A STATUS STUDY OF BIOLOGY TEACHERS IN THE PUBLIC SECONDARY SCHOOLS OF THE STATE OF OKLAHOMA

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CHAPTER I

INTRODUCTION

The tremendous knowledge explosion, particularly in science, since the turn of the century has created some grave problems for educators. Our fund of knowledge is increasing at such a rapid pace that an individual has difficulty keeping current with developments in even a small segment of any particular field of study. Educators, being concerned with this problem, have in the past decade, instituted some unique changes in the curricula of the schools. While changes have taken place in many areas of study and at all levels, this study is particularly concerned with the adequacy of academic preparation of public secondary school biology teachers and the size of school in which the teacher is employed.

Joseph J. Schwab (15) points out that:

> Until very recently, the view was common that science should be represented in the schools mainly or only as a body of useful or interesting truths. Little attention was paid to science as a process of enquiry. Attention to science as a possible vocation was largely limited to two approaches. We tried to rouse interest in the learning and use of information, or we tried to arouse interest in apparatus and techniques. Efforts to lead students to the excitement and satisfaction of problem-solving and of enquiry have been sparse until very recently for we were inhibited by the fact that "coverage" of information was so firmly imbedded as a first priority.

In the past decade some basic changes have been made in organization, methods of presentation, and course content in biology.

These recent changes in biology have given a great impetus to the teaching of biology as enquiry. This does not imply that teaching is better or worse than it was a decade ago. Many teachers have been using current information, student involvement, and student centered teaching for many years.

This study does not assume one teacher or one course of study to be better than any other. An attempt has been made to determine what relationships exist, if any, between the number of teachers in a school system and the academic preparation of biology teachers in specific subject matter areas of biology.

It is generally agreed that more than factual knowledge is needed to become a good teacher. The level of confidence of biology teachers in specific subject matter areas is being investigated along with the relationship between the number of teachers in a school system and their academic preparation. Knowledge of subject matter is necessary but a teacher must also appreciate how his subject appears to students who do not know it yet. The specific subject matter areas covered in this study deal with factual knowledge which should be common information for every citizen as well as specialized areas the teacher needs to know to help those students with professional biological interest. Some of the specialized information is theoretical and the implications are still being explored. Regardless of new developments the need for basic knowledge of subject matter, as a <u>means</u> to an end, is still valid. Obourn (13) points out that perhaps science teaching has fallen short of its fullest potential because curriculum-makers have placed so much emphasis on attaining perfection in the mastery of content and have failed to consider the content as the <u>means</u> to the end of other less tangible outcomes.

Biology is one part of the high school curriculum but it has unique contributions to make to the total program. The student of biology should achieve an understanding of the nature of biology, its concepts, theories, and modes of enquiry.

The Need for the Study

While biology is not a required course in all high schools, it is one of the science courses most often found among those studied by high school students (5). Almost all high schools now offer the course. Enrollments in biology have shown consistent gains for the past two decades.

Since a large number of students will never receive any further formal training in biology after leaving high school, it is imperative that they receive the best possible training while in high school. In order that students may receive the best possible education it is important for educators to know whether a teacher has basic competency in subject matter. It is also important to know if there is any relationship between this subject matter competency and the size of the school in which the teacher chooses to teach.

Watson and Cooley (17) give the areas of needed research in education as (a) the learning process, (b) the learner, and (c) the teacher. They also give the areas of present educational research as (a) Status Studies, (b) Method Studies, and (c) Opinion Studies.

The Scope of the Study

It is the scope and purpose of this study to determine whether any relationship exists between academic preparation of biology teachers in specific subject matter areas and the total number of teachers employed in a school system. The procedures involved in an attempt to determine this relationship were (1) selection of two independent groups for the study (2) selection of terms representing each of the six disciplines under study, and (3) the analysis of data collected from the questionnaire. Details concerning the questionnaire and statistical treatment will be found in Chapters III, IV, and the appendices.

Hypothesis

The following hypothesis stated in the null form was tested: H_o: There is no difference in the need for a program of continuing education for biology teachers in specific subject matter areas in small and large schools.

The alternative hypothesis becomes two-tailed when stated as follows: There is a difference in the need for a program of continuing education for biology teachers in specific subject matter areas in small and large schools. The level of significance upon which to base the decision to reject the null hypothesis was set at the .05 level.

The Chi-square test for K Independent Samples (16), a non-parametric statistical test, was used for testing the hypothesis.

