biology showed variations in teaching backgrounds. In general, science and biology teachers were inadequately prepared for teaching science and biology when their preparations were compared to standards prescribed by various state and national science committees.

Studies related to recommendations for undergraduate and graduate training for biology teachers stressed the need for breadth and depth of preparation in biology.

A balanced five-year program including field work in biology, professional and general education courses, and other related sciences was considered as most desirable for the preparation of biology teachers.

CHAPTER III

BIOLOGY TEACHERS IN NEGROS, PHILIPPINES

To obtain information of the backgrounds of teachers in Negros Occidental and Negros Oriental, Philippines, items were included in the questionnaire regarding the status, teaching assignments, experience, and pre-service training of the biology teachers. The data presented in this chapter were derived from the responses of the 71 biology teachers who participated in the study.

I. STATUS

Sex and age. Of the 71 biology teachers, 28 were male and 43 were female. The ages ranged from 26 to 60 years, and the mean age was 39.5. The data are grouped in Table I.

Teaching status, permanence of teaching career, and type of school. Fifty-three of the 71 biology teachers, or 75 per cent, had regular status and 68 per cent taught in the public schools. Of the 71 respondents, 51, or 72 per cent, had decided to make teaching their permanent careers; 22.5 per cent indicated their careers were temporary; and 6 per cent were undecided. The data pertaining to teaching

TABLE I

BIOLOGY TEACHERS GROUPED ACCORDING TO SEX AND AGE

Age	Males	Females	Total
56-60	4	8	12
51-55	3	7	10
46-50	0	1	1
41-45	1	1	2
36-40	5	4	9
31-35	8	10	18
26-30	6	13	19
Total	27	44	71

status, permanence of teaching career, and type of school are summarized in Table II.

II. TEACHING ASSIGNMENTS AND EXPERIENCE

Teaching assignments. Of the 71 biology teachers, 22 taught biology only, 7 taught biology and chemistry, 7 taught biology and physics, 28 taught biology and general science, 4 taught biology and English, and 3 taught biology and home economics. In Table III, details regarding the teachers' assignments are recorded.

Teaching experience. Most of the respondents had considerable teaching experience. Only 7 had taught 4 years or less and were employed in private schools. The fact that most of the teachers had long years of experience can be partially explained by the nature of the teachers' civil service examination and the indefinite time required for publication of results. The data are summarized in Table IV.

III. PRE-SERVICE TRAINING

Degrees held by the biology teachers. All the biology teachers responding to the questionnaire held a bachelor's degree. Four held a master's degree. The

TABLE II

TEACHING STATUS, PERMANENCE OF CAREER, AND TYPE OF SCHOOL

		Number of Teachers
Teaching status	Regular	53
	Provisional	18
	Substitute	0
Permanence of career	Permanent	51
	Temporary	16
	Undecided	4
Type of school	Public	48
	Private	23

TABLE III

BIOLOGY TEACHERS GROUPED ACCORDING TO TEACHING COMBINATIONS

Subjects Taught	Number of Teachers
Biology only	22
Biology and Chemistry	7
Biology and Physics	7
Biology and General Science	28
Biology and English	4
Biology and Home Economics	3
Total	71

TABLE IV

BIOLOGY TEACHERS GROUPED BY YEARS OF TEACHING EXPERIENCE AND TYPE OF SCHOOL

Number of Teachers	Years of Experience	Type of School	
		Public	Private
7	1-4	0	7
19	5-8	14	5
4	9-12	2	2
7	13-16	6	1
7	17-20	5	2
8	21-24	4	4
11	25-28	8	3
8	29-32	6	2
Total 71		45	26

descriptions of the degrees varied considerably, but most had earned a Bachelor's degree in Education. The data regarding degrees are summarized in Table V.

Type of institution where undergraduate and graduate degrees were completed. Forty-three, or 60.5 per cent of the respondents, completed their undergraduate work in a private university. Seventeen, or 24 per cent, completed in a government university; and 11, or 15 per cent, completed in a private college. Of the 4 teachers who finished a master's degree, 2 completed their work in a private university and 2 in a private college.

Major and minor fields of study of the biology teachers. Seventy-six per cent of the respondents reported that they had a major in biology, 20 per cent indicated they had a minor in biology, and 4 per cent stated they had neither a major nor a minor in biology.

College courses taken by the biology teachers. There was considerable variation as to the type of courses the biology teachers took in college. Another discrepancy was related to the difference in assigning semester credits to a particular course by some schools. The latter was the result of the classification of courses into laboratory and

TABLE V

BIOLOGY TEACHERS GROUPED BY
EARNED ACADEMIC DEGREES

Degrees Held	Number of Teachers
Bachelor of Arts	1
Bachelor of Science	7
Bachelor of Science in Education	49
Bachelor of Science in Education and Bachelor of Arts	3
Bachelor of Science in Education and Bachelor of Science in Chemistry	3
Bachelor of Science in Education and Bachelor of Science in Elementary Education	1
Bachelor of Science in Education and Bachelor of Science	3
Bachelor of Science in Education and Master of Arts	2
Bachelor of Science in Education and Master of Education	2
Total	71

non-laboratory subjects by the institutions. In Table VI, details regarding courses taken by the biology teachers are tabulated.

