

Minutes of the 1958 and 1959 meetings of the Association of Midwestern College Biology Teachers: Dr. Ted Andrews, Kansas State College, Emporia, Kansas (past president).

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Improving Science and Mathematics Programs in American Schools, a joint report of American Association for the Advancement of Science and American Association of Colleges for Teacher Education. (1960).

A Curriculum for Training High School Biology Teachers Which Administrators of Teacher Training Institutions Will Support

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The Problem

In the preceding paper the required biology courses for training a high school biology teacher at 29 midwest institutions were studied in order to find the best allotment of time in the undergraduate curriculum for a major in biology. Using this material the writer has attempted to find a superior biology curriculum which a large percentage of the administrators in midwest state-supported teacher training institutions will support.

The Methods

For the preceding paper most of the college end university biology teachers in midwest state-supported teacher training institutions were contacted by questionnaire; they were asked to comment on the requirements in their biology curriculum and the required courses in the other 29 midwest colleges and universities. From these replies, from the suggested requirements of various organizations, and from the suggestions of other biologists, the writer attempted to make the best allotment of semester hours in the areas of the sciences and mathematics for a biology major. (See results of questionnaire in Table I.) In addition, the eight advanced biology courses most likely to be required were selected. The questionnaire in Table I was sent to the division chairman, department head, or senior member of the biology department in each of 29 state-supported teacher training colleges and universities in Iowa, Minnesota, Missouri, Illinois, Wisconsin, Michigan, and Indiana. (See the list of colleges and universities

which replied to this questionnaire at the end of this paper.)

Discussion of Results

Twenty-two of the questionnaires (79%) that were sent to the administrators were completed and returned.

The 22 biology administrators were almost unanimous in desiring a minimum of 1 year of college chemistry; only 50% of their departments actually required a minimum of 8 semester hours. One college required 15 semester hours of chemistry; four biology administrators commented that a second year should be required, although this was not a part of the questionnaire. There were 32% of the institutions with no chemistry requirement. About one-half of Section I (41 biologists) of the Association of Midwestern College Biology Teachers 1959 meeting believed a minimum of 2 years of college chemistry should be required; this group thought the second year should be mostly organic chemistry. The other half of Section I believed at least one year of chemistry should be required. The Allerton House Conference in 1957 (Dr. Harvey I. Fisher, Southern Illinois University, editor) recommended "(1) a major in one area of science of some 24 semester hours with 18 semester hours in each of two other areas or (2) a broad major in either physical or biological sciences with additional course work in other sciences to total a minimum of 60 semester hours in a four-year program." T. A. Nelson (University of Illinois, 1954) found in his doctoral study that high school superintendents and principals preferred broad training in

Table I

Enclosed are the results of a curricular study I started last year. Most of you have been interested and gracious enough to answer my original questionnaire. Attached is a summary of what the writer believes should be approximate requirements for a biology major in secondary education at state-supported midwest teacher training institutions. If there were no administrative objections, you had qualified teachers and sufficient funds for each course, would you approve the following *required* components of a secondary biology curriculum? (Requirements in semester hours.)

| | | (strongly advise) | |
|---|---------------|-------------------|------|
| A. 1 year of college chemistry | Comments_____ | Yes 21 | No 1 |
| B. 1 year of college physics | Comments_____ | Yes 14 | No 5 |
| | | (in between 3) | |
| C. Introductory courses (general biology, general botany, general zoology) (8 hours) | Comments_____ | Yes 18 | No 4 |
| D. Advanced courses (exclusive of methods and practice teaching) (22 hours) | Comments_____ | Yes 20 | No 2 |
| E. Methods of Teaching (2 hours) | Comments_____ | Yes 19 | No 3 |
| F. Practice Teaching (8 hours) | Comments_____ | Yes 18 | No 4 |
| G. Would you require, recommend or leave elective the following advanced biology courses? | | | |

| Course | Re-quire | Recom-mend | Elec-tive |
|---------------------|----------|------------|-----------|
| Genetics | 11 | 8 | 3 |
| Vertebrate Zoology | 8 | 6 | 8 |
| Comparative Anatomy | 4 | 9 | 9 |
| Animal Physiology | 2 | 15 | 5 |
| Entomology | 2 | 12 | 8 |
| Plant Physiology | 4 | 11 | 7 |
| Bacteriology | 8 | 9 | 5 |
| Field Biology | 8 | 8 | 3 |

List the requirements in your biology curriculum for:

College chemistry 1(15); 10(8); 4(4); 7(0)
College physics 6(8); 2(4); 14(0)

The number of semester hours are in parentheses.

several science fields with intensive training in one field rather than intensive training in

one field with little or no training in related areas.