Limitations of the Study

This study was limited to the members of the populations returning questionnaires and the correctness of responses on each. The areas of study chosen are not all inclusive and only a small sample of terms in any one area could be utilized. This study is also limited by the correctness of the basic assumption that teacher competency, in specific subject matter areas, is directly related to academic preparation.

Another limitation is how well the two samples represent biology teachers over the state.

CHAPTER II

REVIEW OF THE LITERATURE

A review of the literature reveals many status studies concerning various aspects of the science program in public secondary schools in the United States. The most common studies are concerned with the science facilities, equipment, and course offerings. The literature cited points out the trends in science offerings and enrollments and the academic preparation of teachers. This leads to the question of more adequate academic preparation for todays biology teachers. None of these studies, however, use terminology representative of areas of study from presently adopted first year biology textbooks in the state of Oklahoma.

Status of Science Teachers Course Offerings, Enrollments, and Equipment

The United States Office of Education periodically published comprehensive studies on the status of science in the public secondary schools of the United States. Brown and Obourn (2) from the U. S. Office reported in 1957 that:

> Between 1954 and 1956 both percentage and numbers of pupils in science and mathematics increased. There was a decrease in the percentage of students enrolling in physics although the number of students taking physics increased. The percentage of students enrolled in chemistry remained fairly constant while the percent enrolled in biology increased.

In the 1961 report by Brown and Obourn (3) it was found for the first time since 1900 that:

> The percent of pupils enrolled in physics had increased. The rate of increase in the percentage of science enrollments from 1956 to 1958 was greater for chemistry and physics than for general science and biology. Percentage enrollments in chemistry are increasing while the percentage of general science enrollments dropped from 21.8 percent in 1956 to 21.2 percent in 1958. Fewer than 10 percent of schools enrolling twelth grade pupils offer neither chemistry nor physics and these schools enroll only 3.3 percent of all twelth graders.

Breukelman (1) has been periodically reporting the science offerings and enrollments in Kansas since 1951. Koelsche (10) has been doing a similar study in Ohio, including some tabulating of specific facilities in the public schools. Richardson (14) edited a comprehensive study of science facilities for the National Science Teachers Association in 1957. The biology section describes the types of activities most likely to be found in the classroom of a good teacher. There is also a great deal of information concerning specific facilities for classrooms and laboratories.

Heimler (6) in a study of Small Central Schools in New York State found:

> (a) There was far too little stability of science teachers; (b) facilities and equipment were reasonably adequate in the early secondary science programs; and (c) the need for strengthening science programs beyond reading, writing, and talking about science.

Publications by Johnson (9), Hurd (7), and Richardson (14), in the early 1950's have been used as guides for the development of science facilities in public schools.

Woodward (19), in a study of the teachers of Upper New York State in 1958, found:

> (a) That out of seven-period day, taught five science classes; (b) had one free period, and (c) supervised a study hall or performed some other duty for the remaining period.

Woodward also found:

> (d) that of all teachers in 1958, 26 percent were new teachers and in 1961 the percentage was 32 percent; (3) that teaching assignments involved one or more science classes, either as the only science taught, the principal science taught, or as a science class in combination with other subjects, either science or non-science; (f) teaching experience varied from no prior experience to over 26 years; (g) length of class period ranged from 40 to 55 minutes; (h) all schools offered general science, biology, chemistry, and physics and (i) the greatest number of students was in general science, then biology, chemistry, physics, and earth science.

Teacher Preparation in Science

Some studies more directly related to the problem under consideration should begin with Hurd's (8) recent work on biological education. The findings of Hurd's (8) study are broken down into time periods, beginning in 1890.

> From 1890 to 1900, in biological secondary school education, the emphasis was upon "mental discipline" and an intensive study of plant and animal structure. During the period from 1900 to 1920 general biology was introduced with attention given to elements of scientific method. General education and life adjustment characterized the period from 1930 to 1950. From 1950 to 1960 was characterized as a period of crisis and reappraisal. The emphasis in biology today is upon the process of science rather than the products of science.

Grobman gives some of the problems related to teacher preparation and the teaching of science as a process, rather than a product.