All of the respondents indicated they had earned credits in physiology. Only 2 of the 71 teachers reported they lacked credits in taxonomy. More than one-half of the respondents indicated they took courses in anatomy, survey or introduction of biological science, genetics, and embryology. Less than one-half of the teachers had earned credits in microbiology, evolution, histology, microtechnique, ecology, morphology, paleontology, geography, pathology, and history. None reported taking field courses and conservation. However, a number of the courses listed in the questionnaire might have included field work. Some additional courses not listed in the questionnaire were included. These courses were teacher's course in botany, teaching of science and biology, economic botany, entomology, and principles and problems of zoology.

The biology teachers showed a considerable deficiency in the physical sciences. More than one-half, or 56 per cent of the respondents, reported they had earned 5 semester credits in chemistry. However, 31 per cent indicated they took geology in combination with other physical sciences. Twenty-five per cent reported they had earned credits in physics, and 20 per cent indicated they took astronomy with

other physical sciences. Less than 13 per cent of the teachers reported credits in physiogeography and metereology.

Semester credits earned in the biological and physical sciences by the biology teachers. In Table VII is a summary of the total number of semester credits earned in the biological and physical sciences. Sixty-nine per cent of the teachers had earned 31 or more semester hours in the biological sciences and had met the requirements for teaching biology recommended by the Committee on Science Teaching (1:107-118). Only 29 per cent of the respondents had earned more than 21 semester hours in the physical sciences.

IV. SUMMARY

More than one-half of the biology teachers were female. The mean age of the respondents was 39.5.

Fifty-three of the 71 teachers, or 75 per cent, had regular status; 28 per cent were teaching in the public schools. Seventy-two per cent had decided on a permanent teaching career, 22.5 per cent indicated their careers were temporary, and 6 per cent were undecided.

Twenty-two of the 71, or 31 per cent, taught biology only, and 69 per cent taught biology in combination with other subjects. A majority of the respondents had consider-

TABLE VI

BIOLOGY TEACHERS GROUPED BY COLLEGE SCIENCE COURSES COMPLETED

Biology Courses	Botany	Zoology	Biology	Number of Teachers
Listed in the questionnaire				
Physiology	18	42	11	71
Taxonomy	30	39	0	69
Anatomy	15	31	12	58
Introduction or survey courses	15	15	18	48
Genetics	12	21	15	38
Embryology	9	15	12	36
Microbiology	6	9	15	30
Evolution	9	15	3	27
Microtechnique	9	3	12	24
Histology	9	6	9	24
Morphology	9	7	0	16
Ecology	9	6	0	15
Paleontology	3	9	0	12
Pathology	4	5	0	9
Geography	0	0	3	3
History	0	0	3	3
Conservation	0	0	0	0
Field Courses	0	0	0	0
Additional courses listed by respondents				
The teaching of biology			38	38

TABLE VI (continued)

Biology Courses	Botany	Zoology	Biology	Number of Teachers
Economic botany	26			26
Teacher's course in botany	26			26
The teaching of science			22	22
Entomology		20		20
Principles and problems of zoology		18		18
Plant propagation	15			15
Animal husbandry		12		12
Horticulture	11			11
Poultry		11		11
Non-biological science courses				
Listed in the questionnaire				
Inorganic chemistry				34
Organic chemistry				31
Geology				22
Physics				18
Astronomy				14
Introduction or survey courses				14
Field				0
Additional courses listed by respondents				
Physiogeography				8
Metereology				7
General chemistry				6

TABLE VII

BIOLOGY TEACHERS GROUPED BY TOTAL NUMBER OF EARNED SEMESTER HOURS IN SCIENCE

Number of Credits	Number of Teachers Who Earned Credits in Biological Science	Number of Teachers Who Earned credits in Physical Science
51-60	3	0
41-50	42	10
31-40	4	3
21-30	11	8
11-22	8	16
0-10	3	34
Total	71	71

able teaching experience. Only 7 had taught 4 years or less and were employed in private schools.

All the teachers held a bachelor's degree. Four held a master's degree. Seventy-six per cent had a major in biology, and only 4 per cent had neither a major nor a minor in biology. Most had taken their degrees at a private university.

A majority of the respondents indicated they had earned credits in physiology, anatomy, introduction of biological science, genetics, and embryology. Less than one-half had earned credits in other biological science areas. Some listed additional courses not included in the questionnaire. Sixty-nine per cent had earned 31 or more semester credits in the biological sciences.

More than one-half had earned at least five semester credits in chemistry. However, less than 30 per cent had completed work in physics, and only 29 per cent had taken 21 or more semester hours in the physical sciences.

CHAPTER IV

OPINIONS OF THE BIOLOGY TEACHERS REGARDING UNDERGRADUATE PROGRAM AND A FIFTH YEAR OF PREPARATION

The respondents were asked to rank the undergraduate courses according to their importance and to indicate the courses they thought should be strongly recommended in the fifth year of preparation.

