

**ARITHMETIC, HOW TO TEACH IT:  
PROPOSED CHANGES IN THE  
METHODS OF TEACHING  
ARITHMETIC IN THE COMMON  
SCHOOLS**

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Arithmetic, how to Teach it: Proposed changes in the Methods of teaching arithmetic in the common schools by Frank H. Hall

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FROM THE REPORT  
OF THE  
COMMITTEE OF TEN

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“The Conference [on Mathematics] consisted of one government official and university professor, five professors of mathematics in as many colleges, one principal of a high school, two teachers of mathematics in endowed schools, and one proprietor of a private school for boys. The professional experience of these gentlemen and their several fields of work were various, and they came from widely separated parts of the country; yet they were unanimously of opinion that a *radical change in the teaching of arithmetic* was necessary.”

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## ARITHMETIC: HOW TO TEACH IT.

### Whence Comes the Demand for a Change in the Methods of Instruction?

The "Committee of Ten" was appointed at the meeting of the National Educational Association in Saratoga in July, 1892. Its chairman was Charles W. Eliot, President of Harvard University. Dr. William T. Harris, Commissioner of Education, was a prominent member of the committee.

The "Conference on Mathematics" appointed by this committee "consisted of one government official and university professor, five professors of mathematics in as many colleges, one principal of a high school, two teachers of mathematics in endowed schools, and one proprietor of a private school for boys. The professional experiences of these gentlemen and their several fields of work were various, and they came from widely separated parts of the country; yet they were unanimously of opinion that a *radical change in the teaching of arithmetic* was necessary." The members of this conference simply formulated and voiced the common judgment on this subject—the judgment of the leaders in educational thought and of intelligent men of affairs everywhere.

McLellan and Dewey, in *The Psychology of Number*, speak of "a growing impatience with the meager results of the time given to arithmetic in the traditional course of the schools."

Business men very generally deplore the lack of ability on the part of youthful employees fresh from the schools to figure accurately. Great emphasis has hitherto been given to the commercial side of arithmetic, and yet pupils are inefficient, a majority of them at least, to a remarkable degree, in the figure manipulation required in ordinary business. Said a prominent Bostonian: "All children are taught to cipher; yet in my selection of office boys I find that very few know how to apply the art of ciphering to the work of life."

High-school teachers are wont to complain of the inefficiency of the mathematical training received by their pupils while in the grades. They find large numbers of these pupils, possibly a majority, deficient (1) in ability to discern quantitative relation, and (2) in skill in accurate ciphering. They demand improvement in these two respects.

This demand, then, for a *radical change* in the method and curriculum, so far as arithmetic is concerned, is of no narrow origin. It is as extensive as the educational world itself, and as intensive as the combined expression of the mathematician, the psychologist, the representative business man, and the high-school teacher can make it.



**What Changes in Matter are Desirable?**

The first recommendation made by the Conference on Mathematics, appointed by the Committee of Ten, is, that "the course in arithmetic be <sup>Abridgment</sup> abridged and enriched: <sup>Necessary.</sup> abridged by omitting entirely those subjects which perplex and exhaust the pupil without affording any really valuable mental discipline; and enriched by a greater number of exercises in simple calculation and in the solution of concrete problems."

This Conference suggested the curtailment or entire omission of compound proportion, cube root, obsolete denominate quantities, duodecimals, and the <sup>What</sup> greater part of commercial arithmetic. <sup>Omitted.</sup> It further suggested that in such subjects as profit and loss, bank discount, and simple and compound interest, examples not easily made intelligible to the pupil should be omitted. In these recommendations the Conference has voiced the sentiment of thoughtful teachers everywhere.

Pupils in the grammar grades have been required to memorize definitions, when, because of the immaturity of their minds, they were unable to see through the definitions the things defined. They have been required to solve problems of whose uses and applications they had no clear conception. Again and again they have lost sight of what they were trying to do in trying to find out how to do it. The mere manipulation of figures has been allowed to absorb their attention and to exhaust their energies.

In many instances pupils have been well taught in the primary grades and in the so-called "mental arithmetic" work. They have learned in a small way to see magnitude relation and to express it in number. But no sooner are they admitted to the class in "written arithmetic" than they are confronted with long rows of figures—to them mere figures—and with these they are expected to juggle, and to obtain other figures called "the answer."

Too Much  
Mere  
Figure Work.

Says General Francis A. Walker: "Who of us has not seen in the hands of children eleven, twelve, and thirteen years of age examples in compound and complex fractions which were more difficult than any operation which any bank cashier in the city of Boston has occasion to perform in the course of his business from January to December? The most jagged fractions, such as would hardly ever be found in actual business operation—e. g.,  $\frac{1}{2}\frac{1}{3}$  or  $\frac{1}{3}\frac{2}{7}$ —are piled one on top of another to produce an unreal and impossible difficulty; and the child, having been furnished with such an arithmetical monstrosity, is set to dividing it by another compound and complex fraction as unreal and ridiculous as itself. All this sort of thing in the teaching of young children is either useless or mischievous. It is bad psychology, bad physiology, and bad pedagogics."

Work Too  
Difficult.

The leading educators of the state of Wisconsin recently recommended, among other things, the following in relation to the course of study in arithmetic:

Views of  
Wisconsin  
Educators.

Work in fractions below the fifth grade mainly oral.

No long division below fifth grade with divisors of more than two figures.

Omit greatest common divisor entirely as separate topic.

Omit longitude and time. Teach the principles of this in connection with geography.

Omit reduction, addition, subtraction, multiplication, and division of denominate numbers as separate topics.

Limit taxes, insurance, and duties to simplest cases and explanation of terms.

Give very little attention to problems in interest.

Omit true discount, and take only the first case in bank discount.

Omit cube root and its applications, except such as can be done by inspection.

From the foregoing it will be apparent that the current of thought sets strongly in favor of the elimination of much that has heretofore been regarded as essential. "For ten years," says Superintendent J. M. Greenwood, "the process of elimination has been going on, and we have not seen the end of it yet."

#### **Unmerited Criticism to be Expected by Those Who Adopt These Recommendations.**

There will necessarily be some embarrassment for those who accept and adopt such abridgment as is herein recommended. There are examiners and examiners. Many of these learned their elementary mathematics before this process of elimination began, and have not yet come into line with those educators who favor abridgment. These will persist in confronting the pupils with problems that belong to the parts eliminated. The mechanically taught pupil may