Grobman (5) states that:

> For the most part potential high school biology teachers and junior high school teachers receive their biological training in the departments of biology in our colleges and universities. When we observe that their preparation in biology is less than adequate, we cannot simply castigate the education departments of the colleges, fashionable as such complaints are today. Eighty percent of the teachers with a major in biology are the products of liberal arts colleges or universities. This does not include the teachers in biology classrooms -- about 50 percent of

> those currently teaching -- who have not been formally prepared for their present assignments and are in them by administrative fiat, rather than through choice and certification.

Addition Lee gives an overall view of a program of preparation for biology teachers. Addison Lee (11) stated:

> Any program of preparation for biology teachers must consider the professional reputation of biologists and biology courses. The modern trends in the subject matter of biology must not be neglected. More emphasis is on experimental and quantitative biology and less emphasis on purely descriptive biology.

There is some evidence which indicates that recency of professional training is a major factor in effective teaching. Mallison (12) noted:

> In a study of junior-high school and high-school students, that for 1960-61 students who had teachers with science training within five years scored significantly better on the specialized tests than students whose teachers did not have science training within five years. Surprisingly, recency of science training of science teachers was not markedly related to science achievement of high-school students.

White (18) gives some provisions to improve the quality of teaching or of the teacher which include:

> (a) Modify teacher training and certification requirements to insure adequate knowledge of science subject matter content. Provision should also be made for in-service training through graduate programs and graduate science courses specially designed to fit the needs of the science teacher.
> (b) Upgrade science teachers by strengthening their associations with teachers organizations, and scientific societies.
> (c) Provide salary increases sufficient to attract and retain the well-qualified and ambitious teacher in teaching.

Some of the more recent studies related to this one are given below: James W. Gebhard, <u>The Teaching of Science in the Secondary Schools of Montana</u>, Ohio State University, 1960; Harold E. Johnson, <u>The Nature and Content of Science Courses in Selected Public High Schools in the United States in School Year 1953-1954</u>, Temple University, 1960; Earl P. Murphy, <u>A Study of the Probable Factors Influential</u>

in Affecting the Future Curriculum of the Secondary Schools in the United States, St. Louis University, 1960.

The major problem in starting and continuing with any new program is the lack of training on the part of teachers. There is a lack of training in the philosophy of a program as well as specific subject matter. Certainly the emphasis today is upon investigation rather than verification. Brown (4) points out that:

> In the future we can expect teachers to give more attention to objectives which lead to motification of behavior as well as the objective of acquisition of facts. To achieve these objectives units of work must be built around the solving of real, meaningful and socially significant problems.

Summary

The studies cited clearly indicate that enrollments in science increase yearly and facilities and teachers are in short supply. Todays biology teachers are less than adequately prepared to train biology as investigation rather than verification. Some 50 percent of the teachers currently teaching biology are doing so for reasons other than choice and certification. The science teacher must have an adequate knowledge of subject matter content as well as an understanding of the processes of science. A teacher cannot teach science effectively without an adequate command of subject matter.

CHAPTER III

PROCEDURES OF THE STUDY

Selection of Terms

The biology teacher in the public secondary school needs a broad academic background in science. Many disciplines are involved in his academic preparation. This study does not attempt to cover all disciplines necessary for a broad academic background. Six disciplines have been chosen as necessary but not all inclusive. These disciplines are genetics, bio-chemistry, ecology, zoology, radiation biology, and botany. The terminology, selected from each of the six disciplines, was taken from the 1966 state adopted texts for first year biology which are listed below:

B. S. C. S. Blue Version: Biological Science - Molecules to Man, Pupil's Textbook, 1963 Copr. Houghton Mifflin Co.

Modern Biology by Moon, 1965 Copr. Holt, Rinehart & Winston, Inc.

Biological Science for High School by Gregory, et al, 1965 Copr. Ginn and Company.

Biological Science: An Inquiry Into Life by Moore, et al, 1963 Copr. Yellow Version - B.S.C.S. Harcourt, Brace and World, Inc.

Science of Biology by Miller, et al, 1965 Copr. J. B. Lippincott Co.

All of the terminology of a particular discipline could not be presented due to time, and space requirements. Research is also lacking to show what could be considered "essential" knowledge. The terminology used in this study was chosen as representative of the six disciplines under investigation. Since the terminology used is present in at least three of the five state adopted texts for first year biology it would appear that the authors considered the terminology essential. This does not mean that anyone who understands this terminology is, or will be, a good teacher. The basic assumption is that one must be knowledgable in subject matter to be a good teacher. This study attempts to show that it is possible to determine whether or not a teacher is knowledgable in specific subject matter areas. The author does not attempt to say whether a teacher is "good" or "bad".