I. OPINIONS REGARDING UNDERGRADUATE TRAINING

The biology teachers ranked the undergraduate courses in three areas according to the degree of importance for teaching biology. The areas included were biology, professional education, and non-biological science. The five-point attitude scale was used to rate the teachers' attitudes toward the individual courses. However, in this section, the three-number scale was used because the teachers had only three choices to make. The choice, "very important," was assigned five points; "important" was assigned four points; and the choice of "minor importance," three points. The total number of points "earned" by each item was divided by the number of teachers responding to the item. The final numerical values for each course were computed to the nearest hundredth and the courses ranked in a descending

order. The data regarding the rankings are recorded in Table VIII.

The average index number for the groups of biology, professional education, and non-biological science courses were 4.27, 4.59, and 4.66 respectively. With a rating of five considered to be very important, and three to be of minor importance, the midpoint or point of importance was four.

In Group I, biology courses, 16 courses were above the average index rating of 4.27 with a slight difference ranging from .1 to .12 evident among the 16 courses. The courses concerned aspects of physiology, anatomy, genetics, conservation, ecology, pathology, taxonomy, morphology, and embryology. Fourteen courses were below the average index rating with a difference ranging from .2 to .24 among these courses. However, only 7 courses were ranked between 3.0 and 4.0 in the class of minor importance.

Among professional education courses, five ranked above the average index rating of 4.59. Principles of teaching ranked highest followed by practice teaching, observation and methods, audio-visual, and educational psychology. The difference in ranking ranged from .2 to .31. Only one course had index rating of less than 4.0.

In Group III, non-biological science courses, less than one-half of the seven courses received an average

TABLE VIII

AVERAGE RATING OF INDIVIDUAL COURSES ON THE ATTITUDE SCALE BY BIOLOGY TEACHERS

Biology Courses	Very Important	Important	Minor Importance	Index Number
Animal physiology	64	7	0	4.90
Plant physiology	64	5	2	4.87
Plant anatomy	60	8	3	4.80
Animal anatomy	60	7	4	4.79
Animal genetics	52	25	4	4.68
Plant genetics	44	25	2	4.59
Animal conservation	37	31	3	4.52
Plant conservation	40	27	4	4.50
Animal ecology	31	32	8	4.46
Plant pathology	32	39	0	4.45
Plant taxonomy	34	34	3	4.44
Animal taxonomy	34	34	3	4.44
Animal pathology	32	37	2	4.42
Plant ecology	30	35	6	4.34
Plant morphology	28	36	7	4.29
Animal embryology	24	44	3	4.29
Plant embryology	24	41	6	4.25
Animal microtechnique	24	41	6	4.25

TABLE VIII (continued)

Biology Courses	Very Important	Important	Minor Importance	Index Number
Animal histology	20	45	6	4.20
Plant microtechnique	20	44	7	4.18
Plant histology	16	48	7	4.13
Animal morphology	12	54	5	4.10
Plant microbiology	20	44	7	4.07
Animal geography	12	44	15	3.96
Animal evolution	4	60	7	3.96
Plant evolution	8	48	15	3.91
Plant geography	8	47	16	3.89
Animal microbiology	20	36	15	3.65
Plant paleontology	4	28	39	3.51
Animal paleontology	0	28	43	3.31
Professional Education Courses				
Principles of teaching	71	0	0	5.00
Practice teaching	70	1	0	4.98
Observation and methods	61	10	0	4.86
Audio-visual	61	10	0	4.86
Educational psychology	60	11	0	4.84
Educational research	44	21	6	4.53

TABLE VIII (continued)

Professional Education Courses	Very Important	Important	Minor Importance	Index Number
Guidance and counselling	43	20	8	4.49
Test and measurement	35	36	0	4.49
Educational theories and principles of secondary education	31	33	7	4.34
Administration and supervision	30	25	16	4.20
History of education	18	27	26	3.89
Non-biological Science Courses				
Modern advances in science	67	2	2	4.91
General chemistry	61	8	2	4.83
General physics	61	7	3	4.81
Geology	49	16	6	4.60
History of science	48	15	8	4.56
Mathematics	47	16	8	4.55
Astronomy	29	38	4	4.35

rating above 4.66. These courses were modern advances in science, general chemistry, and general physics. Geology, history of science, mathematics, and astronomy were below the average index rating.

II. COURSES RECOMMENDED FOR THE FIFTH YEAR

The respondents were asked to indicate their opinions regarding the fifth year of preparation by checking each individual course they considered important. Since not all teachers checked the courses in the three areas, the total points for each course did not reach 71. Ranking of the courses was based on the frequency of checks assigned to an individual course. In Table IX is a summary of the courses recommended for the fifth year.

In Group I, biology courses, two-thirds of the listed courses were considered important for inclusion in the fifth year program by at least 75 per cent of the teachers. The courses were advanced physiology, advanced anatomy, advanced genetics, eugenics and evolution, biological research project, current research, advanced taxonomy, advanced pathology, and advanced microbiology. However, all of the courses were indicated as being important by more than 60 per cent of the respondents.

