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THE SURVEY COURSES IN SCIENCE

C. W. LANTZ

What should be the nature of the beginning courses in science in our colleges? There has been much criticism directed at these courses. The criticism is usually to the effect that they are too technical and are planned to meet the needs of those who are going to be specialists in some field of science whereas relatively few will continue in a particular field of science. The courses are said to be unrelated to everyday life, whereas what is needed are courses that will give an understanding and an appreciation of modern science as it applies to everyday life in a world so largely dominated by science situations. It is difficult for us who are specialists in some field of science to realize that we are not primarily training specialists in a field of science. Such beginning courses should not be planned for those who specialize but for the average student who needs a knowledge of science in his life and in his chosen vocation.

Since the number of hours that the average student can take in science is limited, would it not be better for him to learn some of the fundamentals in the broad field of science than to devote all of his limited time in science to one or two fields? Those of us who have had experience with college curriculums know how jealously each department defends its own offerings. Each department feels that every student should have one or two years in their particular field if they are really going to have anything worth while. Obviously the wishes of each department cannot be granted in a four year course.

Criticism of our curriculums is a healthy sign. Our courses should be continually subjected to criticism and revision. It often hurts to have our own courses disturbed. Have we revised our courses lately or have we been teaching practically the same things in the same way for the last twenty or twenty-five years? Too often the scientist believes in subjecting his research in his field of science to the critical methods of science, but does not use the same methods with his teaching practices.

The survey course in science is one of the outcomes of this criticism of our science courses. It is not necessary for me to describe the nature of these courses for you are all familiar with them. The purpose of these courses is to give a cultural background in science such as the average educated person should have who is not going to specialize in science and to help those who may decide to specialize in any particular field of science to choose the field of their interest. Both types of students would be served by such courses. Many Colleges and Universities, including some of our leading institutions, have introduced such courses.

There has been much said for and against such courses. My first reaction to them was the usual reaction of one who has specialized in a relatively narrow field of the biological sciences even though my

particular work gave me little opportunity to teach in my special field. I doubted if there was anything of much worth in such courses. After working with a general course in biology of the nature of the surveys I now feel that they have a place in some curriculums.

Attention has recently been directed to the general biology course by Report 15, entitled "Adjustment of the College Curriculum to War-time Conditions and Needs" issued by the United States Office of Education. In this report the Committee states "that they believe that best results in teaching biological sciences have usually been obtained through the use of separate courses in botany and zoology." They further state that "there is no objective evidence to show that general biology is as good or has any advantage over well-organized courses of general botany or that general botany and general zoology have greater value than general biology covering the two great fields."

My feeling when I first read this report was that the statements were made with a finality that is not warranted by the evidence. They admit that these conclusions are based largely on subjective evidence and give no hint as to the nature of the little objective evidence that they have for their conclusions. Professor Gordon Alexander, of the University of Colorado, in *Science* for January 28, 1944 criticizes the report of the committee and Professor C. A. Shull, of the University of Chicago, in *Science* for March 10, 1944 makes a reply to Professor Alexander, in which he says that there is no such subject as biology and that it is not a unified field of science. It would seem that the question is not settled.

At the Iowa State Teachers College we found that our students lacked the cultural background in the various fields of knowledge that a teacher should have. If there is anyone that should have such a background, it is certainly a teacher. We recognized three requirements to be met in training a teacher. First, give the student, as far as possible, a cultural background in the broader fields of knowledge; second, give more extensive training in one or two fields in which he plans to teach; third, give the necessary professional training for teaching. A four-year course is a short time in which to accomplish this and many of our elementary teachers have to be prepared in two years. Should we attempt to give this background work in science in one field of science say botany for two or three terms or would it be better to cover a broader field in more general courses? We proceeded by the second method.

In the fall of 1936, we offered for the first time survey courses in the biological sciences and in the physical sciences. All students on degree curriculums were required to take these courses unless they could show satisfactory proficiency in these subjects. This has since been modified somewhat in the physical sciences but the course in the biological sciences is still required of all degree students. Students on the two-year diploma courses take a different type of biology better adapted to their professional needs. This course is called nature study and involves field work and direct contact with biological materials.

Time does not permit a detailed description of these courses. Briefly,

they are term courses giving five hours of credit in which the student spends seven clock hours per week in class,—two double periods and three single periods. The courses are based on general principles and the application of these principles to every-day affairs. I can speak best concerning the course in biology since it is the one that I teach. The organization of the biology with the approximate time given to the different units is as follows:

Unit 1 Introduction, protoplasm, cell	5 hours
Unit 2 Plants and their relations to man.....	25 hours
Unit 3 Animals, with special emphasis on man.....	30 hours
Unit 4 Interrelations of living organisms.....	7 hours
Unit 5 Reproduction and development.....	5 hours
Unit 6 Genetics	7 hours
Unit 7 Organic Evolution	4 hours

One of the criticisms often offered against general biology courses is that they are really courses in zoology and that plant study is omitted. This is not true in this course. Plants receive much attention although it is not a course divided into botany and zoology. The material is presented largely by the lecture method. The double periods are used for demonstrations, motion picture films, and discussion. Good motion picture films are found to be quite effective.

Since 1935, all sophomores at Iowa State Teachers College have taken the tests provided by the American Council on Education. These tests are given by a number of Colleges and Universities. The results of these tests which have been collected by the Research Bureau of Iowa State Teachers College have given us the opportunity to compare the scores made by our sophomores with scores of the sophomores from other institutions in the United States.