Collecting of Data

Data was collected by means of questionnaires sent to the public secondary schools in the state of Oklahoma. One hundred questionnaires went to schools having 29 or more teachers in the secondary school and one hundred questionnaires to schools having 6 to 17 teachers in the secondary school. The questionnaire consisted of two parts (see appendix A). Part one concerns terminology as representative of six disciplines in the field of biology and part two with personal data of the teacher. A letter was sent to each Principal in the two hundred schools asking that the enclosed questionnaire and cover letter be given to a biology teacher in his school (see appendix B). A stamped, self-addressed envelope was provided for returning the questionnaire.

Fifty percent of the questionnaires were returned from Sample I (schools having 6 to 17 secondary teachers). Sixty-nine percent of the questionnaires were returned from Sample II, (schools having 27 or more secondary teachers) one of which was not usable.

This study forms the basis for a much larger study in the area of academic preparation for public, secondary school biology teachers. Future studies could also include other factors necessary for competence in teaching.

Analysis of Data

In order to validate results of the study it was necessary to establish the level of confidence of biology teachers in using terminology as representative of specific subject matter areas in biology. A comparison of Sample I and Sample II was made for each subject matter area represented by means of Chi-square for two independent samples. The formula used is given below: (16)

$$X^2 = \sum_{i-1}^{r} \sum_{j-1}^{k} \frac{(O_{ij} - E_{ij})}{E_{ij}}$$

Where O_{ij} = observed number of cases categorized in ith row of jth column.

E_{ij} = number of cases expected under H_0 to be categorized in ith row of jth column.

$\sum_{i=1}^{r} \sum_{j=1}^{k}$ directs one sum over all (r) rows and all (k) columns, i.e., to sum over all cells

The values of Chi-square yielded by the formula above are distributed approximately as Chi-square with df=(r-1)(k-1), where r = the number of rows and k = the number of columns in the contingency tables. The symbol X^2 is used for the quantity in the above formula which is computed from the observed data when a Chi-square test is performed. The words "Chi-square" refer to a random variable which follows the Chi-square distribution as given in Table C from Siegel (16). The significance of the value obtained for X^2 was determined by use of Table C from Siegel (16). The statistical analysis is given in chapter IV.

Summary

This chapter has described the population, selection of terminology and collection of data. The statistical and descriptive analysis of data have been discussed.

CHAPTER IV

RESULTS OF THE STUDY

Statistical Analysis of Data

Chi-square for two independent samples was used to analyze data from the terminology section of the questionnaire. The basic reference for the use of Chi-square was Siegel (16). A comparison between sample I and sample II was made for biochemistry, botany, ecology, genetics, radiation biology, and zoology. The results are given in tables I through VI which contain the raw scores data and calculations for each discipline.

Botany was the only discipline in which the results were not significant at the .01 level. All disciplines were significant at the .05 level.

Table VII contains the total of all raw scores and calculations for the level of confidence for all disciplines from sample I and sample II. The combined totals for all disciplines show the results to be significant at the .05 level and the .01 level.

Descriptive Analysis of Data

The personal data from each questionnaire are summarized below except for the semester credit hours in each discipline and professional publications. Table VIII summarizes the average number of semester credit hours for the six disciplines included in the statistical analysis and also included bacteriology, cytology, entomology and physiology. Table IX gives a summary of teacher participation in reading seven professional publications.

The participation in National Science Foundation Summer Institutes from sample I was 34.00 percent and from sample II 52.94 percent. 44.90 percent of sample I and II had attended at least one National Science Foundation Summer Institute. Participation in academic year programs was 4.00 percent and 7.30 percent respectively for samples I and II.

The most frequently occurring age group was 20-29 years for both samples. 48.00 percent of sample I and 35.30 percent of sample II are in the 20-29 age group. It should be noted that 32.00 percent of teachers from sample I are in the 30-39 age group and 33.80 percent of sample II. The average number of years of teaching experience for sample I was 7.06 and for sample II 11.21. The average number of courses taught each day was 3.74 for sample I and 4.87 for sample II. Of the above courses taught, biology makes up an average of 1.48 hours per day for sample I and an average of 3.59 for sample II. The most commonly taught course after biology was general science for sample I and chemistry for sample II.