Of the 11 professional education courses, 6 were rated important by 75 per cent of the teachers. These courses

were special methods and techniques of biology teaching, advanced work in visual-aids, biology curriculum work, advanced educational research, advanced general teaching methods, and observation of biology teachers and classes. The remaining five education courses were considered significant by 40 to 60 per cent of the teachers.

In Group III, non-biological science courses, only modern advances in science, advanced inorganic chemistry, and organic chemistry were considered to be important for inclusion in the fifth year program by 75 per cent of the respondents. Physics, geology, astronomy, and humanities were checked by less than 40 per cent of the teachers.

III. SUMMARY

The three-point attitude scale indicated the ranking of courses in biology, professional education, and non-biological sciences. The average index rating of the three groups were 4.27, 4.59, and 4.66 respectively.

Among biology courses, 16 were ranked above the average index rating of 4.27, and 14 courses were below the average. Only 7 courses were ranked between 3.0 to 4.0 in the area of minor importance. Five courses among the professional education group were ranked above the average and only one course had an average rating of less than 4.0.

TABLE IX

RANKING OF COURSES RECOMMENDED FOR THE FIFTH YEAR BY BIOLOGY TEACHERS

Biology Courses	Number of Teachers
Advanced plant and animal physiology	68
Advanced plant and animal anatomy	66
Advanced genetics, eugenics, and evolution	63
Biological research project	62
Current research	60
Advanced plant and animal taxonomy	55
Advanced plant and animal pathology	54
Advanced plant and animal microbiology	53
Advanced plant and animal embryology	50
Advanced plant and animal histology and microtechnique	48
Advanced plant and animal morphology	47
Advanced plant and animal ecology	45
Professional Education Courses	
Additional work in special methods and techniques of biology teaching	67
Advanced work in audio-visual aids	65
Biology curriculum work	63
Advanced educational research	55
Advanced general teaching methods	54
Observation of biology teachers and classes	53
Advanced psychology of adolescence	40
Additional supervised teaching	33
Advanced test and measurement	32
Techniques of guidance and counselling	31
Advanced administration and supervision	30
Science non-biological Courses	
Modern advances in science	68
Advanced inorganic chemistry	57
Advanced organic chemistry	56
Advanced biochemistry	44
History of science	40
Advanced mathematics through elementary calculus and elementary analysis	32
Advanced physics	28
Advanced geology	21
Advanced astronomy	20
Humanities	12

In Group III, non-biological sciences, modern advances in science, general chemistry, and general physics had an average rating above 4.66. Four courses were below the average.

The opinions of the biology teachers regarding the fifth year of preparation were indicated by the frequency of checks assigned to an individual course. Two-thirds of the biology courses were considered important for inclusion in the fifth year program by 75 per cent of the teachers. However, all of the courses were considered important by more than 60 per cent of the respondents. Six professional education courses were rated important by 75 per cent of the teachers. The remaining five courses were considered significant by more than 40 per cent of the teachers. Three of the 11 non-biological science courses were considered to be important for inclusion in the fifth year program by 75 per cent of the respondents.

CHAPTER V

OPINIONS OF THE BIOLOGY TEACHERS RELATED TO THE FIFTH YEAR OF PREPARATION

The reactions of the 71 biology teachers regarding various phases of the fifth year of preparation were analyzed by using a five-point attitude scale. The points assigned to each attitude were five for "strongly agree," four for "agree," three for "neutral," two for "disagree," and one for "strongly disagree." The average rating of index number for each item would indicate the degree to which teachers favored the statements. An average rating for the entire group was not computed because each item was independent of the other items. Table X includes the number of teachers who marked each item of the attitude scale and the rating given each item.

More than 80 per cent of the teachers agreed that the fifth year should culminate in a master's degree. Item two, which pertained to thesis requirement, was divided into three sections. Each item was rated separately. Sixty-five per cent agreed that a thesis should be required. However, some who agreed that a thesis should be required also agreed with the statement that a thesis should be optional.

Item three concerned inclusion of courses in the fifth year program. Sixty-one per cent favored the inclusion

of one-half required and one-half elective courses in the curriculum. Only 6 teachers were in favor of mostly optional courses.

Ninety-seven per cent agreed on item four, the inclusion of courses for improvement of cultural backgrounds. Ninety-six per cent favored item five, a full-time teaching experience of one year before entering the fifth year program, and item six, the provision of advanced biology courses for high school biology teaching.

Eighty-six per cent agreed on the inclusion of introductory courses in related sciences for graduate credit, with the courses being especially designed for high school biology teachers. Seventy-six per cent of the respondents favored item eight, related to in-service courses for college credit.

Most of the teachers agreed that the fifth year should culminate in a master's degree. Sixty-five per cent agreed that a thesis should be required, and 61 per cent favored one-half required courses in the fifth year. Ninety-seven per cent favored cultural courses for background improvement. Ninety-six per cent agreed on a full-time teaching experience of one year before entering the graduate program, and the provision of advanced biology courses for high school biology teaching.

Eighty-six per cent favored the inclusion of introductory courses in related sciences for graduate credit with the courses especially designed for high school biology teachers. Seventy-six per cent favored in-service courses for college credit.