The following table and graph show the records made in science in tests by the sophomores of Iowa State Teachers College as compared with the national averages for the period extending from 1935 to 1943. Comparisons are made on the basis of median percentile scores.

Table I: Scores made in sophomore tests at Iowa State Teachers College from 1935-1943 as compared with the national scores. Scores are expressed as median percentile scores.

YEAR		1935	1936	1937	1938	1939	1940	1941	1942	1943
Sophomores All Colleges	No. of Students.....	3,393	5,897	3,885	3,885	3,885	4,779	7,224	6,212	3,813
	Median Percentile.....	50	50	50	50	50	50	50	50	50
All Degree Sophomores I.S.T.C.	No. of Students.....	194	211	237	230	221	262	227	174	118
	Median Percentile.....	46	56	57	73	65	72	69	75	68
Degree Men I.S.T.C.	No. of Students.....	96	120	116	130	129	154	129	101	33
	Median Percentile.....	52	66	72	79	73	81	75	81	82
Degree Women I.S.T.C.	No. of Students.....	98	91	121	100	92	108	98	73	85
	Median Percentile.....	37	40	47	60	58	59	56	69	62
Diploma Sophomores I.S.T.C.	No. of Students.....	152	184	197	198	185	194	182	161	134
	Median Percentile.....	41	40	47	53	47	49	51	68	52

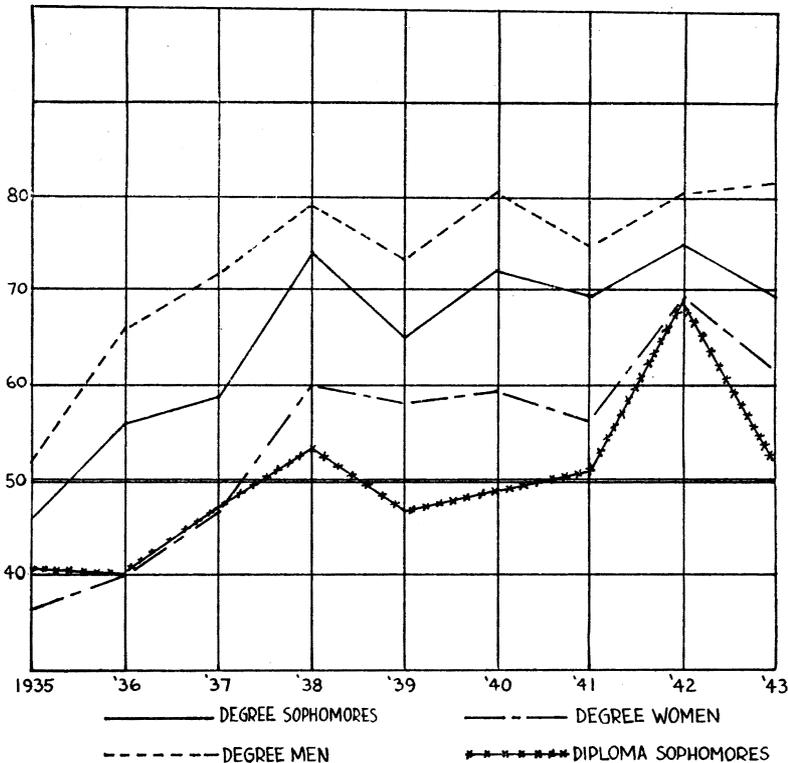


Figure 1

It will be noted that in 1935 the scores of the sophomores at Iowa State Teachers College with the exception of the scores of the men were below the national average. The scores of the men were slightly above the national average. In the fall of 1936, the survey courses were introduced. The sophomore tests were given in the spring. There were some students who took the tests in 1937 that had taken the survey courses but it was not until 1938 that practically all who took the tests would have already taken these courses. It is quite evident that the science scores of our students improved markedly with the introduction of these courses and since then the scores have continued well above the national averages. The diploma students do not take the biology course, but one called nature study which is a different type of course. Their grades are not comparable with the others. Our graduates now know more about the field of science than they previously did. They now all have some contact with science, a situation that did not exist before. Those who are interested in science continue their studies in the field of science in which their interest lies.

These data are submitted as concrete evidence that survey courses in science do have their place in certain college curriculums. The average student unless he specializes in some field of science has only

a very limited number of hours for science. What should he take? Should he take one or possibly two specialized fields of science for the short time that he can devote to the field or would it not be worth more to him from a cultural standpoint to give a similar amount of time to the more general type of courses? Suppose he has only one semester for the biological sciences, should he take one semester of either botany or zoology or would it not be better for him to take a general course in biology based on fundamentals principles? As one trained primarily in botany who has taught the general biology courses for eight years, I favor the general course. As scientists we are likely to feel that all students should have two or three years of formal instruction in sciences. Those in other fields of knowledge feel the same way about their fields. A college course is not long enough to embrace all of these fields and give time for specialization in a field of special interest, especially if some professional training is given at the same time.

This report does not prove that survey courses are superior to special courses for the beginning students. It is not a controlled experiment. It does show that survey courses in science have a place in a curriculum. Objective evidence involving nearly 2000 students show a definite improvement in the knowledge of science that students have since the introduction of required survey courses in science. This course in biology has met a definite need in the curriculum at Iowa Teachers College in a way that a single course in botany or zoology given for the same length of time could not have done.

One of the marks of a good scientist is an open mind. I wonder if we as scientists, while approaching the problems in our special field of science with this attitude, do not often fail to keep this scientific attitude towards our teaching problems. The question of the survey courses in science is not a closed question. There is much to be said for them.

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