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THE STATUS OF THE BIOLOGICAL SCIENCES IN THE HIGH SCHOOLS OF IOWA

C. W. LANTZ

A study of science teaching in the high schools of the United States in the last thirty years shows some marked changes in the sciences taught, in the enrollment, and in the nature of the courses.

The following table shows the percentage enrollment in the various sciences during this period. These data are taken from a report of the Office of Education, United States Department of the Interior.¹

Table I—Percentage of high school students in science in United States.

SCIENCE	1900 %	1910 %	1915 %	1922 %	1928 %
Astronomy	2.78	0.53	0.28	0.07	0.06
Botany		16.83	9.14	3.82	1.59
Chemistry	7.72	6.89	7.38	7.40	7.07
Geology	3.61	1.16	0.48	0.16	0.09
Physical Geography	23.37	19.34	14.58	4.28	2.72
Physics	19.04	14.61	14.23	8.93	6.85
Zoology		8.02	3.21	1.53	0.77
Physiology	27.42	15.32	9.48	5.08	2.68
Hygiene and Sanitation				6.06	7.84
General Science				18.27	17.50
Biology			6.90	8.78	13.57
Agriculture		4.66	7.17	5.11	3.66
Home Economics		3.78	12.89	14.27	16.48
Total	83.94	91.14	85.74	83.76	80.88

There are certain facts that are very evident from a study of these statistics. Astronomy and geology have practically disappeared in the high schools. Botany and zoology as distinct subjects are rapidly disappearing. Physics has decreased but chemistry has maintained itself. New science subjects have appeared to take the place of the older sciences; namely, general science, biology, agriculture, and home economics. The statistics show that if agriculture and home economics are included, the total percentage of enrollment in all sciences has approximately maintained itself during this period.

It seemed as if a study of the science teaching in the high schools of Iowa would be of interest. A questionnaire was sent to

¹ Phillips, Frank M. Statistics of public high schools, 1927-28. Bul., No. 35, Office of Education, U. S. Dept. of Interior, 1929.

representative high schools of all sizes. As a result statistics from the replies of 126 high schools have been tabulated. These are distributed from large city high schools to high schools of less than fifty in enrollment. Four points were studied: (1) Percentage of schools offering particular sciences. (II) Methods of biology teaching. (III) Objectives of biology teaching. (IV) Academic preparation of biology teachers.

I. SCIENCES OFFERED

According to this study the percentage of sciences offered in the high schools of Iowa are as shown in the following table:

Table II—Sciences Offered and Required in Iowa High Schools

SCIENCE	OFFERED %	REQUIRED %
General Science	92.06	73.20
Physics	89.60	70.80
Agriculture	77.70	
Biology	69.80	28.40
Physiology or Hygiene	51.50	61.50
Chemistry	20.60	23.00
Botany	4.70	0.00
Zoology	3.10	0.00

The following graph shows the percentage of high schools in Iowa offering the different sciences as compared with the percentages for the United States. These statistics are taken from Bul.

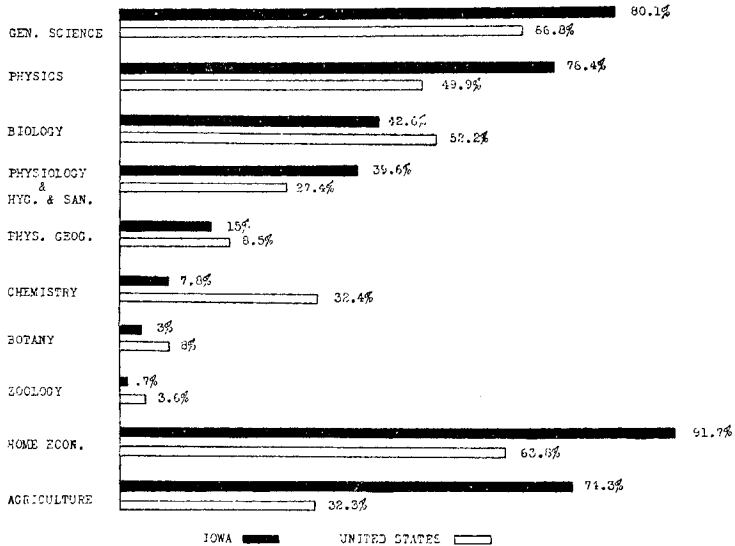


Fig. I

Sciences in Iowa high schools compared with the sciences in the high schools of the United States

35, Office of Education, U. S. Department of the Interior, and are for the years 1927-1928. It will be noted that the total percentages given for Iowa in the United States report are lower than in the data collected in this study. However, the order of these percentages is the same. The data of the two studies were for different years and this study involved fewer high schools.