TABLE X

AVERAGE RATING OF THE INDIVIDUAL ITEMS ON THE ATTITUDE SCALE BY BIOLOGY TEACHERS

Statement Number	Statement Value 1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	Index Number
1. The fifth year of preparation should culminate in the granting of a master's degree	20	43	0	5	3	4.01
2. If a master's degree were granted culminating a fifth year, a thesis should:						
a. be required	39	11	0	10	11	3.80
b. not be required	0	3	15	32	21	2.00
c. be optional	8	10	3	25	25	2.30
3. The fifth year of preparation should include:						
a. mostly required courses	10	12	5	20	24	3.05
b. about one-half required and one-half elective	24	19	1	20	7	3.18
c. mostly elective	3	3	22	19	24	2.18

TABLE X (continued)

Statement Number	Statement Value 1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	Index Number
4. The fifth year of preparation should require teachers to improve their cultural backgrounds by taking some courses in fields outside of the biology, professional education and other science areas	50	19	0	0	2	4.62
5. The fifth year of preparation should require that students have at least one year of full-time teaching experience before entering the program	46	22	3	0	0	4.60
6. The fifth year of preparation should provide advanced courses in biology designed especially for high school						

TABLE X (continued)

Statement Number	Statement Value 1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	Index Number
teachers rather than expecting them to complete biology courses designed for graduate students in science	54	14	0	0	3	4.67
7. The fifth year of preparation should provide introductory courses in related sciences offering graduate credit, without pre-requisites, and prepared especially for high school biology teachers	39	23	6	0	3	4.33
8. The fifth year of preparation should provide in-service courses for college credit for individual and/or group study of general and local school problems	47	7	17	0	0	4.42

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

To aid in improving the training of secondary biology teachers in Negros Occidental and Negros Oriental, Philippines, specific data regarding the academic and professional preparation of biology teachers were obtained. In addition, the respondents supplied opinions regarding the improvement of the undergraduate and graduate program for biology teachers.

The data were obtained by the use of a questionnaire constructed with the aid of teachers and students.

A mailing list of 100 biology teachers was compiled from the names supplied by the Division Superintendent and Mrs. Virginia A. Flores. Seventy-one usable questionnaires were returned. The questionnaires were mimeographed, mailed, and collected in Bacolod City, Philippines.

Some of the significant findings were:

1. A majority of the biology teachers had considerable teaching experience, but only 31 per cent taught biology exclusively.
2. All the teachers held a bachelor's degree and four held a master's degree. Most of the teachers

completed their work in a private university, and 76 per cent had a major in biology.

3. A majority of the teachers indicated they had earned credits in physiology, anatomy, introduction of biological science, genetics, and embryology. Sixty-nine per cent had earned 31 or more semester credits in the biological sciences. Less than one-half had earned credits in other biological sciences.
4. More than one-half had earned at least five semester hours in chemistry. However, only 29 per cent had taken 21 or more semester hours in the physical sciences.
5. At least 75 per cent considered 28 of the 30 suggested biology courses <u>important</u> for inclusion in the undergraduate program of biology teachers.
6. Seventy-five per cent or more considered 9 out of the 11 suggested professional education courses <u>important</u> for inclusion in the undergraduate program of biology teachers.
7. Eighty-five per cent considered all of the non-biological science courses <u>important</u> for inclusion in the undergraduate program of biology teachers.
8. A majority of the 12 suggested biology courses were considered <u>important</u> for inclusion in the

fifth year program by 75 per cent of the teachers.

9. Six professional education courses were rated important for inclusion in the fifth year program biology teachers by 75 per cent of the respondents.
10. Seventy-five per cent considered three of the eleven non-biological science courses important for inclusion in the fifth year program of biology teachers.
11. A majority of the teachers agreed on the statements related to the fifth year of preparation for biology teachers.
    a. Teachers were in favor of a master's degree including a thesis as a culmination to a fifth year of training.
    b. Teachers thought that at least one-half of the courses during the fifth year should be required.
    c. The respondents also agreed on one year of full-time teaching experience before entering a fifth year of preparation.
    d. The teachers believed in the inclusion of cultural courses for background improvement and the provision of advanced biology courses for high school biology teaching.

II. CONCLUSIONS

The following conclusions were derived from the findings:

1. Biology majors and minors and academic degrees are not indicative of the quality of preparation for teaching biology.
2. A major in biology may not be adequate preparation for teaching biology.
3. Most biology teachers are required to teach biology with other subjects.
4. Biology teachers showed a considerable deficiency in the physical sciences.
5. On the basis of earned credits in biology, 69 per cent of the teachers were qualified to teach biology.
6. Certain biological and physical science courses should be required in the undergraduate preparation of biology teachers.
7. Professional education courses should constitute a significant portion of the undergraduate training of biology teachers.
8. Pre-service training is not adequate for a lifetime of effective teaching in biology.
9. Field work should be included in the pre-service training of biology teachers.

10. The fifth year of training should include much additional work in the biological sciences and modern advances in science.
11. Some professional education and non-biological science courses should be included in the fifth year curriculum of biology teachers.
12. Graduate study in biology, related sciences, science education, or professional education should be offered according to the needs of the individual teacher.
13. The fifth year of preparation should include the completion of selected required courses and a thesis, and terminate in a master's degree.
14. Students should be required to have at least one year of full-time teaching experience before entering the fifth year program.