Teachers who have taken course work in science during the past five years total 66.00 percent for sample I and 73.50 percent for sample II. 60.00 percent of sample I received their bachelors degree since 1960 and 39.70 percent of sample II. Teachers with a masters degree make up 38.00 percent of sample I and 54.50 percent of sample II.

TABLE I

Raw Scores Data

Scores for Level of Confidence in Biochemistry

Level	Sample I	Sample II	Total
1 & 2	215 E150	139 E204	354
3	185 E180	240 E245	425
4 & 5	350 E420	641 E571	991
TOTAL	750	1020	1770

$d_f = 2$

$X^2 = 78.03$

Table values $\frac{.05}{5.99}$ $\frac{.01}{9.21}$

TABLE II

Raw Scores Data

Scores for Level of Confidence in Botany

Level	Sample I	Sample II	Total
1 & 2	106 E 91	108 E123	214
3	98 E 86	105 E117	203
4 & 5	546 E573	807 E780	1353
Total	750	1020	1770

$d_f = 2$

$X^2 = 9.20$

	.05	.01
Table values	5.99	9.21

TABLE III

Raw Scores Data

Scores for Level of Confidence in Ecology

Level	Sample I	Sample II	Total
1 & 2	193 E119	87 E161	280
3	147 E115	124 E156	271
4 & 5	410 E516	809 E703	1219
Total	750	1020	1770

$d_f = 2$

$X^2 = 133.56$

Table values $\frac{.05}{5.99}$ $\frac{.01}{9.21}$

TABLE IV

Raw Scores Data

Scores for Level of Confidence in Genetics

Level	Sample I	Sample II	Total
1 & 2	142 E110	118 E150	260
3	155 E127	145 E173	300
4 & 5	453 E513	757 E697	1210
Total	750	1020	1770

$d_f = 2$

$X^2 = 39.00$

Table values $\frac{.05}{5.99}$ $\frac{.01}{9.21}$

TABLE V

Raw Scores Data

Scores for Level of Confidence in Radiation Biology

Level	Sample I	Sample II	Total
1 & 2	217 E191	235 E261	452
3	166 E165	224 E225	390
4 & 5	367 E394	561 E534	928
Total	750	KDKA 1020	1770

d_f = 2

X^2 = 9.35

Table values $\frac{.05}{5.99}$ $\frac{.01}{9.21}$

TABLE VI

Raw Scores Data

Scores for Level of Confidence in Zoology

Level	Sample I	Sample II	Total
1 & 2	142 E116	132 E158	274
3	138 E126	159 E171	297
4 & 5	470 E508	729 E691	1199
Total	750	KDKA 1020	1770

d_f = 2

X^2 = 17.02

Table values $\frac{.05}{5.99}$ $\frac{.01}{9.21}$

TABLE VII

Raw Scores Data

Scores for Level of Confidence in all disciplines

Level	Sample I	Sample II	Total
1 & 2	1015 E776	819 E1058	1834
3	889 E779	997 E1087	1886
4 & 5	2596 E2925	4304 E3975	6900
Total	4500	6120	10620

$d_f = 2$

$X^2 = 209.5$

Table values $\frac{.05}{5.99}$ $\frac{.01}{9.21}$

TABLE VIII

Average Number of Semester Hours Credit by Subject Matter Area

Discipline	Sample I	Sample II	Average Overall
*bacteriology	92	212	2.58
biochemistry	72	130	1.71
botany	373	680	8.95
*cytology	29	63	0.78
ecology	79	226	2.58
*entomology	135	175	2.63
genetics	142	230	3.16
*physiology	218	338	4.71
radiation biology	22	35	0.48
zoology	411	990	11.90

*Were not included in the terminology section for statistical treatment.

TABLE IX

Professional publications read regularly by teachers.

Journal	Sample I	% of Teachers	Sample II	% or Teachers	% of Both
Biology Teacher	11	22.0	27	39.8	32.2
Bioscience	1	2.0	4	5.8	4.2
N.E.A. Journal	26	52.0	49	72.2	63.6
O.E.A. Journal	45	90.0	59	86.7	88.1
Science	12	24.0	15	22.1	22.9
Science Teacher	20	40.0	26	38.3	39.0
Scientific American	10	20.0	48	70.4	49.2

Summary

Descriptive and statistical analysis of the data indicates there is a difference in the level of confidence, between sample I and sample II, in using terminology from the six disciplines studies.

