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TRENDS IN HIGH SCHOOL SCIENCE TEACHING

PAUL E. KAMBLY

The trends in high school science teaching may be grouped under the headings curriculum, teacher training, and methods of teaching. Although no one is likely to object to this grouping, there are undoubtedly many individuals who will object to the following statement of trends. This is true because it is human to emphasize those educational trends which seem to be going in what the prognosticator believes is a sensible direction.

Curriculum trends of the last 100 years have resulted in four reasonably well standardized courses in present-day high schools. From the ninth through the twelfth grade these courses are general science, biology, physics, and chemistry. In the following discussion it is assumed that the reader has a reasonably good understanding of the past trends and present content of these courses. With this background in mind, we can consider the following general curriculum trends:

1. A trend toward arranging subject matter into broader units of work. These broader units supposedly place emphasis on the development of general understandings rather than upon the memorization of specific facts. In practice these broader units do result in the reduction of the number of topics or units included in one school year. Both ninth grade general science and tenth grade biology as they are organized today show the influence of this trend. Typical unit titles in general science are "What are our most important machines?", "How can science help to produce better houses?", and "How do we use electricity?" Typical biology units are "How does man control living things?", "How can we conserve our health?", and "How are living things adapted for survival?"
2. A trend, closely related to the first, is toward courses that disregard the traditional sub-divisions of subject matter. This trend has already made biology a more or less standardized school subject. Various fusions of the physical sciences are now being developed. These fused courses are believed to be more functional in the lives of students who do not intend to enter college than the traditional physics and chemistry of the past. Consequently, smaller schools that must offer a limited curriculum are likely to substitute a fused physical science course for the college preparatory course.

In an attempt to improve general education courses at both junior and senior high school levels some teachers have already experimented with fused courses made up of content taken from more widely separated areas. Combinations of science and shop, science and home economics, and science and social studies appear in some curricula. As evidence that such fusion

is a present day trend one needs only to examine the proposed schedule of courses for either Farmville or American City in *Planning for American Youth*¹ where courses in "Common Learnings" predominate the school day.

3. Another definite trend is toward the establishment of separate health-education courses. In most present day schools health is included as part of general science, biology or physical education. The impetus to health education provided by World War II is reflected in demands for more adequate health education. Most secondary school administrators seem to favor the introduction of special health courses. This trend needs emphasis because the recent New York State Health Syllabus was prepared without consulting the science teachers of that state. After the syllabus was published the science teachers set out to prove that much of the content included was already being taught as part of the high school biology. As a result of their efforts, New York students who take high school biology now automatically receive credit for one half of the health requirement. The status of health education in Iowa will be determined during the high school curriculum revision program that is now in progress.
4. A less definite but more important curriculum trend is toward greater emphasis on conservation education in the areas of physical and biological resources in general as well as the area of human resources. Up to the present time conservation teaching in Iowa schools has been included in standard high school science courses. The least we can expect in the future is more time in each of these courses devoted to helping pupils understand the need for wise use of natural resources.
5. A trend toward more consumer education of the type necessary for wise choice and use of consumer goods was evident before the war. Concrete evidence that this trend still exists is the recent committee report "The Place of Science in the Education of the Consumer."² This report suggests four possible arrangements for extending the use of science in consumer education in public schools and emphasizes the need for and values of consumer education as a part of general education.
6. The recent pre-induction courses that were taught primarily by science teachers suggest another possible curriculum trend. Of these courses, aeronautics was probably the most widely offered. This emphasis on aeronautics may continue in the future. Whether it is taught as a separate subject or as a part of

¹ National Association of Secondary School Principals, *Planning for American Youth*, Washington, D. C., 1944.

² The Consumer Education Study, 1201 Sixteenth Street, N. W. Washington 6, D. C. (\$0.15).

a physical science course will probably be determined very largely by the size of a school and the number of teachers employed. If future revisions of competing physics texts include aeronautics material it is probable that separate courses in aeronautics will disappear from all but the large school science curriculum.

These curriculum trends added to the trends of the past make demands on secondary school science teachers for which they are often not prepared. However, a recent article on the Preparation of High School Science Teachers by a committee of college science teachers indicates that colleges are aware of these demands and are willing to help prepare better trained teachers. They recommend a program which gives the prospective teacher a fair preparation in at least three sciences. As fair preparation they suggest a total of 60 semester hours of science work. This allows for a 24-hour major in one subject and 18 hours in two others. You may be interested in the fact that the Liberal Arts College of the State University of Iowa now offers an area of concentration for science teachers of 50 semester hours in botany, chemistry, geology, mathematics, physics and zoology distributed in at least three of these areas. With the help of an interested advisor a prospective teacher at least has an opportunity to get broad enough training to enable him to teach in the schools typical of the State of Iowa. Such broad training is obviously essential for teachers of fusion courses.

In addition to providing opportunities for broader training colleges are developing greater interest in helping with the in-service training of teachers.

There are four trends in the methods of science teaching with which most teachers are familiar.

1. A trend, closely associated with the building of more comprehensive science units, which has resulted in greater use of the unit method of teaching and less use of the textbook—recitation method. The emphasis in unit teaching is on the development of understandings of major questions through the use of science concepts. Properly used it provides opportunity for pupil-teacher planning of the work to be done, a variety of learning activities in doing the work, an adequate organization and discussion of the concepts, and an evaluation of the student's progress. The State Department of Education has encouraged this unit-method of teaching for several years.
2. Another trend in methods is the increasing use of audio-visual aids. Both the army and navy have made fabulous claims for the value of these aids in teaching. Whether you believe these claims or not you must admit that certain science materials can be taught much more effectively and efficiently with the help of good visual aids. Anyone who has tried to help high

school biology students learn about the heart and circulation of the blood with and without the use of a film called "Heart and Circulation of the Blood" will agree that the film more than halves the amount of time necessary to develop the same degree of understanding. In fact, such difficult concepts as valve action and blood flow through capillaries are clear to most students after they have seen the film.

The increase in the number of educational film producers is evidence that the use of audio-visual aids is expected to increase. Further evidence is the number of schools that have ordered projectors to be delivered as soon as they are available.

3. The trend toward greater use of teacher-demonstrations may be past the stage in which it should be called a trend. The controversy over the relative merits of teacher-demonstrations and individual-pupil-laboratory has resulted in a general consensus that both techniques have merit. At the secondary school level most general education science courses make much greater use of teacher-demonstrations than of individual-pupil-laboratory.
4. Providing class time for supervised study has resulted in more **teacher supervision of the work of pupils**. Although this is not a new trend it is one which is slowly producing changes in teaching methods in modern secondary schools. The teacher's chief responsibility is to help pupils learn how to read science materials with the maximum amount of understanding. In practice the teacher who recognizes this responsibility spends considerable time in reviewing student background before making textbook assignments.

In conclusion we should remember that, as always, the most potent of all trends is the trend on the part of a seemingly great majority of secondary school science teachers to ignore or resist all trends that threaten the content of the traditional high school science courses or "proved" methods of teaching them.

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