III. RECOMMENDATIONS

The following recommendations appear to be justified on the basis of the conclusions drawn from the study:

A. Undergraduate preparation of biology teachers.
   1. Prospective biology teachers should earn a minimum of 45 semester hours in science.
   2. Of the 45 semester hours, 25 semester credits should be selected from the following list:

a. introductory courses in biology

b. physiology

c. anatomy

d. genetics

e. conservation

f. ecology

g. pathology

h. taxonomy

i. morphology

j. embryology

k. modern advances in science

l. field courses

3. The prospective biology teachers should complete at least five semester hours in physics, ten semester hours in chemistry, and five semester hours in earth science.

B . Fifth year of preparation of biology teachers.

1. To earn a master's degree, the student should have

a. successfully taught at least one year prior to entering the fifth year program.

b. completed 45 semester hours of undergraduate work in science.

c. presented a thesis.

d. completed at least 50 per cent of the graduate work in biological science.

e. taken non-biological sciences, cultural, and professional education courses.

2. The 50 per cent graduate work in biological sciences should be selected from the following list:
   a. physiology
   b. anatomy
   c. genetics, eugenics, and evolution
   d. biological research project
   e. current research
   f. taxonomy
   g. pathology
   h. microbiology
3. Approximately, 15 per cent of the fifth year program should be devoted to each of the following areas:
   a. special methods and techniques of biology teaching
   b. audio-visual aids
   c. biology curriculum work
   d. educational research
   e. general teaching methods
   f. observation of biology teachers and classes
4. Among non-biological sciences the following courses should be included in the fifth year

curriculum of biology teachers:

a. modern advances in science

b. advanced inorganic chemistry

c. advanced organic chemistry

C. For administrators and personnel of colleges and universities:

1. An in-service training for biology teachers should be conducted regularly.

2. Colleges and universities should offer a wide variety of biology courses in the summer session.

3. Teachers should be assigned to teach subjects based on their undergraduate preparation in science.

4. The schools of education and the Department of Education should be encouraged to consult with competent biologists in planning the biology subject matter requirements necessary for graduation and certification of the high school teacher.

5. Biology teachers should be encouraged to participate in local and nation-wide, teacher planned, in-service programs built around common school programs and problems related to the teaching of biology.

6. Biology teachers should be encouraged to have appropriate individual study of scientific and professional literature.
7. Biology teachers should be encouraged to participate in professional and scientific organizations at the local and national levels.

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APPENDICES

APPENDIX A:

C O P Y A LETTER TO THE DIVISION SUPERINTENDENT REQUESTING THE NAMES OF THE BIOLOGY TEACHERS IN HIS DIVISION

January, 1962

The Division Superintendent
Province of Negros Occidental
Bacolod City
Philippines

Dear Mr. Yanson:

You will be happy to know that I am presently enrolled in Central Washington State College for a master's degree.

In a few weeks I will be conducting a study to determine the need for improvement of the training of secondary biology teachers in Negros with the approval of the College of Education Graduate School at Central Washington State College. Four major aspects of the study are to determine: (1) present academic and professional preparation of secondary biology teachers, (2) if improvements are needed in the undergraduate training for teaching biology, (3) the nature of teaching assignments of biology teachers, and (4) factors which can contribute to the improvement of the fifth year of training for biology teachers.

Knowing you are the best person qualified to furnish the names of biology teachers in your division it would be greatly appreciated if you would list the names and locations of biology teachers under your supervision.

The attached form may be used, or if you have a printed list of biology teachers, the appropriate names could be checked.

Thank you very much for your cooperation.

Truly yours,

Reme S. Agustin

APPENDIX B:

C O P Y

A LETTER TO THE SECONDARY SCHOOL PRINCIPAL/DIRECTOR INFORMING THEM ABOUT THE NATURE OF THE STUDY

February , 1962

Dear Principal/Director:

I was a biology teacher in Bacolod City, Philippines before enrolling in the graduate school of Central Washington State College, Ellensburg, Washington.

The problems that confront us in our educational system today, especially in the science education area, are many. Consequently, I am conducting a study of the training for biology teachers in the secondary schools of Negros.

A questionnaire has been prepared and will be sent to biology teachers. An accompanying letter to the teachers explains the purpose of the study and requests their assistance.

A copy of the questionnaire is enclosed. If you have any question, please do not hesitate to write.

Truly yours,

Reme S. Agustin

APPENDIX C:

C
O
P
Y

A LETTER TO THE BIOLOGY TEACHER REQUESTING HIS COOPERATION IN THE STUDY

February , 1962

Dear Biology Teacher:

Educational leaders in our country are deeply concerned with the problem of science education. Various studies have been conducted in other areas for the improvement of instruction but little research has been done with the training of biology teachers.

I was a biology teacher in Bacolod City, Philippines but am now enrolled in the graduate school of Central Washington State College, Ellensburg, Washington. I am conducting a study to determine needs for a more adequate biology program in our country.