The data shows that there is a difference in the number of class periods a teacher teaches in his major area and in professional publications read regularly between sample I and sample II. This accounts for much of the difference between sample I and sample II in the level of confidence in the use of terminology. The teachers from sample I must be more of a generalist because of teaching duties. The teachers from Sample II are much more specialized because most of their teaching is in biology.

CHAPTER V

Conclusions and Recommendations

On the basis of results obtained from the questionnaires utilized in the study there is reason to reject the null hypothesis that there is no difference in the need for a program of continuing education for biology teachers in small and large schools. The emphasis here is on a program of continuing education. The terminology, used to determine this need in subject matter areas, was taken from the new state adopted first year biology textbooks. From the supporting information in the personal data section it is easy to see why there is a difference in the need for a program of continuing education for the two groups. Teachers in small schools average 1.48 classes of biology each day compared to 3.59 classes each day in large schools. The fact that teachers in small schools must teach more hours each day out of their major area of preparation makes it more difficult to keep abreast of new terminology in biology.

In large schools, teachers are more specialized which enables them to study more in their major area. This study shows that there is a difference in the two groups in biology but it does not show what the differences would be in other areas. Some differences could be expected in other areas also because of the generalist versus specialist teaching assignments of the two groups.

At the time this questionnaire was sent out the school year was only half completed. This means that many terms in the new state adopted textbooks and consequently in the questionnaire would not have been encountered by the teacher. Although this study does take into consideration self-study undertaken during the year by the teacher the effects of self-study of at least one-half of the new terminology would not be apparent until the following year.

The average number of years of experience is greater for teachers in the large schools. This could account for some of the difference in the level of confidence in using the terminology.

There is also a significant difference in the professional publications read regularly by the two groups. Teachers from the large schools read more technical publications in science and are more likely to encounter new terminology. Teachers from small schools tend to read general publications probably because of their broad teaching responsibilities.

The implication is that the two groups need a different type of continuing education program. The National Science Foundation has attempted to equalize the educational opportunities of all science teachers through summer and academic year fellowships. A much greater percentage of teachers from large schools have taken advantage of these fellowships. This may be another reason for the difference in the needs of the two groups.

This study has shown the feasibility of teacher self-evaluation in the use of terminology representing areas of study. The teacher could be supplied with a more complete list of terms appearing in state textbooks, and summaries of new developments and could evaluate himself on basic subject matter competency.

If teachers from both groups are compared to an arbitrary standard of 90 percent of the terminology used in the questionnaire there is a need for both groups to become more familiar with the terms used. In this relationship there is a need for a program of continuing education for both groups and the problem becomes a matter of relative degree of need.

The following recommendations are made to institutions concerned with the improvement of science education in the public schools of the State of Oklahoma.

1. Design programs specifically for practicing biology teachers to help keep them abreast of new developments in the field.

2. The degree of need for such a course to be determined by means of a pre-test covering new terminology and developments in biology.

3. Teachers would receive credit for this type of course as they would any other academic course in biology.

4. For new course development the following disciplines should be considered first: radiation biology, biochemistry, and ecology.

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APPENDIX A

OKLAHOMA STATE UNIVERSITY • STILLWATER

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74074

As a principal you are well aware of the revolution taking place in all areas of the high school curriculum. Institutions of higher education are very much involved in this revolution and are trying to set forth the best possible programs to keep pace with this revolution. One area of acute need is the teacher training program. Teaching is changing so rapidly it is very difficult to remain current in any field. In an attempt to assess current thinking of people in the field of biology a questionnaire is being sent to a sample of the schools and you are asked to give the enclosed letter and questionnaire to the biology teacher in your school who will be professional in filling out and returning this questionnaire. Your school or teacher will not be identified in any way. The information obtained from the questionnaire will be used to make recommendations for pre and in-service teacher education to teacher training institutions.

Your help in this endeavor will be very much appreciated.

Sincerely,

John R. Shinpoch

John R. Shinpoch
Doctoral Candidate
Oklahoma State University

Kenneth Wiggins

Dr. Kenneth Wiggins
Associate Professor, College of Education
Oklahoma State University
Stillwater, Oklahoma

OKLAHOMA STATE UNIVERSITY • STILLWATER
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FRontier 2-6211, Ext. 273
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Dear Biology Teacher:

For some time now a revolution has been taking place in high school biology. As a biology teacher you are in an excellent position to be aware of this revolution. Institutions of higher education responsible for teacher education are also aware of this change and need to revise their programs in line with this change. We need your help in order to assess the current thinking in the field and perhaps to make recommendations to these institutions.

