GENERAL SCIENCE INSTRUCTION IN THE GRADES; PART I-II

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GENERAL SCIENCE INSTRUCTION IN THE GRADES

PART I.
A QUANTITATIVE ANALYSIS OF GENERAL SCIENCE TEXTS

PART II.
THE REACTION OF CHILDREN OF THE LAST THREE GRAMMAR GRADES TO SCIENCE

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PART I.

CHAPTER I.

THE PRESENT STATUS OF GENERAL SCIENCE.

THE presentation of General Science may be defined as a method of teaching the laws of Nature and their applications in the inventions of man without considering the boundaries of those groups into which scientific knowledge is usually divided: astronomy, botany, chemistry, physics, physiography, . . . zoölogy. The method is not new, for books treating of natural phenomena in this general manner were published fifty years and more ago as readers for the schools, and at any given date in the last half century one or more such texts have been on the market. In many, if not most, of them the biological phases of science as embodied in Nature Study have predominated.

The present tide of interest in the content and method of General Science dates from about 1912, when the publication of texts in rapid sequence was begun. The United States Commissioner of Education's Report for 1890-1910, published in 1910, had just announced the startling fact that the sciences were rapidly waning in popularity in high schools, as evidenced by the decreasing per cent of enrollment. The school journals had published several articles condemning "university domination" of high-school science, the criticism being largely directed at the types of entrance examinations, and other requirements of college-entrance boards, which seemed to demand that the content and method of high-school science be essentially that of a diluted college course, with emphasis on laws and theories rather than applications and everyday illustrations.

If causes are to be judged by results, the psychological moment had arrived for radically altering the methods of teaching science to pupils in early adolescence, for from 1911 to the present date (January 1, 1920) twenty-two texts have been published, also many laboratory manuals, either independent or accompanying texts; a quarterly journal devoted exclusively to General Science has entered its third volume; departments of General Science have been opened in several educational journals; committees under the auspices of the National Educational Association, the Association of Science and Mathematics Teachers, etc., have had official status and published reports, and the in-

clusion of General Science in the eighth and ninth grades has spread rapidly throughout the nation.

Of course the new subject has met with strong opposition, and each of its claims has been countered by closely related criticisms.[1] It is unfortunate that but few of the arguments for or against General Science have been based on any accurate examination of texts or manuals.

The writer, in 1917,[2] examined the ten textbooks then on the market page by page, and made a critical analysis of the purpose, subject-matter, and method of treatment found therein. In the spring of 1919 the list was again brought up to date, and eighteen texts which had been advertised or reviewed in school journals were examined, and an analysis of these texts, greatly amplified and considering many phases not included in the first analysis, comprises the first portion of this study.

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[1] "A Bibliography of General Science," W. L. Eikenberry, General Science Quarterly, Vol. II., No. 3, p. 406.

[2] "A Quantitative Analysis of General Science," H. A. Webb, School of Science and Mathematics, Vol. XVII., No. 6, pp. 534-543; June, 1917.

CHAPTER II.

METHOD OF THE ANALYSIS.

THE eighteen texts contain a total of 6,638 pages of instruction, all tables of contents, introductions, prefaces, general review questions, appendices, and indices excluded. These pages were carefully examined one by one, and an entry made on a card for every half page, labeling each card with the title of the topic, the name of the book, and page number of the topic, to permit future identification. The cards were then arranged under headings of the generally recognized branches of scientific knowledge, then rearranged under the important topics in each of these special sciences. This distribution, and a number of subsequent ones by texts, by size of topics, etc., form the minute data from which the tables of this study are obtained.

The topic. The employment of a certain degree of personal judgment was inevitable in these arrangements. It was first necessary to decide upon a title for the subject-matter discussed in a given half page. For example, if the instrument by which the weight of air may be measured was described and illustrated, the word "barometer" was written as the title, especially if the paragraph or page heading gave the hint.

The science. It was necessary to judge whether the topic was properly included in any of the several principal divisions of science, and, if so, which one. While the barometer is discussed in several sciences, notably chemistry, physics, meteorology, yet its principle is a law of physics fundamental to all the phenomena of the mechanics of fluids. Chemistry and meteorology deal with the applications and interpretations of air pressure after it has been measured, rather than with the workings of the barometer. Texts in physics treat the topic more fully than do texts in the other sciences. The assignment of the topic "barometer" to the science of physics seems just and reasonable from these considerations.

In like manner each topic was assigned to some science, or to a purely miscellaneous group, the best possible individual judgment being brought to bear on each decision. The writer has had teaching experience in each and every subject of the high-school science curriculum, and founds these judgments upon the knowledge thus acquired.

The unit group. Closely related topics were grouped to

reduce the number of units to be handled. The content of General Science could be far more easily, and almost as accurately, judged from an examination of these groups than from the display of the great mass of minute data. The topic "barometer" thus becomes linked with other topics of air pressure and measurement as considered in physics, under a more general heading, and forms a medium-sized unit of subject-matter neither as small as a paragraph nor as large as a chapter.