You and other selected teachers are best able to provide valuable data which will be the basis for making recommendations to improve the training of biology teachers. Your assistance in filling out the questionnaire will be greatly appreciated.

The names of teachers and schools participating in the study will be omitted in reporting the findings. Most of the responses can be made by a check, a number, or a word.

It will be greatly appreciated if you will return the complete questionnaire in the enclosed envelope within a week.

Thank you very much for your cooperation.

Very truly yours,

Reme S. Agustin

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

APPENDIX D:

C O P Y

THE FOLLOW-UP LETTER TO THE BIOLOGY TEACHER WHO DID NOT RETURN THE QUESTIONNAIRE AFTER THREE WEEKS

February , 1962

Dear Biology Teacher:

Two weeks ago a questionnaire was mailed to you and other biology teachers. Your school affairs may have forced you to temporarily lay aside the questionnaire. Because the data you can provide will be very valuable in helping to improve the training of biology teachers, would you please complete and return the questionnaire very soon?

Thank you again.

Very truly yours,

Reme S. Agustin

APPENDIX E:

LIST OF INSTRUCTIONS

1. Secure names of all teachers, principals/directors, to whom materials are to be sent.

2. Mimeograph letters to principals/directors, and biology teachers.

3. Mimeograph questionnaires and staple with letters to directors/principals, and biology teachers.

4. Mimeograph follow-up letters to the biology teachers.

5. Mail letters to principals/directors with a copy of the questionnaire.

6. Inquire about the cost of mailing for the purpose of avoiding delay caused by the envelopes being returned to you or the respondents because of insufficient postage.

7. Type self-addressed stamped envelope with the return address of the respondents in the upper left hand to insure return of the questionnaire and to aid in mailing follow-up letters.

8. Type the address of the respondents, and include the letter, questionnaire, and self-addressed stamped envelope.

9. Check the names on the envelopes containing the returned questionnaire as they come in with that found in your list, to aid in sending follow-up letters.

10. Time limit for returning the questionnaire will be two weeks

11. Send the follow-up letter right away in case the respondents fail to mail back the questionnaire after two weeks.

12. After you are convinced all have been returned, mail the the questionnaires back to me. Paste the name of the respondent cut from the returned envelope containing the questionnaire.

13. Send me the names of teachers, principals/directors together with their addresses.

14. Follow exactly, no errors on any materials sent. Check everything before mailing for any typographical error.

APPENDIX F: (QUESTIONNAIRE)

1. Sex: ____ (Male) ____ (Female)
2. Age: ____
3. Degree(s) attained: Year graduated
   (1)_____ ____
   (2)_____ ____
   (3)_____ ____

4. Type of institutions where you completed you completed your undergraduate and graduate degree. (If more than one undergraduate and graduate degree, please indicate the type of institution for each degree using the appropriate number from question 3.)

   A. Undergraduate
   (1)___government university
   (2)___private university
   (3)___government college
   (4)___private college

   B. Graduate
   (1)___government university
   (2)___private university
   (3)___government college
   (4)___private college

5. Major and minor fields or areas in undergraduate and graduate work:

   A. Undergraduate
   (1) Major(s)
   a._____
   b._____
   (2) Minor(s)
   a._____
   b._____

   B. Graduate
   (1) Major(s)
   a._____
   b._____
   (2) Minor(s)
   a._____
   b._____

6. Status: (Check one)
   (1)___regular (2)___provisional (3)___substitute
7. Permanence of teaching career: (Check one)
   (1)___permanent (2)___temporary (3)___undecided
8. Type of school where you are teaching: (Check one)
   (1)___public (2)___private
9. Approximate enrollment of school where you are teaching____
10. Number of years of teaching experience including this year____
11. Please list your daily teaching schedule and approximate number of students in each science class.

Subjects	Year	Number of students

12. List the number of semester credits completed in biological and physical sciences as an undergraduate and graduate. If a biology course covered both plant and animal aspects, list the semester credits in the column headed "biology." Be certain that credits are not counted more than once for any one course. If courses were combinations (i.e. histology and microtechnique) divide the credits proportionately.

	Botany credits taken as:		Zoology credits taken as:		Biology credits taken as:	
	Undergrad	Grad	Undergrad	Grad	Undergrad	Grad
1. Introduction or survey courses	___	___	___	___	___	___
2. Taxonomy	___	___	___	___	___	___
3. Physiology	___	___	___	___	___	___
4. Anatomy	___	___	___	___	___	___
5. Histology	___	___	___	___	___	___
6. Ecology	___	___	___	___	___	___
7. Genetics	___	___	___	___	___	___
8. Microtechnique	___	___	___	___	___	___
9. Embryology	___	___	___	___	___	___
10. Evolution	___	___	___	___	___	___
11. Microbiology	___	___	___	___	___	___
12. Geography	___	___	___	___	___	___
13. Paleontology	___	___	___	___	___	___
14. Pathology	___	___	___	___	___	___
15. Morphology	___	___	___	___	___	___
16. Conservation	___	___	___	___	___	___
17. History	___	___	___	___	___	___
18. Field courses (Please specify)						
_____	___	___	___	___	___	___
_____	___	___	___	___	___	___
19. Others (Please specify)						
_____	___	___	___	___	___	___
_____	___	___	___	___	___	___

