THE NEW METHODS IN ARITHMETIC

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The new methods in arithmetic by Edward Lee Thorndike

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EDWARD LEE THORNDIKE

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By

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THE PREFACE

In the *Psychology of Arithmetic* the writer has presented the applications of recent dynamic psychology and experimental education to the teaching of arithmetic, in form suitable to students who approach the topics as part of a general systematic study of education in elementary schools.

The present volume deals with somewhat the same material, but from the point of view of the working teacher or student in a normal school seeking direct help in understanding the newer methods and using them under ordinary conditions of classroom instruction. No knowledge of psychology is assumed as a requirement for profitable study of this book. Discussions of the general psychological basis of the new methods and of the evidence in their favor are here omitted or much simplified. The treatment is constructive throughout. The practical consequences are treated more specifically and with abundant detailed illustration and application.

In order to aid the teacher still further in putting the new principles of teaching into active operation, each chapter is accompanied by exercises, which are even more detailed and concrete in nature than the text.

The choice of textbook material for illustrations of current practice in the text and for various uses in the exercises requires a word of explanation. As a matter of scientific care and of convenience to the student almost all of this material is taken from the same textbook. Scientifically this is almost necessary; for a procedure that is correct in one total teaching plan might be weak or even wrong in a different total teaching plan. Each detail of method ought to be judged with reference to its setting. All the details presented here are parts of one same teaching plan or textbook—all belong in the same setting.

Practically it seems unwise to require constant consultation of more than one textbook series. After the facts are clearly in mind as they work out in one textbook or total teaching plan, the student may study them in others so far as he has time and facilities.

The textbooks chosen are the *Thorndike Arithmetics*, with which the author is best acquainted and which were written with the definite purpose of applying "the principles discovered by the psychology of learning, by experimental education, and by the observation of successful school practice to the teaching of arithmetic."

One other feature of this volume needs explanation. It may seem that the older methods are not given a fair defense. This is, in a sense, true. But it must be remembered that the older methods are those by which the readers of this book have been taught, which they understand and are accustomed to, and which their unconscious tendencies will strongly favor. A certain advocacy of the newer methods by the author is thus necessary to achieve a real impartiality. In fact, even very vigorous advocacy will hardly suffice to balance the prepossession in favor of the methods by which we learned and which have become a part of us. If the newer methods as presented in this volume win assent and confidence, it will be on merit.

TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE NEW METHODS IN ARITHMETIC

CHAPTER I

REALITY

The older methods taught arithmetic for arithmetic's sake, regardless of the needs of life. The newer methods emphasize the processes which life will require and the problems which life will offer.

INDISCRIMINATE VERSUS USEFUL COMPUTATION

The old idea was that arithmetic should teach the children to add, subtract, multiply, and divide any numbers. Pupils subtracted ninths from fifteenths and multiplied $\frac{5}{54}$ by $\frac{9}{56}$ in school, though they never would be required to do so all their lives thereafter.

The work shown below illustrates the sort of computation which textbooks and teachers used to assign, but which the newer methods seek to replace by training which can be directly beneficial in the real world:

Reduce to integral or mixed numbers:

$$\frac{35}{15} \quad \frac{48}{21} \quad \frac{198}{14} \quad \frac{2134}{67} \quad \frac{413}{413} \quad \frac{6125}{3175}$$

Simplify:

$$\frac{3}{4} \text{ of } \frac{8}{9} \text{ of } \frac{3}{5} \text{ of } \frac{15}{22} \qquad \frac{7}{8} \text{ of } \frac{15}{18} \text{ of } \frac{4}{5} \text{ of } \frac{1}{36}$$

Reduce to lowest terms:

$$\frac{357}{527} \quad \frac{264}{312} \quad \frac{492}{779} \quad \frac{418}{874} \quad \frac{854}{1789} \quad \frac{77}{847} \quad \frac{18}{243}$$

Square:

$$\frac{2}{3} \quad \frac{4}{5} \quad \frac{5}{7} \quad \frac{6}{9} \quad \frac{10}{11} \quad \frac{12}{13} \quad \frac{15}{16} \quad \frac{19}{20} \quad \frac{17}{18} \quad \frac{41}{53}$$