The above data indicate that the status of the sciences in the high schools of Iowa agrees fairly well with the status reported for these sciences for the United States. Botany and zoology are rapidly disappearing from the high schools in Iowa and biology now occupies an important place. The biology is usually an elective subject. General science has become almost universal and is usually required. Physics is given in most high schools in the state and is generally required. There is a greater percentage of students enrolled in physics and a lower percentage of students in chemistry than in any other state in the United States.

II. METHODS IN TEACHING

This study shows that general science is universally given in the ninth grade and sometimes in the eighth grade of the Junior High School. Biology is about equally distributed between the tenth and eleventh grades, and physics is given in the twelfth grade.

Slightly over 54% of the high schools give laboratory work in biology although only 34% report double laboratory periods. A textbook course only in biology is given by 25% of the high schools while 18% report demonstration work without laboratory. This is of interest in connection with the studies reported by some recent investigators in which they conclude that the demonstration method of presenting high school sciences is superior to the laboratory method. Iowa teachers are not as yet making general use of the demonstration method. It is deplorable that 25% of the schools teach biology purely from the text book.

The teachers almost unanimously think that field work is desirable in biology, but because of administrative reasons find it difficult to carry out. Some field work is given in 62.5% of the schools.

The two text books most generally used are Smallwood, Reveley, and Bailey in 39.5% of the schools and Gruenberg in 22%. The other texts in order of their occurrence are: — Moon, Peabody and Hunt, Hunter, Kinsey, Trafton, and Clements.

III. OBJECTIVES

The following six objectives were submitted to the teachers and they were asked to rank them according to their importance. The first figure placed after the objective gives the number of first places accorded to it and the second, the number of sixth places accorded to it.

- a. To train in observation (11), (4).
- b. To train in the scientific method (5), (30).
- c. To train in citizenship (11), (15).
- d. To give a knowledge of the environment necessary for effective living (33), (1).
- e. To give a knowledge of biological facts necessary for the maintenance of the health of the individual and of the community (47), (0).
- f. To broaden the pupil's life by the aesthetic appeal of plants and animals (6), (20).

IV. TEACHERS TRAINING.

Reports on the teacher's academic training in the biological sciences was received from only 67% of those answering the questionnaire. Only 19.8% of these teachers had majored in college in a biological science; 11.3% had minored in a biological science; 30.2% majored in some science other than a biological science; 18.8% majored in home economics. The median number of college credit hours earned in the biological sciences by these teachers was 16. There were three teachers who reported as having no college credit in the biological sciences and 27% had only ten credit hours or less.

The reports seemed to indicate that the teacher was employed more often to teach some other subject primarily and that biology was more or less incidental.

V. CONCLUSIONS

This study indicates clearly that botany and zoology as distinct subjects are seldom given in the high schools of Iowa. A course called biology has replaced these two subjects, and judging from the textbooks used, this course attempts to cover plant study, animal study, and the study of the human body. This is in accord with the tendency in the whole United States. General science has become almost universal in the schools. Many University and College specialists in the sciences have opposed the introduction of these more general sciences, but in spite of this, they have become established in our high schools. Evidently in the minds of those

most closely in touch with high school students these courses are meeting the demands for science instruction because they are on the increase and the old special lines of science are decreasing. This perhaps is in line with the general tendency all over the country in favor of survey courses and outline books in various fields.

Biology teaching in Iowa high schools is handicapped by the lack of preparation of the teachers. The fact that only 20% of those teaching biology majored in any biological science is a deplorable condition.

The emphasis in high school biology is to teach biology in relation to man, so that he may better adjust himself to his environment and become a more efficient member of his community. This I think is a very worthy objective. It is rather surprising that few consider the training in the scientific method important.

Those of us who are preparing high school teachers of biology must recognize the general tendency as indicated by this study, because it calls for teachers with a broad scientific training as well as a special training.

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