	Credits taken as: Undergrad	Grad
1. Introduction or survey courses in physical science	___	___
2. Inorganic chemistry	___	___
3. Organic chemistry	___	___
4. Biochemistry	___	___
5. Geology	___	___
6. Astronomy	___	___
7. Physics	___	___
8. Field courses (Please specify)		
_____	___	___
_____	___	___
9. Others (Please specify)		
_____	___	___
_____	___	___

13. Which aspects or areas do you consider important with respect to undergraduate training of high school biology teachers. Please rank in this manner:

1. Very important-should be required
2. Important-should be on the list of electives from which courses must be selected
3. Of minor importance to the actual teaching of biology in the high school

A. Biology

1.____plant taxonomy
2.____plant physiology
3.____plant anatomy
4.____plant histology
5.____plant ecology
6.____plant genetics
7.____plant microtechnique
8.____plant evolution
9.____plant embryology
10.____plant microbiology
11.____plant geography
12.____plant paleontology
13.____plant pathology
14.____plant morphology
15.____plant conservation
others (Please specify)

____
____

1.____animal taxonomy
2.____animal physiology
3.____animal anatomy
4.____animal histology
5.____animal ecology
6.____animal genetics
7.____animal microtechnique
8.____animal evolution
9.____animal embryology
10.____animal microbiology
11.____animal geography
12.____animal paleontology
13.____animal pathology
14.____animal morphology
15.____animal conservation
others (Please specify)

____
____

B. Professional education

1.____educational psychology
2.____tests and measurement
3.____educational research
4.____history of education
5.____principles of teaching
6.____observation and methods
7.____guidance and counselling
8.____educational theories and principles of secondary education
9.____administration and supervision
10.____practice teaching in the high school
11.____audio-visual materials and methods
others (Please specify)

____
____
____

C. Science-non biology

1.____general chemistry
2.____general physics
3.____geology
4.____astronomy
5.____history of science
6.____mathematics through elementary analysis and elementary calculus
7.____modern advances in science
others (Please specify)

____
____

14. Check the areas or courses you believe important enough to be required or strongly recommended for the fifth year of preparation assuming that the biology teacher has completed an undergraduate major in biology.

A. Biology
___1.advanced plant and animal taxonomy
___2.advanced plant and animal physiology
___3.advanced plant and animal anatomy
___4.advanced plant and animal ecology
___5.advanced plant and animal embryology
___6.advanced plant and animal genetics, eugenics,evolution
___7.advanced plant and animal microbiology
___8.advanced plant and animal histology and microtechnique
___9.advanced plant and animal morphology
__10.advanced plant and animal pathology
__11.biological research project
__12.current research
additional field courses and others(Please specify)

___
___

B. Professional education
___1.advanced administration and supervision
___2.advanced work in audio-visual aids
___3.advanced general teaching methods
___4.advanced tests and measurements
___5.advanced educational research
___6.psychology of adolescents
___7.additional supervised teaching
___8.biology curriculum work
___9.observation of biology teachers and classes
__10.additional work in special methods and techniques for biology teaching
__11.techniques of guidance and counselling
others(Please specify)

___
___

C. Science-non biology
___1.advanced inorganic chemistry
___2.advanced organic chemistry
___3.advanced biochemistry
___4.advanced physics
___5.advanced geology
___6.advanced astronomy
___7.mathematics through elementary analysis and elementary calculus
___8.history of science
___9.modern advances in science
__10.humanities
others(Please specify)

___
___

15. These questions require your opinion regarding the improvement of a biology teacher in the fifth year of preparation. Please give very careful consideration.

Please indicate for each item or each part of an item your degree of agreement or disagreement in the following manner:

1. Strongly agree -I agree with no reservations
2. Agree -I agree with minor reservations
3. Neutral -I neither agree nor disagree
4. Disagree -I disagree with minor reservations
5. Strongly disagree -I disagree with no reservations

1.____The fifth year of preparation should culminate in the granting of a master's degree.

2. If a master's degree were granted culminating a fifth year, a thesis should:
____a. be required
____b. not be required
____c. be optional

3. The fifth year of preparation should include:
____a. mostly required courses
____b. about one-half required and one-half elective
____c. mostly elective

4.____The fifth year of preparation should require teachers to improve their cultural backgrounds by taking some courses in fields outside of the biology, professional education and other science areas.

5.____The fifth year of preparation should require that students have at least one year of full-time teaching experience before entering the program.

6.____The fifth year of preparation should provide advanced courses in biology designed especially for high school teachers rather than expecting them to complete biology courses designed for graduate students in science.

7.____The fifth year of preparation should provide introductory courses in related sciences offering graduate credit, without pre-requisites, and prepared especially for high school biology teachers.

8.____The fifth year of preparation should provide in-service courses for college credit for individual and/or group study of general and local school problems.

16. Please add comments concerning the fifth year of preparation for biology teachers you wish to make. Any opinion regarding the biology program or other phases of the program not covered above will be most welcome. (Use the space at the back)