

THE MOVEMENT TOWARD A UNIFIED SCIENCE COURSE IN SECONDARY SCHOOLS

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The title of this report, as announced, is the result of careful editorial work on some one's part and we would correct it immediately. It would appear that there can be no real "Unified Science Course" as long as localities and their needs are different, or as long as men's minds are individual and various. Your attention is asked for only a brief statement of the current movement toward a unified science course.

Our science courses in college and high school have passed through just as distinct phases as have the development of the microscope and automobile. At the time of Linnaeus's first connection with the University of Upsala there was a marked movement there toward field work in natural history which so upset the equilibrium of the institution that Linnaeus was forced to resign. Attendant upon the development of the microscope was an awakening in microscopic technique. Modern research in the higher sciences has brought into the text books and our teaching a mass of material much of which, after trial, proves too heavy for the mind of the high school pupil. This seems to be the climax of specialization in high school science. Hitherto we have been most interested in the proper presentation of our subjects in all their fullness and beauty; the development of the child or the man has been quite incidental.

"Certain defects of science courses in content and in methods are becoming increasingly apparent. In some respects science teaching is not as closely related to the environment and experience of the pupil today as it was a quarter century ago. With the elaboration of apparatus and the increased attention to quantitative methods, there has come an aloofness from the experience of everyday life, so that the pupil may secure a high standing in physics, chemistry, biology without necessarily gaining an understanding of their applications. Moreover, teachers in science in some instances over-emphasize the importance of formal and fixed procedure and, as a result, are not alert to utilize new opportunities."

The reaction now is toward making each subject valuable and interesting to the pupil, and toward a closer articulation of the subjects as opposed to their former isolation and individualness. Courses are being compiled and fitted, being cut down here and built out there, the high places made low and the valleys filled, in order that classes may be held through the course.

The Commissioner of Education in the report for 1910 brings out the potent fact that at the then existing rate of decline, physiology will cease to be studied by 1925, physics by 1935, chemistry by 1945, and physical geography by 1960. While these statements seem overdrawn, yet they do emphasize the inefficiency of our past methods of presenting our sciences and their suicidal effect.

Without entering into the lengthy discussion of conditions which we all appreciate, may we turn to the immediate topic. Within the last decade there has sprung up a great dissatis-

faction with the conventional courses. This is particularly true of the teachers in the lower years of the high school, for it is they who see the enormous loss in attendance and in interest in school work. In 1892 a committee of the National Educational Association recommended the elaboration or intensification of the first year science, geography. Gradually this became too intensive and too collegiate. In 1909, seventeen years later and five years ago, geographers inaugurated a movement among themselves to react against the inattention to human response and environment, the fitting of pupils for college rather than for life, and the suppression of interest in economic or industrial facts and factors.

Apparently thus far science teachers generally have been quite willing for the first year teachers to wrestle alone with the task of revision and adaptation. In fact the others have been eager to prune back geography to almost nothing and to graft on scions of almost everything else. But they insist that their own courses, as biology, chemistry, or what not, be left inviolate and intact.

At the present time, however, a very widespread movement is at work toward the revision of the entire high school course, science included. This work is partly under the direction of the National Educational Association and its committee on the reorganization of high school education. Its purpose and plans are given in Bulletin No. 41, 1913, of the United States Bureau of Education. This general committee presides over ten subcommittees or the high school departments: the subcommittee on natural science is divided into five others for (1) First Year Science; (2) Physics; (3) Chemistry; (4) Geography, and (5) Biology. The special committee on biology immediately upon its appointment broke up into many minor groups in order that all sections of the United States might be represented and at work. The special committee centering in Chicago, of which the speaker has the honor to be a member, includes representation from Wisconsin, Michigan, Indiana and Illinois.

It is the plan to continue this work for a period of years but to change the membership several times in order that the final report may be the work of many men and that it may be carefully formulated and revised; its first report may be collated in 1915. The general revisory committee hopes that it will:

"(a) Formulate statements of the valid aims, efficient methods and kinds of material whereby each subject may best serve the needs of high-school pupils.

“(b) Enable inexperienced teachers to secure at the outset a correct point of view.

“(c) Place the needs of the high school before all agencies that are training teachers for positions in high schools.

“(d) Secure college entrance recognition for courses that meet actual needs of high school pupils.”

From this statement of aims the welding of the several sciences into a unified course is not, apparently, a definite and immediate purpose. Whether this result ensues is a question.

To our personal knowledge there is no other broad movement looking toward the reorganization of secondary education, although departmental sections throughout the country are engaged thereon. Notable among these is the Central Association of Science and Mathematics Teachers, a committee of which is at present working up a two year course in general science. Its preliminary report, which was presented at the Des Moines meeting last Thanksgiving, stated in a very general way the aims in this two year “stem” course. A successful “stem” course in general science has been worked out by W. K. Eikenberry of the School of Education, University of Chicago; it was adopted by the Agricultural Section of the Illinois High School Conference last November and is outlined in the current (January) issue of *School Science and Mathematics*.

From the accounting of the plans of the National Educational Association and of the Central Association of Science and Mathematics Teachers, and that of other isolated cases, it appears that with the possible exception of this Illinois Academy of Science, no organization has yet considered the formulation of a general course in high school science in which there shall be not only a unity or commonness of purpose and method, but even more, a close articulation or, to put it more plainly, an almost entire absence of demarcation between the natural sciences.

As heretofore given, physiology, botany, chemistry, and others have been taught and studied as independent units. When several of these sciences were in a course there was a strong staccato effect, a marked hiatus between them and a full stop at the end of each study; often there were many of these within the subject. Thus while a so-called science course was listed the pupil studied only separate units, units just as separate and distinct as Latin and history, as mathematics and English. The broad scientific truths or generalizations prob-

ably dawned upon the pupil's comprehension, if at all, long after high school days were over. The causes of this lack of articulation were at least two: the teacher and the text-book.

There exists in the minds of certain members of this committee, as probably has been stated at a previous meeting, a very admirable conception of a high school science teaching which will break down and clear away the barriers which have been the jealous boundaries of each man's domain; which will interweave the materials, the methods, and the facts of all the sciences into a fabric so smooth that a pupil entering upon the science course of a curriculum will find less difficulty in beginning new subjects each year and hence will be more apt to complete the entire course. Such a course has been well marked out in English. English now is a four-year unit and no longer solitary, independent units; the course is working excellently. In such a course the materials and information from one laboratory will be utilized in the others. The chemical, physical, biological, and geographical materials will be unified.

For example: A zoology or physiology class, when studying the animal eye, will begin with a simple lens, determination of principle and secondary foci, and image formation, and from this physical basis work into the use of a retina. This material used again in the physics laboratory, will give point or application to a cold law of optics or refraction.

And throughout the course materials of study will be interchanged and utilized until the pupil realizes that no phenomenon is to itself alone, but that all unite to make the whole. In such a course it may even come about that instead of the name plates on laboratory doors and in catalogs being called "Chemistry," or "Geography," they will be "Third Year Science," and "First Year Science."

In conclusion, then, may it be stated that by "unified science" is not meant a uniform, standardized, "cut and dried" course for all teachers, all classes and all localities, but a science the parts of which are not integers but fractions, not isolated subjects taught by trained specialists, but are portions of a broad (or deep) subject, science, taught by men who specialize in the general education of youth.