In an attempt to determine present status and future needs for pre and in-service teacher training programs questionnaires are being sent to a sample of the schools in the state and to one teacher in each of these schools. You will be making a positive contribution to the teaching profession by filling out and returning the attached questionnaire in the stamped, self-addressed envelope. Individual school systems or teachers will not be identified in any way. Please return the questionnaire during the week of February 19 to February 25, 1967.

If you would like a summary of this work put your name and address on a 3 by 5 card and enclose it with the questionnaire.

Sincerely,

John R. Shinpoch
Doctoral Candidate
Oklahoma State University

Dr. Kenneth Wiggins
Associate Professor, College of Education
Oklahoma State University
Stillwater, Oklahoma

APPENDIX B

This questionnaire has been constructed so as to take a minimum amount of your time to answer. You are asked to check the level at which you feel confident in teaching these terms as representative of areas of study in the field of biology. These terms appear in the State adopted texts and reflect the change taking place in biology today. The scale to be used is given below:

very uneasy	uneasy	undecided	confident	very confident
1	2	3	4	5

Please place a check ✓ in the space after the number representing your choice for each term.

EXAMPLE: Cholecystitis--------1__2__3✓4__5__

Hardy-Weinberg Principle---- 1__2__3__4__5__
alleles--------------------- 1__2__3__4__5__
filial generation----------- 1__2__3__4__5__
genetic code, man----------- 1__2__3__4__5__
sex-linked traits, man------ 1__2__3__4__5__
gene mutations, plants------ 1__2__3__4__5__
chromosome theory----------- 1__2__3__4__5__
independent assortment------ 1__2__3__4__5__
non-disjunction------------- 1__2__3__4__5__
blending-------------------- 1__2__3__4__5__
autosomes------------------- 1__2__3__4__5__
backcross------------------- 1__2__3__4__5__
inbreeding------------------ 1__2__3__4__5__
lethal genes---------------- 1__2__3__4__5__
genetic continuity---------- 1__2__3__4__5__
acetycholine---------------- 1__2__3__4__5__
adenosine diphosphate------- 1__2__3__4__5__
amylase--------------------- 1__2__3__4__5__
carbohydrate synthesis------ 1__2__3__4__5__
carcinogens----------------- 1__2__3__4__5__
citric acid cycle----------- 1__2__3__4__5__
estrogens, action of-------- 1__2__3__4__5__
yeast fermentation---------- 1__2__3__4__5__
glycolysis------------------ 1__2__3__4__5__
hydrolysis of proteins------ 1__2__3__4__5__
lacteals, action of--------- 1__2__3__4__5__
digestive enzymes, action of 1__2__3__4__5__
chemical bonding, DNA------- 1__2__3__4__5__
adenosine triphosphate------ 1__2__3__4__5__
nucleic acids--------------- 1__2__3__4__5__
biome----------------------- 1__2__3__4__5__
ecosystem------------------- 1__2__3__4__5__
food pyramid---------------- 1__2__3__4__5__
food chain------------------ 1__2__3__4__5__
forest community------------ 1__2__3__4__5__
homeostasis----------------- 1__2__3__4__5__
population pyramid---------- 1__2__3__4__5__
plant climax---------------- 1__2__3__4__5__
plant succession------------ 1__2__3__4__5__
consumers, primary---------- 1__2__3__4__5__
producers, primary---------- 1__2__3__4__5__
decomposers----------------- 1__2__3__4__5__
food web-------------------- 1__2__3__4__5__
ecological niche------------ 1__2__3__4__5__
desert community------------ 1__2__3__4__5__