Minimum requirements do not always show the true picture, for Eastern Illinois University requires only 8 semester hours in chemistry, but zoology graduates in the last 10 years have each averaged taking over 13 semester hours in chemistry.

Sixty-four per cent of the biology administrators would require 1 year of college physics (8 semester hours); 14% would require less than a year, and the rest believed no college physics should be required. There were only 27% of the biology departments which required 8 semester hours of physics; 9% required a 4 or 5 semester hour course and 64% had no physics requirement. One administrator suggested that physics should be reserved for the fifth year program. Section I of the Association of Midwestern College Biology Teachers 1959 meeting reported almost unanimously that they believed any biology teacher should have a background of mathematics through trigonometry before taking at least 8 semester hours of physics. The attitude of a biologist toward physics is influenced by his or her background; certainly no one would expect to be a physiologist without physics, although it is much less important to a taxonomist. The writer believes a student in any college science curriculum should have a minimum of a year each in physics, chemistry, and biology regardless of the area in which he or she desires to major.

A total of 30 semester hours in biology for a biology major exclusive of methods of teaching and practice teaching seems optimum. Seventeen of the 22 biology administrators thought 30 semester hours was best. Two believed 28 hours should be a maximum; three others, believed 32, 36 and 38 hours should be required. If 10 semester hours are required in methods of teaching and practice teaching, and 20 hours are required in chemistry, physics and mathematics, one-half of the entire curriculum is allotted to the science area. In state-supported colleges this leaves only 60 semester hours for cultural and other required courses; in private religious colleges the addition of theology and philosophy makes a reasonable allotment to the biology curriculum still more difficult. The writer believes that if the

student is to receive a balanced undergraduate curriculum, not more than one-half of the undergraduate work should be allotted to the areas of science and mathematics.

In this study 18 of the 22 administrators thought 8 semester hours was optimum for introductory courses; other administrators suggested 20, 16, 16 and 4 as the best number of semester hours for introductory courses. As you can see in the preceding paper, there are many combinations of general biology, general botany, and general zoology required of biology majors in the midwest. The discussion groups of the 1958 and 1959 meetings of the Association of Midwestern College Biology Teachers were unanimous in agreeing that the basic course in biology should be an 8 semester hour, fundamental, integrated course with laboratory for all students.

Two semester hours of methods of teaching biology were accepted as best by 19 of the 22 administrators. One of the three who replied negatively believed the course should only be recommended; another stated he believed a course in biological technique would be of more value, and the third thought the course would be of little value.

Eighteen of the 22 administrators thought 8 semester hours for practice teaching was optimum. Two others stated 5 hours were adequate, and two believed practice teaching was of little value.

In making the questionnaire the writer selected the advanced courses which were either required or mentioned by the most biologists. The list (Table I) was kept small in hopes that more questionnaires would be returned than with an extensive list of advanced courses. Genetics was the only course in which one-half believed it should be required; 8 of these institutions have a required course in genetics at the present time. Eight out of 22 thought vertebrate zoology, bacteriology, and field biology should be required. According to these administrators it would be difficult to make a case for requiring animal physiology (the writer is a physiologist), entomology, or plant physiology. Since comparative anatomy and vertebrate zoology are closely related, they must be considered together.

Summary

A biology major for secondary teaching should take approximately 8 semester hours of physics, 12 hours of chemistry which should include some organic, 8 hours of an integrated biology course, approximately 22 hours in advanced biology courses, 2 hours of methods, and 8 hours of practice teaching. If some advanced courses are to be required, genetics, field biology, bacteriology, and either vertebrate zoology or comparative anatomy should be included.

Colleges and Universities Participating in the Study

Illinois

Northern Illinois University
Illinois State Normal University
Western Illinois University

Missouri

Southwest Missouri State College
Central Missouri State College
Northwest Missouri State College
Northeast Missouri State College

Iowa

State College of Iowa

Michigan

Northern Michigan College
Western Michigan University
Central Michigan University

Minnesota

Bemidji State College
St. Cloud State College

Indiana

Ball State Teachers College

Wisconsin

State College, Whitewater
State College, Superior
State College, Eau Claire
State College, La Crosse
State College, Oshkosh
State College, Platteville
State College, River Falls
State College, Stevens Point

Literature Cited

- Nelson, T. A. "What Administrators Want in the Training of Science Teachers and the Actual Training of Beginning Science Teachers in the State of Illinois." *Science Education* 40 (1956): 24-43.
- Minutes of the 1959 meeting of the Association of Midwestern College Biology Teachers: Dr. Ted Andrews, Kansas State College, Emporia, Kansas, (past president).
- Allerton House Conference on Education: Group IV-Physical and Biological Sciences, Dr. Harvey I. Fisher, Southern Illinois University, Editor (1957).