cell division, animal---------- 1__2__3__4__5__
protista----------------------- 1__2__3__4__5__
regeneration, animals---------- 1__2__3__4__5__
vertebrate characteristics----- 1__2__3__4__5__
irritability, animals---------- 1__2__3__4__5__
taxes-------------------------- 1__2__3__4__5__
Theory of Natural Selection---- 1__2__3__4__5__
Recapitulation Theory---------- 1__2__3__4__5__
phenylketonuria---------------- 1__2__3__4__5__
vitalism and mechanism--------- 1__2__3__4__5__
animal classification---------- 1__2__3__4__5__
evolution, as change----------- 1__2__3__4__5__
insect metamorphosis----------- 1__2__3__4__5__
biogenesis--------------------- 1__2__3__4__5__
cell theory-------------------- 1__2__3__4__5__
radioactive half-life---------- 1__2__3__4__5__
radiation hazards, man--------- 1__2__3__4__5__
radioautograph----------------- 1__2__3__4__5__
radioactive isotopes----------- 1__2__3__4__5__
rad unit----------------------- 1__2__3__4__5__
food sterlization by radiation- 1__2__3__4__5__
radiation, types--------------- 1__2__3__4__5__
carbon - 14 dating------------- 1__2__3__4__5__
gene mutations by radiation---- 1__2__3__4__5__
radiation fallout-------------- 1__2__3__4__5__
radiation sickness------------- 1__2__3__4__5__
solar radiation---------------- 1__2__3__4__5__
dosimeter---------------------- 1__2__3__4__5__
background radiation----------- 1__2__3__4__5__
x-rays------------------------- 1__2__3__4__5__
heterotrophs------------------- 1__2__3__4__5__
capillary action--------------- 1__2__3__4__5__
cell division, plants---------- 1__2__3__4__5__
cambium------------------------ 1__2__3__4__5__
geologic eras, plants---------- 1__2__3__4__5__
photosynthesis, dark phase----- 1__2__3__4__5__
seedless plants---------------- 1__2__3__4__5__
grana-------------------------- 1__2__3__4__5__
metric system------------------ 1__2__3__4__5__
nitrogen cycle----------------- 1__2__3__4__5__
kingdom plantae---------------- 1__2__3__4__5__
tropisms----------------------- 1__2__3__4__5__
reproduction, flowering plants- 1__2__3__4__5__
leaves, functions of----------- 1__2__3__4__5__
vegetative propagation--------- 1__2__3__4__5__

Personal Data Form

Please list the approximate number of credit hours you have completed in the following subject areas:

bacteriology	______	entomology	______
biochemistry	______	genetics	______
botany	______	physiology	______
cytology	______	radiation biology	______
ecology	______	zoology	______

Number of National Science Foundation programs attended? Summer _____, Academic year _____.

In what areas? Biology ___, Earth science ___, Radiation biology ___, list others ________.

Year bachelors degree received ____, Masters _____. Hours above masters ______________

Most recent summer of college work in science _____.

Please check the professional publications you read regularly.

Biology Teacher	______	Scientific American	______
Bioscience	______	N.E.A. Journal	______
Science	______	O.E.A. Journal	______
Science Teacher	______	Others ______________	

How many classes in biology are you teaching this year? _____ general science __________

chemistry _____, physics _____, other ______________________________

Number of years teaching experience including this year? _____

Check the range in which your age falls:

60 or above	_____	30 to 39	_____
50 to 59	_____	20 to 29	_____
40 to 49	_____	below 20	_____

The Oklahoma State Department of Education is cooperating in this study to help improve pre and in-service teacher education in the state. You will have contributed your part by completing and returning this questionnaire.

Please return to Dr. Kenneth Wiggins, Associate Professor, College of Education, Oklahoma State University, Stillwater, Oklahoma 74074, during the week of February 19, 1967, February 25, 1967. (Stamped, self-addressed envelope enclosed.)

VITA

John Russell Shinpoch

Candidate for the Degree of

Doctor of Education

Thesis: A Status Study of Biology Teachers in the Public Secondary Schools of the State of Oklahoma

Major Field: Higher Education

Biographical:

Personal Data: Born near Elm Grove, Oklahoma, October 14, 1931, the son of Herbert and Anna Shinpoch.

Education: Attended grade school at Elm Grove and Council Hill Oklahoma; graduated from Schulter High School in 1949; received the Bachelor of Science degree from the Oklahoma State University, with a major in Natural Science, in May, 1957; received the Master of Science degree from the Oklahoma State University with a major in Natural Science, in May, 1961; completed requirements for the Doctor of Education degree in July, 1967.

Professional Experience: Teaching experience includes four years as a science teacher in the public schools of Oklahoma; two years as a science teacher at Jimma Agricultural Technical High School, Jimma, Ethiopia; one year as a traveling science teacher for Oklahoma State University; one year as assistant professor of science-education, Tarkio College, Tarkio, Missouri; presently on leave of absence from Tarkio College to serve as project director for the BI-STATE PROJECT FOR THE IMPROVEMENT OF INSERVICE TEACHER EDUCATION THROUGH SCIENCE.